

Exploring Innovation Activities of Firms from Peripheral Regions in Estonia and Germany

A Relational Perspective

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Referat

Die vorliegende Dissertation exploriert Innovationsaktivitäten von Unternehmen des produzierenden Gewerbes in zwei unterschiedlich strukturierten peripheren Regionen: in Südostland und dem Erzgebirgskreis. Die Arbeit erweitert bestehende Forschung, da periphere Regionen und low-tech Industriezweige sich nur vereinzelt in wirtschaftsgeographischen Forschungsagenden finden. Ausgehend von einer relationalen Perspektive fokussiert die Forschungsarbeit auf Akteursbeziehungen und insbesondere darauf, wie diese Beziehungen Wirtschaftsprozesse wie Wissensgenerierung und Innovation bedingen. Als analytische Perspektiven innerhalb dieses relationalen Rahmens werden Netzwerke und unterschiedliche Dimension von Nähe und Distanz herangezogen (geographische, soziale, kognitive, institutionelle und organisationale). Die Dissertation erarbeitet kontextualisierte Erkenntnisse zu räumlichen und relationalen Elementen von Innovationsaktivitäten in peripheren Regionen. Methodisch orientiert sich die Arbeit am Ansatz der Innovationsbiographien. Dazu werden konkrete Innovationsprojekte und ihre Netzwerke aus räumlicher und zeitlicher Perspektive rekonstruiert. Entsprechend wird im empirischen Teil der Arbeit ein evolutionäres, interaktives und wissensbasiertes Innovationsverständnis aufgegriffen. Die Arbeit stellt heraus, dass Unternehmen in beiden Untersuchungsregionen aktiv Innovationsprozesse vorantreiben bzw. an diesen teilhaben. Periphere Lage und sozioökonomische Herausforderungen prägen die Innovationspraktiken der Unternehmen entlang unterschiedlicher Dimensionen. Insbesondere lassen sich zielgerichtete Netzwerkaktivitäten, ein hoher Mobilitätsgrad sowie die strategische Ausrechterhaltung bzw. der Ausbau einer umfassenden Technologie- und Fertigungstiefe identifizieren. Diese Praktiken fungieren als Mechanismen zur Überwindung potenzieller Strukturnachteile peripherer Regionen. Basierend auf diesen Erkenntnissen illustriert die Dissertation Ansätze zur Erweiterung wirtschaftsgeographischer Innovationstheorie und diskutiert Maßnahmen zur Förderung der Innovationstätigkeit von Unternehmen in peripheren Regionen.

Abstract

This dissertation explores innovation activities of LMT manufacturing firms located in two differently structured peripheral regions: South Estonia and the Erzgebirgskreis. Thus, the dissertation expands existing scholarship in economic geography by investigating innovation in localities and sectors that are not part of broader research agendas. Operating from a relational perspective, this research emphasises the diverse actor relations and how these relations shape economic processes of knowledge creation and innovation. Within this relational framework, networks and multi-layered dimension of proximity and distance (geographical, social, cognitive, institutional and organisational) are mobilised as central analytical perspectives. Thereby, the dissertation provides contextually grounded insights on the spatial and relational elements that drive innovation activities in peripheral regions. Methodologically, this research is guided by the innovation biographies approach. Specific innovation projects and their networks are traced throughout space and time. Thereby, the evolutionary, interactive and knowledge grounded understanding of innovation is empirically addressed. This research finds that firms in both study regions actively pursue and participate in innovation activities. Operating at distance shapes the practices of firms in a number of decisive ways: purposive networking activities, high levels of actor mobility and maintenance of comprehensive internal capacities are identified in particular. These practices operate as mechanisms to overcome potential shortcomings of peripheral regions. Based on its findings, the dissertation outlines avenues to expand dominant approaches towards innovation theory in economic geography and provides avenues for policy measures that aim at fostering firm innovation in peripheral regions.

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Summary

Economic peripheralisation processes and persisting regional disparities can for instance be attributed to a lack of firm innovation (e.g. Friedmann, 1973; Kühn, 2015). Consequently, successful innovation activities can be considered a central mechanism to counteract peripheralisation dynamics and to support regional economic development. The phenomenon of innovation holds a central position within economic geography. It is widely acknowledged that the capacity of firms to innovate depends on the specifications of regional environments (Isaksen and Karlsen, 2016). This assumption facilitated the emergence of a persistent urban bias (Shearmur, 2017) and induced a specific core-region thinking into the discourse on innovation and space (Isaksen and Sæther, 2015). City regions are widely considered quintessential innovation hotspots (Shearmur, 2012; Florida et al., 2017) as structural features such as size, actor and resource density, proximity etc. provide fruitful conditions. Conversely, peripheral regions are portrayed as rather non-innovative settings because agglomeration advantages are largely absent.

This theoretically grounded urban bias facilitated a focus of empirical investigations on innovation in urban areas and high-tech sectors. Conversely, scholarship on innovation outside of designated hotspots and high tech industries is still scarce, although dynamically expanding (Eder, 2018). Despite the broadly theorised perspective of peripheral regions being rather uncondusive settings for innovation, this emerging scholarship illustrates that also these regions do generate innovation. However, these innovation processes might be different to the patterns and models observed in metropolitan regions. Such indications operate as a starting point for this dissertation, which explores innovation activities in localities (peripheral regions) and sectors (low and medium-low tech manufacturing) that are not part of broader research agendas. Despite growing scholarship, a need to better understand how firms from peripheral regions innovate successfully continues to exist (Shearmur, 2017). Thus, this dissertation expands existing scholarship in economic geography and its innovation geography subfield. In particular, the present study contributes to a better understanding on the spatial and relational contexts of innovation activities that occur in peripheral regions. The spatial focus of this study is on South Estonia and the Erzgebirgskreis (Saxony). Within this study, both regions are considered peripheral as they are exposed to socio-spatial challenges such as relative economic stagnation, ongoing population decline and a geographically remote location. Based on these motivations this dissertation investigates the following overarching research question:

- *Which key mechanisms facilitate the emergence and drive the dynamics of firm innovation in peripheral regions?*

Innovation is broadly used as a generic term for progress and has become a fuzzy phrase of academic, policy and wider societal debates (Grupp and Fornahl, 2010). Innovation in this dissertation is defined as the processes whereby firms transform ideas into new or improved products or processes (Baregheh et al., 2009). This inclusive understanding emphasises the evolutionary, interactive and knowledge grounded nature of innovation. To understand the diverse contexts of innovation and to overcome prevailing core-region thinking, this dissertation operates from a relational perspective. Social relations between economic agents and how these relations shape knowledge creation and innovation are openly explored by adopting a geographical lens (Bathelt and Glückler, 2003; Yeung, 2005), focussing on actors and practices.

Networks constitute a central concept within the relational framework. Networks are depicted as central modes to organise complexity and interaction (Rammert, 1997). Adopting a network perspective allows to understand how actors interact with their environments and, ultimately, how actors build their environments needed for innovation. Network ties are driven by configurations of proximity and distance. The easing function of geographical proximity has traditionally been emphasised, even though it has been argued that geographical proximity alone does not facilitate interactive learning and innovation (Boschma, 2005). As firms from peripheral regions are not able to extensively draw upon the benefits of geographical proximity, this research adopts multi-dimensional, relational conceptions of proximity and

distance (Gilly and Torre, 2000; Boschma, 2005). Based on these conceptual perspectives the following sub-questions complement the guiding research question:

- *How are the networks firms from peripheral regions mobilise for their innovation activities configured in terms of actors and scales?*
- *To what extent are these configurations shaped by multi-layered dimensions of proximity and distance, i.e. social, institutional, cognitive and organisational dimensions?*
- *What is the role of spatial proximity in innovation and how is it organised?*

To investigate these research questions, a qualitative, actor-centred, micro-level and explorative design, guided by the innovation biographies approach (Butzin and Widmaier, 2015), is adopted. Based on narrative interviews with firm representatives, specific innovation projects and their networks are reconstructed throughout space and time, considering their specific and contingent contexts. Thereby, the evolutionary, interactive and knowledge grounded understanding of innovation is empirically operationalised.

One overarching finding of this dissertation is that firms in both study regions actively pursue and participate in innovation, ranging from incremental to comprehensive projects. In theoretical terms, this study suggests that determining elements of innovation such as interaction, density, proximity and knowledge creation are less dependent on specific spatial contexts than conventionally assumed. Their function is mediated through actor practices. Collectively, such practices relate to strategic networking activities, actor mobility and internal capacity building and operate as central mechanisms that facilitate and drive innovation in peripheral regions.

This research affirms that innovation does typically not happen in isolation, but relies on external linkages that complement internal capacities and moderate innovation related complexities. The majority of external linkages relates to other firms and has distinct transaction-orientations, aiming for instance at technology acquisition. Solely knowledge-oriented linkages that facilitate joint learning and mutual partnership, and in particular collaborations with research partners, occur less frequently. However, external partners in knowledge-oriented linkages are found to substantially shape project paths, mutual learning and capacity building as these partners cover functionally comprehensive roles. Spatial analyses of external linkages reveal pronounced differences between study regions. South Estonian firms engaged more frequently international partners (45% of linkages) compared to firms from the Erzgebirgskreis (8%). Due to existing resource shortages, this distinct international orientation can be considered a particular necessity rather than deliberate choice. However, as one in three linkages in both study regions relates to regional partners, regional contexts seems to provide for innovation-relevant resources.

Firm's innovation networks exhibit complex interplays of relational dimensions of proximity and distance. These non-spatial configurations act as productive substitutes for geographical proximity. Firms actively construct network spaces that are constituted by both, relational and spatial elements. In these configurations, social proximity (trust, familiarity) acts as an indispensable element of functional collaboration. Processes of trust building necessitate co-presence between actors and, therefore, facilitate episodes of mobility. With respect to institutional and cognitive dimensions this research finds that distanced rather than proximate arrangements provide productive grounds for innovation and capacity building. Successful innovation projects tolerate and even require distance. Therefore, distance in certain dimensions should be considered a particular asset rather than a constraint. While geographical proximity is generally perceived a desired condition in collaborative projects, its absence must not be considered a major limitation to firms' innovation endeavours. Rather, geographical distance shapes the routines of firms from peripheral regions and facilitates strategic and purposive networking behaviour and high levels of actor mobility based on a range of formats that generate co-presence (e.g. project meetings, trade fair participation etc.). Furthermore, this research finds that, in order to gain flexibility and build self-sufficiency, firms in peripheral regions strategically maintain comprehensive levels of and further expand

internal capacities. Thus, internal capacities operate as a compensation mechanism through which firms respond to (regional) resource shortages and avoid transaction costs and uncertainties related to knowledge sourcing through (new) network linkages.

This dissertation complements existing research in economic geography by providing contextually grounded micro-level perspectives that illustrate practices, strategies and motivations of innovating actors. It establishes a typology of innovation-related action strategies of firms from peripheral regions based on which policy instruments are derived and discussed.

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LIST OF ABBREVIATIONS

BBSR	Bundesinstitut für Bau-, Stadt- und Raumforschung; Federal Institute for Research on Building, Urban Affairs and Spatial Development
BMFB	Bundesministerium für Bildung und Forschung; Federal Ministry for Education and Research
ca.	circa
CAD	Computer-aided design
CDC	Estonian County Development Centre; Arenduskeskus
CEE	Central and Eastern Europe
CEO	Chief Executive Officer
CIS	Community Innovation Survey
DUI	Doing, Using, Interacting – mode of learning and innovation
e.g.	for example (lat.: <i>exempli gratia</i>)
EAS	Enterprise Estonia; Estonian business and regional policy promotion agency
EIS	European Innovation Scoreboard
ERZ	Erzgebirgskreis
et al.	and others (lat.: <i>at aliae/ alii/ alia</i>)
etc.	and so forth (lat.: <i>et cetera</i>)
EU	European Union
FDI	Foreign direct investment
GDP	Gross Domestic Product
GDR	German Democratic Republic
i.e.	that is (lat.: <i>id est</i>)
IB	innovation biographies approach
ibid.	In the same place (lat.: <i>ibidem</i>)
ICT	Information and communication technologies
IHK	Industrie- und Handelskammer; Chamber of Industry and Commerce
JW	Jakob Winter GmbH
KPI	key performance indicators
LMT	low and medium-low tech industries
MIM	Metal injection moulding
MSM	Mechanically separated meat
NACE	Nomenclature statistique des activités économiques dans la Communauté européenne; Statistical classification of economic activities in the European Community
NUTS	Nomenclature of Territorial Units for Statistics
OECD	Organisation for Economic Co-operation and Development
QCA	Qualitative content analysis
R&D	Research and development
REG	Relational economic geography
SAB	Sächsische Aufbaubank
SMWA	Sächsisches Staatsministerium für Wirtschaft, Arbeit und Verkehr; Saxon State Ministry for Economic Affairs, Labour and Transport
STI	Science, Technology, Innovation – mode of learning and innovation
TFTAK	Food and Fermentation Technology Development Center; Research institute in Tallinn
TU	Technical University
VW	Volkswagen
WFE	Wirtschaftsförderung Erzgebirge GmbH; Erzgebirge Business Development Agency
ZIM	Zentrales Innovationsprogramm Mittelstand; Central Innovation Programme for SMEs; funding programme for SMEs with business operations in Germany which want to develop new/significantly improve existing products, processes or technical services.

Introduction and Motivation

This research investigates the formation contexts and development dynamics of innovation processes of firms located in peripheral regions in Estonia and Saxony. In the context of this research, innovation is defined as the processes by which firms transform ideas into new or improved products or processes (Baregheh et al., 2009). This open and inclusive understanding allows to explore various kinds of innovation, ranging from small-scale and incremental developments to larger scale developments which might introduce novelties to markets and industries. Furthermore, it emphasises the process nature of innovation, which this research acknowledges theoretically and adopts as part of its methodological proceedings. The present study expands dominant and primarily quantitative methodological approaches within economic geography that tend to reduce innovation to specific outcomes and, thereby, largely neglect its process nature. This research is conducted from a particular economic geography perspective and situated within the ‘innovation geographies’ subfield.

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Why innovation in peripheral regions?

The spatial focus of this study is on regions in Estonia and Saxony that are affected by socio-spatial challenges. These challenges drive and re-produce ongoing processes of uneven spatial development and potentially facilitate the stiffening of spatial patterns that reflect divergence between thriving metropolitan regions and peripheral regions. Theoretical scholarship explains economic peripheralisation processes by lacking innovation activity, ultimately producing self-reinforcing dynamics of regional development (e.g. Friedmann, 1973; Kühn, 2015). In this research I mobilise the reverse argument of this diagnosis as the central entry point and motivation: considering lacking innovation as crucial drivers of peripheralisation processes suggests that successful innovation might act as a critical mechanism for regions and actors to counteract peripheralisation dynamics. Consequently, successful innovation might contribute to the stabilisation and development of peripheral regions – potentially contributing to more equal socio-spatial development dynamics. Accordingly, the stimulation of firm innovation constitutes a central element of policy intervention within the regional economic development arena in which innovation is considered key for firm competitiveness and regional economic development (e.g. Tödting and Trippl, 2005; World Bank, 2009).

In essence, **this research seeks to contribute to a better understanding of the processes, contexts and configurations that shape the innovation activities of firms operating from peripheral regions.** From a disciplinary perspective, a distinct and prevalent urban bias has been diagnosed within innovation-related economic geography and innovation studies (e.g. Shearmur, 2017). Larger city regions are, due to concentrations of innovation relevant actors and resources, widely considered quintessential innovation hotspots (e.g. Shearmur, 2012; Florida, Patrick and Mellander, 2017). In contrast to these hotspots, peripheral regions are typically regarded rather non-innovative environments (e.g. Isaksen and Karlsen,

2016). Furthermore, with its sectoral focus on low and medium-low tech (LMT) industries, this dissertation addresses a second major bias in the field as existing research focusses on firm innovation in high-tech sectors (e.g. Hansen and Winther, 2011). As high-tech industries tend to concentrate in agglomerations, spatial and sectoral biases are closely interlinked. Thus, this research explores innovation activities in localities and sectors that are not part of broader research agendas. Consequently, and despite growing scholarship and disciplinary interest in innovation activities in peripheral regions, an explicit need to better understand how firms from peripheral regions innovate successfully and how these processes can be characterised continues to exist. Such fine-grained insights are especially important as it has been indicated that economic geography lacks a coherent theoretical framework to explain the occurrence of innovation in peripheral regions (e.g. Isaksen and Karlsen, 2016; Shearmur, 2017). Against the backdrop of persistent and growing regional disparities, scholars and policy makers must have a key interest in understanding the drivers of innovation in peripheral regions more thoroughly, as such insights might offer valuable starting points for effective support activities.

Research perspectives and research questions

Following a bi-national comparative design, this project investigates specific innovation projects of firms located in peripheral regions in Estonia and Saxony. Counties in South Estonia and the Erzgebirgskreis in Saxony were selected as study regions for this project for multiple reasons. First, both regions are exposed to socio-spatial challenges that surface as continuous population decline, economic stagnation relative to respective macro contexts (Estonia and Saxony) and a geographically rather remote location. Second, although commonly sharing these socio-spatial challenges, South Estonia and the Erzgebirgskreis differ along a number of determining features such as actor density and historical trajectories (see 3.4.1). Accordingly, the study regions reflect the heterogeneity of settings that might be referred to as peripheral and, thus, might give rise to regionally distinct as well as common observations. However, it needs to be mentioned that this research does not introduce a ‘counterfactual’ perspective, i.e. will not study innovation processes that engage firms from metropolitan regions. The absence of this particular comparative dimension induces certain limitations regarding the findings from this research. In particular, it involves that this research cannot explicitly state that findings are spatially unique. Some of the mechanisms, practices and configurations identified in this research as facilitators and drivers of innovation projects of firms from peripheral regions might also be observed when conducting this research with a focus on firms located in metropolitan regions. However, as stated previously, the main intention of this research is to contribute to a better understanding of innovation processes that occur outside of agglomerations, which conditions its particular spatial focus.

Within the project, I investigate specific innovation projects from an actor-centred perspective to **uncover and understand the spatial and relational contexts** of these projects. However, this dissertation does not intend to study direct impacts and effects of firm innovation on local and regional development processes within the study regions. However, some of the projects investigated reveal such immediate links, for instance concerning job creation or the involvement of the local communities in value creation.

The project's micro level focus on actor practices in innovation projects is not attuned to evaluations that relate, on the rather macro level, to overall regional development processes and dynamics.

Existing and emerging scholarship illustrates that peripheral regions constitute arenas that take part in innovation activities – despite the broadly theorised perspective of peripheral regions being rather un conducive environments for innovation. Such insights serve as a starting point for this study and invite, more generally, for adopting perspectives that ascribe peripheral regions and its actors the ability to mobilise innovation capacity, i.e. to re-considering seemingly established positions within economic geography. Rather than treating structural attributes of space and regions as essential pre-conditions that matter for innovation, and which are undoubtedly more favourable in metropolitan areas, this project focusses on actors and practices. From these lines of thought derives the motivation to study the spatial and relational contexts that give rise to and shape innovation. From here, I derive the **guiding and overarching research question** of this dissertation:

Which key mechanisms facilitate the emergence and drive the dynamics of firm innovation in peripheral regions?

To investigate this research question, I utilise different, yet interrelated, theoretical perspectives. The overall theoretical perspective by which this research is inspired relates to relational economic geography (REG). In essence, REG is concerned with the various social relations between agents and how these relations shape and condition economic action, such as innovation, and associated spaces. The analytical perspectives of this dissertation relate to this overarching relational approach. First, I consider innovation as interactive processes that are organised in networks. Thus, for investigating and analysing innovation activities, a network perspective will be adopted. Second, to better understand the constitution and emergence of innovation activities and their associated networks, I mobilise expanded frameworks of proximity and distance to uncover their relational mechanisms and spatial dynamics. The following paragraphs succinctly introduce the building blocks of these perspectives, more detailed explorations follow in part 1 and part 2.

Relational thinking (e.g. Bathelt and Glückler, 2003; 2011) is utilised throughout this research as a means to overcome prevailing 'core-region thinking' in the discourse on innovation and space (Isaksen and Sæther, 2015; Shearmur, Carrincazeaux and Doloreux, 2016). Relational thinking allows to openly explore innovation processes without privileging particular spatial scales or mechanisms. Along the lines of REG, social and cultural relations between economic agents and how these relations shape processes of knowledge creation, learning and innovation become central analytical interests and are explored by adopting a geographical lens (Bathelt and Glückler, 2003; Yeung, 2005). Spaces become un-bounded contexts in which multi-scalar actor relations are coordinated (Amin, 2004).

In this research, I depart from an interactive and knowledge grounded understanding of innovation. Due to increasing complexities innovation requires interaction, firms cannot solely rely on internal capacities to respond to these complexities. However, internal capacities play a crucial role for firm competitiveness and innovativeness (Foss, 1997). Thus, resources internal and external to firms operate as complements.

Introduction and Motivation

Networks are depicted as central modes to organise complexity and interaction in innovation processes (Rammert, 1997). By tracing the evolution of networks associated with innovation projects, a network perspective allows to understand how actors interact with their various environment and, ultimately, how they build specific environments needed for innovation.

Proximity and distance constitute a central conceptual pair in economic geography. This pair has shaped and continues to shape innovation discourses which, implicitly and explicitly, privilege actor arrangements in geographical proximity, i.e. co-location. However, it has been argued that geographical proximity per se is neither a necessary nor a sufficient condition for interaction and innovation (e.g. Boschma, 2005). Accordingly, proximity and distance have experienced a certain de-territorialisation (Bunnell and Coe, 2001) and, thus, were enriched by non-spatial dimensions. Such multi-layered and relational understandings of proximity and distance are conceptualised along various dimensions, including social (trust, friendship), institutional (shared reference frameworks), cognitive (resources, capacities and knowledge bases) and organisational (membership in organisational arrangements) dimensions (e.g. Gilly and Torre, 2000; Boschma, 2005; Coe, Kelly and Yeung, 2007) and are considered key qualities of innovation related interaction. Typically, proximity, i.e. similarity, is emphasised as an interaction facilitating element. However, more recently the productive properties of distance, i.e. diversity, have been highlighted (e.g. Ibert, 2011). Re-visiting the role of geographical proximity and distance between actors, changes regarding the organisation of spatial configurations have been suggested: from static and co-localised arrangements to temporary configurations in co-presence (Torre, 2008).

Based on these perspectives and linked to the goal to analyse the relational mechanisms and spatial dynamics of innovation activities of firms from peripheral regions, the aforementioned guiding research question is complemented by the **following sub-questions**:

- *How are the networks firms from peripheral regions mobilise for their innovation activities configured in terms of actors and scales?*
- *To what extent are these configurations shaped by multi-layered dimensions of proximity and distance, i.e. social, institutional, cognitive and organisational dimensions?*
- *What is the role of spatial proximity in innovation and how is it organised?*

In addition to these central research interests, this dissertation reflects upon the largely deficit-oriented representation of peripheral regions in conventional innovation discourses. Such dominant debates produce and reproduce a particular image which will be referred to as the ‘periphery label’ in this research (see 1.3.2). This ‘periphery label’ draws on structural deficits peripheral regions are, in contrast to their metropolitan counterparts, confronted with. Thus, I append the following research interest to the previously formulated central questions:

- *Along which dimensions do actors from peripheral regions affirm and contest dimension of the ‘periphery label’?*

Structure of the dissertation

This research follows a multiple case study approach. Individual cases, i.e. firms and specific innovation projects, were investigated in two study regions: South Estonia and the Erzgebirgskreis. Part 4 of this dissertation provides a contextual introduction to both study regions. These contextual introductions provide an overview of the overall economic structures and historical trajectories of study regions. As the two study regions comprise divergence regarding structural features like size and density, contextual understanding is considered essential to interpret findings. Within these two differently structured contextual settings the approach to case selection was guided by the rationale to introduce variety regarding firm size, age and micro-location. The sectoral focus is on firms active within low and medium-low tech manufacturing (LMT). Figure 1 provides a summary on how this dissertation is structured.

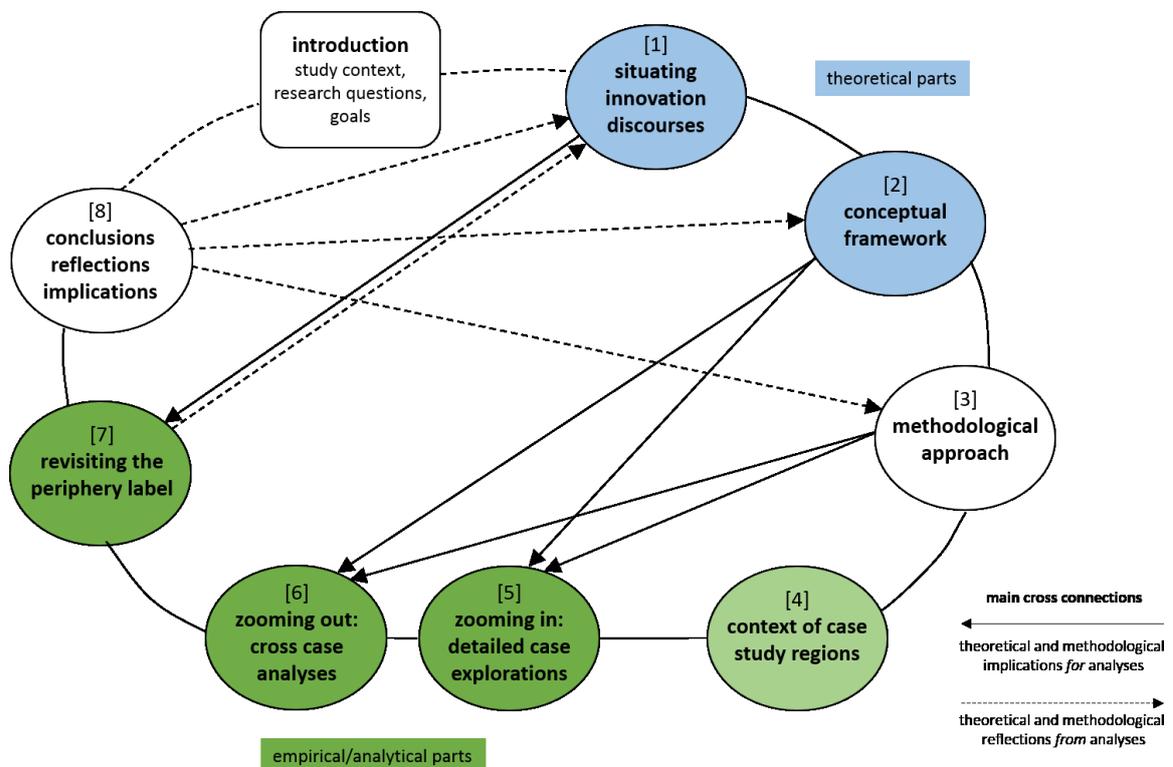


Figure 1: Structure of thesis

The opening parts of this research (parts 1 and 2) provide theoretical explorations and build the basis for situating the specific research intentions of this dissertation (part 1) and more specifically regarding its conceptual framework (part 2). These theoretical explorations are based on literature surveys and textual analysis and provide an overview on debates and perspectives related to the central topic of this study: innovation activities of firms that are located in peripheral regions. However, in this research, I do not intend to fully explore and cover all varieties of theoretical debates somewhat related to this research. Rather, the aim is to provide selective, yet coherent, discussions of theoretical as well as existing empirical scholarship to highlight the relevance of this research. Part 1 explores, from different viewpoints, the central phenomena of this thesis: firm innovation. First, the overall understanding of innovation adopted throughout this research is illustrated (1.1 and 1.2). Second, differentiated spatial perspectives on innovation are introduced by mobilising theoretical and empirical accounts on the ‘geographies of

innovation' (1.3). Part 2 links these wider theoretical considerations to the particular conceptual perspectives utilised for analysing the empirical material, namely networks (2.1) and multi-dimensional frameworks of proximity and distance (2.2). Part 2 concludes with a synthesis of theoretical perspectives mobilised to conduct this research.

The empirical part draws on qualitative and quantitative methods. Part 3 outlines the overall methodological approach, including an outline of basic methodological positions (3.1), an overview on the study design (3.2), discussions of individual methods used for data collection and analysis (3.3) as well as the different selection approaches mobilised in this research (3.4). I also address limitations adhering to individual methods, suggesting that the chosen methodological approach represents one specific way, and not the ultimate way, to conduct this research. The main empirical parts of this dissertation (5, 6 and 7) are primarily based on the analyses of interviews with business representatives and actors from the regional development arena. Following triangulation principles, interviews were complemented by information drawn from sources such as secondary literature, statistical databases, promotional material and internet sources such as websites and social media accounts. This body of empirical material was mobilised for qualitative and quantitative analyses. The interpretation of 40 interviews conducted as part of this research, including 31 interviews with business representatives and nine contextual interviews with intermediary organisations, was guided by principles of qualitative content analysis (3.3.3).

Part 5 zooms into the empirical material and provides, for each study region, three in-depth illustrations of innovation projects. Thereby, this part offers particular micro-level insights on specific innovation projects, firm practices, strategies etc. These thick narrations yield illustrative individual case studies that capture the emergence and dynamics of innovation projects, associated particular geographies and, collectively, reflect examples of the empirical material that illustrates the actor-centred 'innovation-biographies' approach adopted.

Going beyond these particular narrations, part 6 provides analyses that cut across cases and study regions ('zooming out'). Chapter 6.1 analyses processes and configurations related to the emergence of innovation projects. Central features of the networks mobilised as part of innovation projects and the actor configurations in these networks along multiple dimensions of proximity and distance are analysed in chapters 6.2 and 6.3. Chapter 6.4 focusses on the role of geographical proximity in innovation projects and analyses in particular actor perceptions towards geographical proximity and its organisation. Chapter 6.5 exceeds the specific network perspective and discusses the role of internal capacities. Finally, in chapter 6.5 an empirically grounded typology on innovation-related action strategies of firms from peripheral regions is constructed and discussed – synthesising preceding analyses and connecting to implications on debates and instruments regarding innovation-oriented regional development policies.

Part 7 reflects on the deficit-oriented 'periphery label' in economic geography derived in chapter 1.3. This part seeks to confront this assertive label with the perceptions of innovation relevant actors operating in and from peripheral regions. It reflects on elements of periphery in spatially informed innovation discourses, devoting attention to both specific limitations as well as qualities of peripheral regions. In the

Introduction and Motivation

final part I summarise the main findings of this research. It further comprises theoretical, conceptual and methodological reflections and derives conclusions and implications.

1 Situating Innovation Discourses

1.1 *The notion of innovation*

The literal meaning of the term of innovation is ‘novelty’ or ‘renewal’. In colloquial speech, innovation is commonly linked to ‘something new’ and often equated with inventions. The multiplicity of academic disciplines and policy debates concerned with the notion of innovation has contributed to a wide range of perspectives, resulting in multi-faceted understandings and definitions that inevitably contribute to a fuzzy innovation-related terminology. Due to this terminological vagueness, innovation, within academic, policy, economic and wider societal debates, has become a buzz-term broadly used as a placeholder for modernity and progress (Grupp and Fornahl, 2010). Consequently, a commonly used definition of innovation between (and even within) academic disciplines is missing. Nevertheless, terminology developed by Schumpeter is broadly considered the origin and common denominator of innovation research in economics and related disciplines. According to Schumpeter (1961), innovations within the economic sphere refer to the implementation of ‘new combinations’ that reinforce the competitive position of firms. Thus, innovations are considered new creations that bear economic significance (Edquist, 1997; Pavitt 2006). On this basis, a certain consensus across disciplines has emerged, broadly framing innovations as successfully commercialised inventions which can either be new/improved products or processes (Fagerberg, 2006). A similarly open and inclusive understanding of innovation is adopted by the Organisation for Economic Co-operation and Development (OECD) in its *Oslo Manual*, which has become the central reference point for the collection and interpretation of innovation data: ‘*an innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations*’ (OECD/Eurostat 2005:46). Due to its openness, this definition encompasses a wide range of possible innovations.

Based on these considerations on the notion of innovation, in this I depart from an equally broad understanding and refer specifically to a multi-disciplinary ‘meta-definition’ of innovation. This definition by Baregheh, Rowley and Sambrook (2009) grounds on more than 60 individual definitions from disciplines that frequently mobilise the notion of innovation, and covers a time horizon from 1934-2008:¹

‘Innovation is the multi-stage process whereby organizations transform ideas into new/improved products, services or processes, in order to advance, compete and differentiate themselves successfully in their marketplace.’ (Baregheh et al., 2009:1334)

In line with the understandings of Schumpeter and the OCED, this definition emphasises novelty as a constituting element of innovation. At the same time, the definition keeps a broad and inclusive understanding of innovation which is a fruitful aspect for studying innovation in peripheral regions. A narrow and rather limiting understanding of innovation, for instance mere technological understandings, confines the scope to fully grasp the range of innovations to be encountered in peripheral regions (e.g.

¹ These somewhat overlapping disciplines are: economics, innovation and entrepreneurship, business and management, technology science and engineering, organization studies, marketing and knowledge management.

Meng, 2012). Another determining element of this meta-definition is its conception of innovation as organisational transformation processes. Such a processual perspective devotes particular attention to business practices and activities that relate to innovation processes, addressing its path from idea generation up until commercialisation. Thereby, specific practices and strategies of actors can be moved to the centre of empirical investigation. Focussing on practices and strategies assigns relevance to the processes that shape innovation activities, their contexts and dynamics. Consequently, this processual perspective on innovation contrasts with outcome-oriented perspectives which emphasise the outcomes of innovation processes, i.e. new/improved products or processes. These perspectives ground on different theoretical considerations and, importantly, also relate to different methodological approaches which can be generally framed as intentions to understand innovation processes and to measure the outcomes of innovation processes.

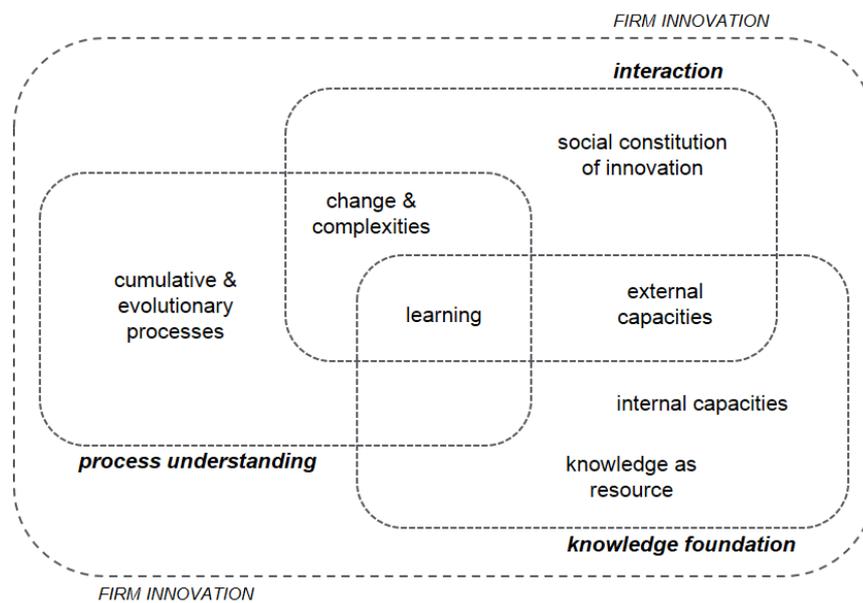


Figure 2: Conceptualising firm innovation

In the following sections the inclusive understanding of innovation from which this thesis departs is further specified, focussing on three particular dimensions: its process (see 1.1.1), knowledge grounded (see 1.1.2) and interactive nature (see 1.1.3). Collectively, these intertwined and overlapping dimensions (see Figure 2) constitute the central building blocks of how this thesis understands innovation in theoretical terms and approaches the notion methodologically. This particular understanding informs the conceptual framework mobilised as primary analytical perspectives, focussing in particular on knowledge driven and interactive dimensions (see part 2). Furthermore, it is manifested in the methodological procedure of this thesis which addresses the processual understanding of innovation rather than reducing the notion merely to process outcomes (see 3.3.1).

1.1.1 Process understanding of innovation

EVOLUTIONARY PERSPECTIVES

A process perspective on the organisational transformation processes that constitute innovation can be placed within an evolutionary framework. Thus, rather than focussing merely on the outcomes of associated transformation processes, their evolutionary nature is emphasised. Transforming ideas into novel products/processes draws upon existing paths and generates new trajectories. Schumpeter (1934) related to such paths and the evolutionary nature of innovation processes by arguing that innovation can only be the result of new combinations of existing knowledge, generating more robust solutions than available previously. Even if Schumpeter's understanding rules out the possibility of creating genuinely new knowledge, a view which is broadly rejected nowadays, it is widely accepted that the vast majority of innovations build, to varying degrees, on existing knowledge, capacities, resources and experiences. Hence, innovation and technological shifts constitute cumulative and evolutionary processes (Dosi, 1998; Koschatzky, 2001). Innovation and the change it facilitates does not simply occur out of the blue, but is directed by the state-of-the-art in respective fields, i.e. capabilities and awareness-levels which individuals and organisations have previously achieved (Dosi, 1998:223). Similarly, Fagerberg (2006) argues that even most radical innovations require a series of preceding incremental innovations to unfold their revolutionary potential.

Consequently, effective management of accumulated knowledge, capacities and routines put organisations in favourable positions for generating innovation. Additionally, it has been argued that future innovation does, however, not solely depend upon knowledge, routines and practices which have proven successful in the past, but on retaining openness for introducing novelty, procedures and expertise alongside existing ones (Nelson and Winter, 1982). This capacity to absorb and appropriate external stimuli and knowledge not only represent critical mechanisms for maintaining innovative capacity (Cohen and Levinthal, 1990), but further helps preventing to get trapped into existing routines. This latent danger of lock-in emphasises the necessity to integrate capacities and expertise located outside the own organisation. This understanding, and its underlying notion of interactivity, has been integrated into various interaction oriented innovation models (Kline and Rosenberg, 1986; Rothwell and Zegveld, 1985; Chesbrough, 2003). These models collectively share a distinct process understanding of innovation. Some of the most influential models will briefly be illustrated in the following paragraphs. At the same, these illustrations set ground for more elaborate discussions on the knowledge grounded and interactive nature of innovation that follow (1.1.2 and 1.1.3).

INNOVATION MODELS

Perceiving innovation as processes links to a set of theoretical models that portray innovation as sequential processes encompassing different stages framed by initial activities related to idea generation and the rather final marketing activities. While different models diverge in how these individual stages are perceived, it is the particular process understanding which forms their common starting point.

During the 1950s ideas related to the *linear model* of innovation have been increasingly circulated (Godin, 2006). The linear model has been influential and remained, up until the 1980's, a common reference point

for academics and policy-makers alike (Kline & Rosenberg, 1986; Godin, 2006). In essence, the linear model proposes a stage-like transition encompassing formal research, application-oriented development activities involving intense prototyping of products/processes and finally marketing. The distinct emphasise on formal research during the initial stages places the model within ‘science-push’ perspectives on innovation. The idea that innovation mainly originates from science related activities has, at the time, been widely adopted. Consequently, policy has funnelled substantial financial resources into science as well as research and development. Up until today, the influence of the linear innovation model with its particular focus on formal R&D and science-push mechanisms is frequently articulated. As such, central ideas of the linear model reflect in contemporary innovation policy, regional development or industrial policy and their focus on the support of formal R&D activities (Hansen and Winther, 2011). In addition to the implicit policy orientation towards the linear model of innovation, it is pointed out that dominant methodological approaches, using R&D expenditures or patent data as primary approximations for innovation activities, also lean on the linear model (e.g. Godin 2006; Smith, 2006).

Despite its continued influential position, various critiques regarding its theoretical assumptions facilitated alternative understandings proposing that ‘*everyone knows that the linear model of innovation is dead*’ (Rosenberg, 1994; cited in Godin, 2006:640). Central critiques towards the linear model were articulated by Kline and Rosenberg (1986; Kline, 1985) and Rothwell and Zegveld (1985). During the mid-1980s, these authors came up with influential alternative conceptualisation, the ‘chain-linked model’ by Kline and Rosenberg and the ‘coupling model’ by Rothwell and Zegveld, which critically responded to the dominant linear understanding. Despite conceptual differences, both of these models emphasise the non-linear, iterative and interactive aspects of innovation processes.

The central critique addressed the linear model's emphasise on formal research activities during early stages suggesting that basic and applied research constitute the most critical impetus to innovation. Thus, not allowing for market and demand-driven innovation arising for instance from feedback provided through market agents as well as monitoring activities by innovating organisations. Kline and Rosenberg (1986; ‘chain-linked model’) argue that the empirical reality calls for complements to ‘science-push’ mechanisms with ‘demand-pull’ logics. Additionally it is argued that, due to its focus on formal research, the linear model undermines the importance of incremental innovation which arises as part of continuous efforts for organisational improvement, not relying on R&D.

A second major criticism articulated in response to the continued influence of the linear model has been its implicit assumption of innovation processes as being well-behaved, smoothly transitioning from one stage to the next. Such an understanding contrasts with the various complexities innovation involves. Innovation does typically not follow a linear and predictable chain of events. Rather, innovation is determined by iterative feedback loops (Rothwell and Zegveld, 1985; Kline and Rosenberg, 1986). Insights from iteration and feedback inform the action of individuals, departments and organisations involved in preceding and subsequent stages of the transformation process. Allowing for feedback and interaction is considered essential in order not to ‘oversimplify’ innovation processes (Kline, 1985) and to sufficiently incorporate complexities that innovation induces and is exposed to at the same time. The

1 Situating Innovation Discourses

arguments brought forward by Kline/Rosenberg as well as Rothwell/Zegveld regarding feedback and iteration also oppose the isolated, i.e. non-interactive understanding embedded within linear model. Interaction occurs firm-internally due to loops that encompass multiple departments and through exchange with external actors like customers, suppliers, collaboration partners etc. and became the central element of alternative conceptions collectively referred to as ‘interactive innovation models’.

More recently the ‘open model’ of innovation (Chesbrough, 2003) further extended the existing interactive conceptualisations. In essence, the open model argues that organisations don’t necessarily pursue all stages of the innovation process in-house. Internal processes are opened for knowledge created externally (outside-in mechanism) and, vice versa, knowledge generated in-house is not restricted to be commercialised internally (inside-out mechanism) (Chiaroni et al., 2011). Hence, the open innovation paradigm emphasises the importance of interaction in conjunction with external knowledge acquisition and absorptive capacity as well as spillover mechanisms. It keeps the process nature of innovation but offers substantially expanded perspectives. Including a notion of knowledge that can easily be transferred and exchanged, i.e. framing knowledge as a highly mobile resource. This perspective has triggered substantial criticism as knowledge is widely perceived as an immobile, sticky and highly context related resource (Howells, 2002; Gertler, 2003). A more elaborate discussion on the nature(s) of knowledge will follow in the next section.

SECTION SUMMARY:

- A process understanding is inscribed into the various theoretical innovation models. The particular mechanisms and functional modes of such organisational transformation processes have been subject to intense debates: linear and isolated understandings of innovation processes (e.g. Godin, 2006) have been substantially enriched by perspectives emphasising their iterative and interactive attributes (Kline and Rosenberg, 1986; Chesbrough, 2003).
- Innovation is a cumulative and evolutionary process (e.g. Dosi, 1998) that is, to varying degrees, constituted and directed by the state-of-the-art in its respective fields (e.g. Schumpeter, 1934; Fagerberg, 2006).

1.1.2 Innovation as knowledge grounded processes

It is widely accepted that firm-internal capacities and how they are co-ordinated play a key role for knowledge creation, learning and competitiveness (Taylor and Asheim 2001; Edquist, 2006). Consequently, firms can be perceived as unique bundles of resources such as technological capabilities, production experiences and organisational routines, human resources or existing customer bases (e.g. Foss, 1997; Flåten, Isaksen and Karlsen, 2015). All of these ensure competitiveness and set firms apart from competitors. Based on embedded learning and the particular routines that shape knowledge bases, firms generate and process knowledge (Taylor and Asheim, 2001). With respect to the focus of this dissertation on firms operating from peripheral, i.e. structurally challenging regional settings (for operationalisation of *peripheral regions* see 3.4.1), it can be argued that firm-internal capacities are

1 Situating Innovation Discourses

pivotal resources for maintaining innovative capacity. This is because these firms are confronted with rather resource thin regional environments (Tödting and Tripl, 2005; Flåten et al., 2015).

However, while being substantial resources for innovation, firm-internal capacities alone are typically not sufficient. Network resources supplement internal resources and, thereby, distinctively shape firm's innovation capacities (Leick, 2013). Linkages to external actors such as suppliers and customer, research and educational institutions, state agencies and chambers are considered central mechanisms through which firms access resources and expertise not available internally. The capacity of firms to recognise and internalise external knowledge from diverse sources and localities is coupled with their internal capacities. This intertwining of internal capacities and externally acquired resources has been conceptualised by Cohen and Levinthal (1990) as firm's *absorptive capacity*. Capacity building through external resources is guided by what is already known within organisations (Powell and Grodal, 2006). Internal capacities must be continuously developed as external resources can only complement, but not replace them.

The paradigmatic shift towards an increasingly knowledge based economy (KBE) underscores the particular function of both, knowledge and learning (Lundvall and Johnson, 1994). From a knowledge perspective, innovation reflects endeavours to newly combine or to generate genuinely new knowledge (Fagerberg, 2006). Processes of knowledge creation, acquisition, diffusion, reproduction and appropriation are key to sustain competitiveness of organisations, industries, regions and nation states (Gertler, 2003; Feldman and Kogler, 2010; Vale, 2011). The KBE has been substantially fuelled by advancements in information and communication technologies, e.g. data storage and processing capacities. Knowledge increasingly complements 'classical' production factors such as labour, capital or natural resources. Besides being an input to economic processes, knowledge also constitutes a major output. In contrast to classical resources, knowledge is not consumed during production processes but amplifies through learning and (re)production. However, knowledge must not be considered an easily accessible physical stock that grows by mere accumulation (Amin and Cohendet, 2004). Rather, expanding knowledge resources require effective management and sufficient investments from firms as well as individuals. Effective identification, use and appropriation of knowledge, including discarding and forgetting redundant knowledge, are critical mechanisms to facilitate innovation (Lundvall and Johnson, 1994). Departing from this knowledge grounded understanding of innovation, the remainder of this section delves more thoroughly into conceptions of knowledge (considered the essential resource for innovation) and learning (considered essential processes for innovation). Although I acknowledge that theoretical debates on knowledge are deeply rooted in philosophical thought, it is not my intention to activate these philosophical discussions.

EXPLORING KNOWLEDGE CONCEPTIONS

A fundamental distinction is made in the literature between information and knowledge. Nonaka (1994) frames information as messages and meanings containing elements that increase the amount of information available to individuals and organisations. Information is structured according to individual and organisational specifications as well as cognitive capacities (Nooteboom, 2006). However,

information alone does not suffice for knowledge creation and innovation, as *'innovation [...] cannot be explained sufficiently in terms of information gathering or problem solving. Innovation can be better understood as a process in which the organisation creates and defines problems and then actively develops new knowledge to solve them'* (Nonaka, 1994:14). To be transformed into knowledge, information need exposure to organisational and individual practices and contextual interpretation by which actors assimilate, assign meaning and anchor information (Howells, 2002; Amin and Cohendet, 2004). Consequently, knowledge becomes a complex and heterogeneous resource and *'multifaceted concept with multi-layered meanings'* (Nonaka, 1994:15). These multiple facets emerge in the literature as diverging approaches to theorising knowledge, reflecting different and sometimes conflicting schools of thought (Amin and Cohendet, 2004).

The distinction between tacit and codified knowledge links to the discussion on information and knowledge. The tacit/codified divide assumes that certain fragments of knowledge cannot at all, or only under specific circumstances, be codified, i.e. expressed and documented. Polanyi (1966) suggests that there is more knowledge than individuals are able to express in words and numbers (*'we can know more than we can tell'*). In this context, information is typically referred to the codified dimension. Codified knowledge can be transmitted and stored as publications, blueprints, databases, machines, artefacts and procedural methods (Koschatzky, 2001) and be recalled by the use of formal language (Nonaka, 1994). However, access to codified knowledge presupposes command of the formal rules and systematics by which it is expressed (Amin and Cohendet, 2004): *'this implies that codified knowledge that stands alone is not economically useful'* (Jensen et al., 2007:681).

Individually bound, i.e. contextualised knowledge anchored in practices and experiences, is broadly understood in tacit terms. Nonaka (1994:16) refers to tacit knowledge as *'rooted in action, commitment and involvement'*, thus, being highly contextualised and limiting the scope for its formalisation. This position supposes that tacit knowledge is a largely individually-centred resource, constantly evolving and (re)producing through anchoring in routines (e.g. Howells, 2002; Lundvall, 2007). Similarly, Huggins, Johnston and Thompson (2012:204) perceive knowledge as sets of individually grounded information that might change routines and approaches *'either by becoming grounds for action or by making an individual or organization capable of different or more effective action'*. Being subject to experiences and cognitive abilities tacit knowledge differs between individuals. Consequently, it cannot easily 'flow' between actors, which underscores the function of effective interaction as an essential prerequisite to transmit tacit knowledge (Howells, 2002). Interaction between individuals provides the ground for developing and negotiating 'codes' to assimilate and interpret tacit knowledge (Lundvall and Johnson, 1994). The codes and interpretation principles necessary for assimilation point towards the 'club-like' attributes of tacit knowledge (Cusinato, 2016). Within the innovation context it can be noted that tacit knowledge is typically assigned a premium value (Gertler, 2003; Simmie, 2005). As it cannot be easily and fully documented, it constitutes an exclusive resource that allows actors to set themselves apart from rivals. Consequently, tacit knowledge withstands becoming ubiquitous (Malmberg and Maskell, 1999).

Despite the pivotal function assigned to tacit knowledge in the innovation context, the role of codified knowledge should not be dismissed. It has been argued that it is exactly the interplay between the two that facilitates novel ideas (Nonaka, 1994; Amin and Cohendet, 2004; Jensen et al., 2007). Thus, a dichotomous understanding of codified and tacit knowledge, appealing for analytical purposes, induces theoretical simplifications. Rather than referring to separate units, tacit and codified knowledge should be considered ends of a spectrum that are combined in a ‘dialogue’ (Nonaka, 1994). Genuinely pure forms of both tacit and codified knowledge are hardly conceivable (e.g. Howells, 2002, 2012; Amin and Cohendet, 2004): *‘Actually, in economic practice it is seldom a question of working with knowledge that is either tacit or codified. The zone in between and the complementarities between tacit and codified elements of knowledge are often what matters most’* (Jensen et al., 2007:682).

Perspectives on knowledge in mainstream economics literature widely dismiss its individually /collectively grounded and contextualised nature. Rather simplistically, it is assumed that tacit knowledge can be transformed into codified units. These units can then be exchanged between individuals and organisations at convenient times and places (Amin and Cohendet, 2004). While these views allow to treat knowledge as an economic good, it denies propositions that tacit knowledge remains largely unarticulated e.g. because of related complexities or because it remains intentionally unarticulated. Additionally, it goes unnoticed that knowledge codification inevitably induces simplifications that result in partially losing or discarding tacit knowledge (Howells, 2002; Gertler, 2003). Thus, knowledge codification comes at a cost. However, if tacit knowledge remains inactive and idle, it will eventually be forgotten (Amin and Cohendet, 2004). Consequently, codification through systematic procedures is a mechanism to sustain certain fractions of tacit knowledge.

Departing from the tacit-codified distinction, the ‘differentiated knowledge base approach’ (Asheim and Coenen, 2005; Asheim, 2007) gained conceptual influence. It puts forward the idea that firm’s innovation processes differ according to industrial affiliation. Thus, the approach derives three specific knowledge bases: *‘analytical’* (science-based), *‘synthetic’* (engineering-based) and *‘symbolic’* (creativity-based) (Asheim, 2007). These knowledge bases activate tacit and codified elements to varying degrees. Industries such as the chemical sector, bio- or nanotechnology make extensive use of R&D capacities, therefore largely draw on analytical knowledge. Its creation closely relates to formalised procedures, outcomes are typically documented as reports, publications or patents. The analytical knowledge base is, due to its focus on formal processes of research and development, largely congruent with the ‘Science, Technology and Innovation’ (STI) mode of learning and competence building described by Jensen et al. (2007). Within the synthetic domain, knowledge is prevalingly generated through practical experimentation and testing, therefore largely grounded in individual and collective experiences. Such specific *know-how*, described by Lundvall and Johnson (1994) as practically relevant experiences, plays a substantial role in manufacturing and engineering industries. Jensen et al. (2007) have conceptualised experienced-based competence building as the ‘Doing, Using, Interacting’ (DUI) mode of learning and innovation. Symbolic knowledge is linked to creative and cultural industries like filmmaking, publishing, music etc. and mostly concerns the generation of intangible and aesthetic novelties (Asheim, 2007). Actors draw expertise and

competitiveness from tacit aspects grounded in particular industrial norms, habits and experiences. However, while analytically neat and frequently mobilised, this rather clear cut typology is criticised as overlooking knowledge bases beyond science, engineering and arts (e.g. Qian, 2016). Furthermore, it has also been shown that knowledge creation typically transcends and combines inputs from different individual knowledge bases (Crevoisier and Jeannerat, 2009; Strambach and Klement, 2012). In a similar vein it has been shown that it is actually the combination of different knowledge bases and associated modes of learning and competence building that yields most valuable outcomes (Jensen et al., 2007).

Going beyond the distinction between tacit and codified knowledge, perspectives regarding processes of 'knowing in practice' (e.g. Amin and Cohendet, 2004; Ibert, 2007) have emerged more recently. These perspectives induce a conceptual shift away from conventional considerations that conceptualise knowledge as an object. Focussing on the state of 'knowing' rather than the factual object of 'knowledge' highlights that knowing is in fact a 'capacity to act' and not a static, property-like entity as the notion of knowledge implicitly suggests. As the state of knowing emerges from collective action, it requires interaction. Consequently, knowledge becomes a social process that is continuously in the making (Faulconbridge, 2017).

LEARNING

While knowledge is considered its pivotal resource, learning is viewed as the central process for innovation. Knowledge creation processes inevitably involve learning and vice versa (Lundvall and Johnson, 1994). Learning can be broadly defined as efforts to create, appropriate, apply and adapt knowledge to specific contexts (Koschatzky, 2001:61). However, learning does not merely relate to processes of accumulating information and knowledge. In times of rapidly evolving knowledge fields and 'exploding' knowledge creation, learning can also be seen as a filtering mechanism that separates relevant and redundant knowledge (Lundvall and Johnson, 1994). Furthermore, forgetting implies that knowledge, once crucial and relevant, might lose value and become redundant.

Learning can be both, intentional (e.g. education, training, research and development, market research) and implicit (e.g. experiences and routines). Lundvall and Johnson (1994:32) propose a typology that differentiates different types of learning: learning-by-doing, learning-by-using, learning-by-interacting, learning-by-producing and learning-by-searching.² Furthermore, interactive features of learning and knowledge creation processes have been widely stressed and will be dealt with in the following section (see 1.2.3). However, it should be noted that not all learning activities are necessarily interactive. Glückler (2013) conceptualises such non-interactive learning mechanisms within the innovation context. Imitation is for instance in particular seen as the central non-interactive mechanism that gives rise to knowledge creation and learning within imitating organisations. It is argued that non-interactive learning occurs in particular in situations of co-presence, for instance through practices of monitoring, observation or reverse engineering.³

² The initial conceptions of learning-by-doing originate from Arrow (1962) and learning-by using from Rosenberg (1982).

³ Reverse engineering essentially describes an accepted practice of extracting knowledge from human-made artefacts by re-constructing the specific knowledge they embody (Glückler, 2013).

SECTION SUMMARY:

- Innovation is a knowledge grounded process that builds on firm-internal resources as well as resources that need acquisition from external actors (e.g. Foss, 1997).
- Knowledge is a critical resource for innovation while learning constitutes its most important process (Lundvall and Johnson, 1994; Vale, 2011). Although individually grounded, knowledge it is highly contextualised and anchored in collective and social practices as well as experiences (Jensen et al., 2007). Processes of knowledge creation and transmission necessitate interpretation and sense-making. Learning processes can either be the result of collective/interactive (e.g. Howells, Amin and Cohendet, 2004) or non-interactive endeavours (Glückler, 2013).

1.1.3 Innovations as interactive processes

Although firm-internal resources and capabilities play a substantial role for building innovation capacity, they do not suffice (Fagerberg, 2005). In particular as innovation activities become increasingly complex and firms increasingly align their knowledge bases to existing core competencies (Bathelt and Glückler, 2011). Thus, interaction with external actors constitutes a crucial mechanism for innovation (Chesbrough, 2003) and constitutes the third conceptual building block for the understanding of innovation adopted in this study. It is emphasised that *‘in order to understand processes of knowledge creation, it is necessary to understand how people act and interact with one another’* (Bathelt and Glückler, 2011:29; Bathelt and Glückler, 2000). Interaction facilitates access, exchange and creation of innovation-relevant knowledge and, thereby, acts as a mechanism to effectively coordinate the complexities innovation processes involve. Consequently, interaction and knowledge grounded understandings of innovation are largely interconnected. Interaction links up to the conceptual network perspective adopted in his thesis. Networks are framed as central concept to understand how firms interact with their various environments (see 2.1).

Theoretical and empirical accounts widely assert that firms almost never innovate in isolation (e.g. Fagerberg, 2005; Morgan, 1997; Ozman, 2009). As outlined previously, innovation is understood as the transformation of ideas into outputs of commercial value (see 1.2). Nonaka (1994:15) explicitly highlights the function of interaction in this transformation: *‘ideas are formed in the minds of individuals, interaction between individuals typically plays a role in developing these ideas’*. In a similar vein anthropological accounts add that *‘innovation is much less dependent on the creative individual than on the interaction within social milieux’* (Welz, 2003:255). One key argument emphasising the role of interaction for innovation is that, in line with increasing complexities, the various resources and inputs needed are usually not possessed by individual organisations. Resources are distributed across a multiple individuals and organisations, thus, necessitating engagement with external actors like individuals, firms, public organisations etc. Firms that are able to effectively mobilise resources from external partners tend to be in better positions to innovate (Fitjar and Rodríguez-Pose, 2017:26). Growing complexities further increase pressures to combine and coordinate heterogeneous external resources, increasingly transcending sectoral boundaries and industrial knowledge bases (Strambach and Klement, 2012). Against the background of ongoing knowledge segmentation, interaction in innovation processes is an essential

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driving force of spatial (Bathelt, Malmberg and Maskell, 2004) as well as industrial contexts (Crevoisier and Jeannerat, 2009; Strambach and Klement, 2012) and related knowledge dynamics.

However, firms are heterogeneous units that exhibit differences in numerous dimensions. One dimension certainly is the interaction requirement, which might differ in terms of frequency and intensity (McCann, 2007; Shearmur, 2017). Different interaction requirements arise for a number of reasons such as firm size and industrial activity. Firms that operate in rapidly evolving and changing environments such as ICT or fashion might have higher interaction needs to keep up with change. Thus, it is argued that firms with high interaction needs show locational preferences for actor dense and information rich environments. On the other hand, firms with low interaction needs might chose to reside outside dense and therefore costly locations (Shearmur, 2017). Rather than requiring buzzing local environments, infrequent and routine interaction can also be facilitated over the internet or by temporary visits. In a study on the interaction behaviour of Canadian manufacturing firms Shearmur and Doloreux (2016) empirically confirm these propositions and find that the frequency with which innovators interact declines significantly with increasing distance from metropolitan regions. Hence, there might be firms that generate innovation in more isolated locations and with little interaction, building on in-house developments and secrecy (slow innovators).

Further extending this line of thought suggests that some firms and individuals might even benefit from isolated locations. The potentially productive properties of distance and (temporary) disconnection have for instance been shown for artists (Hautala, 2015). Furthermore, interaction requirements might also differ between individual innovation projects. Certain projects, and stages within projects, might require more intense and more frequent interaction and inflow of external capacities than other stages/projects, e.g. depending on the degree of novelty involved.

Interaction inevitably relates to contact between individuals and emphasises, as well as constitutes, the social and cultural dimension of innovation. Innovation is not a mere technical and rationale transformation process, but reflects social and cultural practice (Welz, 2003), including aspects such as trust, feelings and emotions (Bathelt and Glückler, 2018): *'It is neither the inspiration granted to the gifted individual nor the capacity of an institution to apply scientific findings to a technological problem that makes the difference, but the key to successful innovation lies in how communication between social actors is organized in a setting devoted to the generation of new ideas and products.'* (Welz, 2003:265). This emphasis on the social and cultural nature of innovation in particular and economic activity in general substantially informed the emergence of relational economic geography (REG) as an overarching research paradigm (Bathelt and Glückler, 2003; Yeung, 2005). Its theoretical perspectives emphasise the social and cultural logics of innovation, e.g. by ascribing innovation facilitating functions to configurations in which actors share understandings, norms, practices and trust (e.g. Amin, 1999; Bathelt and Glückler, 2011).

SECTION SUMMARY:

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- Innovation does typically not happen in isolation (e.g. Fagerberg, 2005; Ozman, 2009) but requires interaction (Nonaka, 1994).
- Interaction in innovation is driven by increasing complexities and ongoing firm specialisation which results in relevant innovation resources being dispersed across organisations. The capacity to identify and appropriate external resources is coupled with internal capacities (Cohen and Levinthal, 1990).
- Interaction requirements across firms differ, for instance according to industrial affiliation or project specifications (e.g. McCann, 2007; Shearmur and Doloreux, 2016).
- Interactive perspectives on innovation illustrate their social and cultural embedding (e.g. Bathelt and Glückler, 2003; Welz, 2003).

1.1.4 Innovation typologies

Before delving into theoretical perspectives on the ‘geographies of innovation’ (1.3), I want to briefly present some of the major typological divisions regarding the notion of innovation. These typologies will be frequently referred to in the remainder of this dissertation.

TYPES OF INNOVATION

A basic differentiation is between product and process innovation, i.e. different *innovation types* (e.g. Edquist, 2001). This categorisation relates to changes in the ‘things’ organisations offer (product innovation) as well as changes in the way these products are created and delivered (process innovation). These types can be further divided regarding their particular outcomes, which can either be tangible (goods and artefacts, technological processes) or intangible (services, organisational processes). While these divisions provide for analytically separable units, it needs mentioning that these categories cannot always be unequivocally separated when investigating innovation empirically. In empirical reality, the borders between product and process changes might in fact be fuzzy.

	product innovation	process innovation	
tangible	goods	technological processes	incremental – radical
intangible	services	organisational processes	incremental – radical

Table 1: Innovation typologies (own elaboration based on Edquist, 2001)

Developing a new product might require upfront changes in processes and vice versa. Consequently, interrelations and overlaps between the separate categories can occur and are in fact frequently observed (e.g. Tidd, Bessant and Pavitt, 2005; see 6.1.2).

DIMENSIONS OF INNOVATION

Dimensions of innovation relate to degree of novelty associated changes imply, i.e. how new and radical they are with respect to technical and societal reference systems (e.g. Tidd et al., 2005). Following the

Oslo manual (2005)⁴, the novelty of an innovation can be defined by a number of technical variables (e.g. use of new materials, use of new intermediate products, use of radically new technology), or in terms of the market (e.g. new only to the firm, new to the industry in the country or to the operating market of the firm, new to the world). As an alternative to this quantifying approach, the degree of novelty innovations imply can also relate to a spectrum ranging from small scale incremental innovation (new to the firm) to radical and landmark innovations (new to world). Hence, incremental changes primarily impact on direct firm environments and departments. Radical innovations, on the other hand, possess disruptive properties and might induce ruptures of existing routines and norms by introducing new ones. This understanding of radical innovation can be traced back to Schumpeter (1934). In illustrating his understanding of innovation, Schumpeter refers to the notion of *creative destruction*. The concept refers to the destruction and replacement of existing routines, habits and systems by new ones that become widely diffused and adapted throughout reference systems. The impact of such radical innovations transcends boundaries and affects wider sectoral, technical and societal scales which might result in the emergence of new genuinely market environments (Lundvall, 1992).

Due to their revolutionary character, radical innovations occur only infrequently. The majority of innovation is rather incremental. Steady creation of incremental innovation is considered an essential driver of organisational capacity building. Consequently, organisations have increasingly adopted and implemented systemic approaches towards innovation management (Tidd et al., 2005). The rationale linked to the significance ascribed to incremental innovation is that cumulative effects (Kline & Rosenberg, 1986; Rothwell, 1994; Fagerberg, 2006) might outweigh infrequently occurring radical innovations: *‘the cumulative effect of numerous minor incremental innovations can sometimes be more transforming and have more economic impact than a few radical innovations of technological breakthroughs’* (National Research Council, 1996:10). Additionally, it remains emphasised that even the most revolutionary innovations substantially build on a long chain of incremental developments, overall reflecting their evolutionary features (see 1.2.1).

1.2 Innovation and regional economic development

Innovation as a concept has taken on a key position in both research and policy circles. Its function is attributed to the transition towards increasingly knowledge-based economies (Lundvall and Johnson, 1994) and, accordingly, innovation is broadly considered a key ingredient of regional economic development (Welz, 2003; Cantwell, 2006). In this chapter, I will reflect upon the links between innovation and debates on regional economic development. However, as the notion of regional economic development does not constitute a central but rather implicit concern of this dissertation, I will not delve into and discuss the multifaceted theoretical debates on regional economic development in detail.

The notion of regional development continues to receive significant attention from both, academics and policy makers. However, this intriguing concept is widely asserted to lack commonly accepted theoretical

⁴ The Oslo manual is the Organisation for Economic Co-operation and Development's document for *‘the measurement of scientific and technological activities, proposed guidelines for collecting and interpreting technological innovation data’*. The Oslo manual has become a central reference point for major surveys such as the Community Innovation Survey (CIS).

foundations (Torre and Wallet, 2016) and is therefore subject to multiple and often imprecise understandings. The notion of development itself invokes the association of improvement and increase (ibid.) which, in disciplines as economics, economic geography and innovation studies, is typically linked to the notion of economic growth. However, the concept of development has also been more widely framed from a capacity perspective. It has been highlighted that development constitutes a process by which individuals, groups and organisations organise their systems in a way that enhances their resources and capacities to solve problems and achieve objectives (OECD, 2006:147; similarly Perroux, 1964 as cited in Torre and Wallet, 2016:21). Such capacity-based understandings of development make a clear distinction between development and growth. It suggests that development encompasses and supports but is not equal to economic growth.

Within the context of regional development debates, the understanding on the various processes regional development can comprise gradually expanded from traditional, merely quantitative aspects with a focus on growth, jobs, income etc. to more qualitative and capacity-related aspects like quality of life (Pike, Rodriguez-Pose, and Tomaney, 2006). However, despite such efforts to couple and better align the multiple dimensions in discourses on regional development, it has been suggested that different perspectives on regional development, i.e. narrow growth-centred and wider development-centred ones continue to exist (Basco, 2015). In this regard, the notion of firm innovation is primarily framed along the notion of regional economic development, i.e. ‘economistic’ conceptions of innovation and development prevail (Pike, Rodriguez-Pose, and Tomaney, 2006). However, as previous discussions in chapter 1.1 illustrated, firm innovation can be essentially framed as learning and capacity building processes that impact on individuals, organisations and industries alike. Due to its capacity building (i.e. development) properties within the economic sphere, innovation in enterprises induces development and in the long run growth of these enterprises. Based in these principle mechanisms, innovation is considered a central element for regional economic development (Vale, 2011). Furthermore, the notions of innovation and development are linked to a specific geographical dimension. This assumption is based on empirically corroborated observations that suggest a certain causality between firm innovation and regional economic performance (e.g. Howells, 2005), in which high(er) performance is considered progress and development. With regards to the spatial focus of this study on peripheral regions, it can be argued that innovation might contribute to the stabilisation and development of regions that face ongoing socio-spatial challenges, for instance through capacity building and growth. Thereby, innovation in peripheral regions can be considered a potential mechanism to reduce regional disparities (Friedmann, 1973; Howells, 2005; Kühn, 2015).

The principle understanding is that competition constitutes the central mechanism to stimulate innovation. By transforming resources into new/improved products or processes, firms build capacities and strengthen their competitive position. The organisational processes that underlie innovation induce knowledge creation, expertise and resource building and are considered essential levers to maintain and increase organisational, regional and national competitiveness (Tödtling and Trippel, 2005; World Bank, 2009). New demand is generated by introducing new or improved products and processes, which benefits

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innovative firms and industries and, implicitly, also the regional settings in which the firms and industries locate. Consequently, innovation ensures the long-term competitiveness of economic actors and regions. However, while innovation is broadly presented as the seemingly most essential factor to sustain competitiveness, firms might also mobilise mechanisms besides innovation (Godin and Vinck, 2017). Nevertheless, it has been theorised that settings that fail to generate sufficient levels of innovation have higher propensities to be affected by peripheralisation processes and, consequently, to suffer from economic decline (Friedmann, 1973). Accordingly, locally based enterprises are considered crucial agents for inducing development processes. Consequently, their activities and practices, and in particular those related to innovation play an essential role for regional development (Welz, 2003; Basco, 2015).

Literature on the territorial dimension of innovation (see 1.3) emphasises that regional specifications, such as the availability/lack of agglomeration advantages, support/impede firm innovation. Additionally, it can be argued that innovation affects and shapes regional settings. The emergence of localised learning processes, regional competence and network building, improvements of educational infrastructure etc. resulting from firm innovation, not only benefits firms but has also immediate relevance for local and regional settings. From this perspective, innovation can be considered a key stimulus for more comprehensive regional development processes that exceed mere economic aspects (Vale, 2011). Such considerations relate to the notion of endogenous development. Endogenous development is determined by actors, building regional resources, capacities and initiatives (Martin and Sunley, 1998; Bosworth and Atterton, 2012). Linking this endogenous understanding of development to the notion of innovation underscores the position of innovative firms as essential players for regional development, stabilisation and change. Consequently, firm innovation scores high on policy agendas and is, through manifold approaches and instruments, deeply rooted in policy initiatives of governmental and non-governmental organisations and various scales (Cantwell, 2006; Mahroum, 2007). In fact, the overarching goals of economic development, i.e. regional resource and competitiveness building, growth etc., are widely pursued through fostering innovation capacity (Cantwell, 2006).

By generating new demand, innovation secures existing, and induces new employment and value added. However it might also induce negative externalities. With reference to employment effects it has been stressed that certain types of innovation might reduce regional employment. Especially process novelties that aim at rationalising production processes by substituting manual labour with technical procedures typically cut employment (Pianta, 2006). Despite these varied, and not necessarily beneficial and often unintended effects of innovation on the micro and meso-level, a causal understanding between innovation and regional development is widely held: innovation is not a zero-sum game. From an aggregated perspective, the positive implications of innovation are considered to outbalance its negative implications for certain groups/regions (Pianta, 2006). This facilitating and enabling understanding of innovation as inducing, on aggregate, development reflects its normative dimension. Placed at the centre of contemporary capitalist and neo-liberal agendas, innovation in academic as well as public and policy discourses reflects a desired process, one that is generally perceived beneficial for the economy and the society. While this research aims at contributing to a better understanding on the mechanisms that underlie

the innovation activities of firms from peripheral regions, it does not explicitly provide a critical lens on this overall societal attitude towards innovation, referred to as the '*pro-innovation bias*' (Godin and Vinck, 2017). However, this ideological bias in studying and promoting innovation, as well as the broadly perceived correlation between innovation and regional development should not be ignored.

Furthermore, it has also been suggested that the link between innovation and its regional value might not be as clear-cut as conventionally assumed. Especially in increasingly globalised economies, innovation might not necessarily have its most substantial implications in its place of origin (Ibert, 2017). The regional value generated by innovation might be difficult to capture and a direct correlation between innovation in a region and this region retaining all/most benefits might not be given. In this regard Shearmur (2017) argues that dense urban areas function as most productive locations to capture, scale-up and commercialise innovation. Consequently, innovation activities and direct effects are not confined to specific local/regional settings but traverse actors and scales and are increasingly conceived multi-local and mobile phenomena (Gibson and Brennan-Horley 2016; Schmidt, Müller, Ibert and Brinks, 2018). Nevertheless, it can be argued that innovative firms are crucial actors for regional development processes to emerge.

1.3 Geographies of innovation

1.3.1 Agglomeration centred perspectives on innovation

This section explores theoretical scholarship on the geographies of innovation from a distinct agglomeration-oriented perspective – which has generated coherent theoretical insights and, therefore, has been and continues to be a dominant stream of thought in innovation studies and economic geography. As will be further detailed in the following sections, this agglomeration-oriented perspective emphasises in particular the notions of density and proximity/distance, constituting common themes within its various theoretical debates. The World Development Report (World Bank, 2009) exemplifies the dominant position and mainstream character of these ideas as well as their mobilisation for explaining the concentration of innovation activities in metropolitan regions.

This report, titled 'Reshaping Economic Geography', portrays density and distance as essential geographical dimensions of development. It states that '*denser concentrations of economic activity increase choice and opportunity. They ensure greater market potential for the exchange of goods, services, information, and factors of production*' (p.74) and suggests that '*high density reflects the self-reinforcing benefits of proximity between economic agents across spatial scales – local, regional, and international [...]*' (p. 96). Mobilising the notion of distance and coupling it with the particular benefits related to density, the report deduces that '*leading areas have a high economic density, and lagging areas have a long distance-to-density. An area is more likely to be lagging the farther it is from leading areas because greater distance-to density implies a lack of integration into the economy of leading areas. It also implies poorer access to the "thick" markets of capital, labor, goods, services, and ideas, and the spillovers of knowledge and information they provide. A lagging area is usually a remote part of the*

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country with one or more of the following features: high poverty, low productivity and income, high unemployment, and stagnant growth [...]' (p.78).

This account summarises and typifies the distinct as well as prevailing and rather narrow 'core-region thinking' that can be frequently identified in economic geography scholarship (Isaksen and Sæther, 2015). In this section I will, from the perspective of particular agglomeration logics, mobilise theoretical accounts that yield a coherent framework to explain the emergence of innovation in particular places, namely larger city regions.

AGGLOMERATION EXTERNALITIES

The initial interest of economic geographers and regional scientists in innovation was fuelled by indications that innovation seemed to be spatially concentrated in larger city-regions. Such indications provided departure points to examine how geographical contexts determine and shape the ability of firms to innovate (Moulaert and Sekia, 2003). Interestingly, innovation and agglomeration have for long been separated perspectives: '*Schumpeter was not concerned with the spatial distribution of innovations. Similarly, traditional agglomeration theory was not concerned with innovation*' (Simmie, 2005:793). Today it is widely established that the propensity for innovation differs according to regional specifications such as a critical mass of innovation relevant actors and specific factor endowments. The two perspectives were linked and mutually developed through assigning and active function to socio-spatial conditions for economic processes. Thus, perceptions in which space provides a neutral setting for the economic process of innovation were increasingly abandoned (Cisunato, 2016). The basic understanding is that dense settings, i.e. spatial concentrations of innovation relevant actors such as firms, universities, research institutions, intermediary organisations etc. generate organisational thickness (e.g. Malecki and Tootle, 1996; Tödtling and Tripl, 2005) which favours innovation. Departing from this common, density grounded understanding, agglomeration advantages are discussed along the two mechanisms of specialisation (Marshall, 1890, Glaeser, Kallal, Scheinkman and Shleifer, 1992) and diversity (Jacobs, 1969).

The specialisation logic suggests that both pecuniary and non-pecuniary benefits are available to firms from related industries. Due to the possibilities of resource sharing, intra-industry economies of localisation lower transaction, coordination and transport costs and induce scale-economies available to individual firms. Additionally, firms might also benefit from a specific industrial 'atmosphere' (Marshall, 1890), implying that regional specialisation eases knowledge creation between actors operating in related fields of economic activity (van der Panne, 2004; Feldman and Kogler, 2010). This distinct atmosphere is largely grounded in local institutional and cultural arrangements that emerge from within localities and which cannot be easily replicated (Cusinato, 2016). Related arguments within this strand of scholarship, to which Arrow (1962) and Romer (1987) have significantly contributed later on, suppose that knowledge is in essence an industry-specific resource. The emergence of industry-specific interpretive frames, understandings and knowledge spillovers is eased by regional concentrations of firms from within the same or closely related industries. These *Marshall-Arrow-Romer* externalities provide theoretical arguments that call for regional specialisation.

On the other hand, diversity arguments of urbanisation posit that innovation inducing benefits from the potentials of dense, agglomerated settings act as cross-fertilising arenas (Jacobs, 1969; van der Panne, 2004). Ideas developed within one industry might also be fruitfully appropriated in other industries. Thus, diverse local production structures that bring together heterogeneous actors facilitate the exchange of complementary resources. These arguments favour diversification of local structures rather than specialisation of knowledge bases. While the accounts on economies of specialisation and diversification relate to particular foci, it is argued that actor dense localities generally provide for both types of agglomeration economies. Thus, localisation and urbanisation advantages are not mutually exclusive but complementary phenomena (Feldman and Kogler, 2010). More lately, and along the lines of Jacobs-spillovers, debates on whether variety in economic activities that is related or unrelated to existing regional industrial activities are most conducive for innovation and development have gained interest (Frenken, Van Oort and Verburg, 2007; Feldman and Kogler, 2010).

Despite the widely acknowledged positive effects ascribed to agglomeration advantages, there might also exist a tipping point beyond which these advantages may turn into constraints. Negative externalities might play out as different *lock-in* situations that relate to states of over-embeddedness in which actors are trapped in rigid, regionally specific institutions and routines and not anymore sufficiently susceptible for external stimuli (e.g. Grabher, 1993; Boschma, 2005). Such contrasting views on agglomeration economies suggests that co-located actors, in order to avoid lock-in situations, need to balance the advantages that arise from localised relations against the potentially constrains arising from over-embedded relations (Bathelt et al., 2004).

SPATIAL ASPECTS OF KNOWLEDGE-CENTRED DEBATES

Further advantages of dense city-regions in the innovation context relate to theoretical debates on knowledge (see also 1.2.2). The differentiation between tacit and codified knowledge has been frequently mobilised to explain co-localised interaction. Opportunities for face-to-face contact are considered key to effectively acquire and exchange individually and collectively-anchored tacit knowledge (Howells, 2002). Deciphering and interpreting tacit knowledge requires awareness of common codes and practices. Such practices might be anchored in shared institutional and geographical contexts, i.e. defined locally or regionally (Amin and Thrift, 1995). Consequently, tacit knowledge is primarily perceived a *spatially sticky* resource (e.g. Gertler, 2003; Faulconbridge, 2006). These accounts on the spatial reach and (im)mobility of tacit knowledge emphasise the role of the local and regional scale in the discourse on knowledge, innovation and space and further contribute to distinct ‘agglomeration arguments’ (Amin and Cohendet, 2005; Ibert, 2007). The wide acceptance of these empirically corroborated theoretical notions prompt Feldman and Kogler (2010) to portray the localised nature of knowledge spillovers as a ‘stylized fact’ in the geography of innovation. Thus, being closely located to the hotspots of knowledge creation increases the propensity to benefit from knowledge diffusion and might, in the long run, positively affect firm innovation (Koschatzky, 2001).

While tacit knowledge is considered spatially sticky, codified knowledge is typically framed as a ubiquitous and ‘global’ resource (Amin and Cohendet, 2005). As it can be formulated and transmitted as

publications, blueprints, databases, artefacts and procedural methods (Koschatzky, 2001) codified knowledge is not tied to any particular spatial scale. Its transmission is feasible at distance using information and communication technologies. The rather low complexities involved in appropriating codified knowledge and the understanding that it does not adhere to individual experiences and practices (Nooteboom, 2006) facilitates its exchange and absorption across contexts and scales.

Departing from the tacit/codified distinction, the differentiated knowledge base approach (Asheim and Coenen, 2005; Asheim, 2007; see 1.2.2) proposes particular spatial references. It is suggested that spatial proximity is especially relevant for industries that primarily draw on synthetic and symbolic knowledge bases, whereas geographical co-location is less essential for industries oriented towards analytical knowledge. Thus, the distinct agglomeration arguments are linked to certain industrial activities such as engineering-based manufacturing or the creative industries, which tend to rely on a higher degrees of tacit types of knowledge and which therefore have, from a theoretical perspective, higher propensities to spatially cluster.

TERRITORIAL INNOVATION MODELS AS CONCEPTUAL MANIFESTATIONS

Territorial innovation models (TIMs) constitute variations of the idea that regional concentrations of economic activity, most often in larger towns or cities, might lead to dynamic interaction between actors and hence to knowledge exchange, creation and innovation. These conceptual models on dynamic regional economies have received wide attention in academia and policy circles alike.

Although the different concepts are often referred to as reflecting a homogenous group, individual concepts emphasise different mechanisms leading to regional economic dynamics, including different ways of how geographical proximity between actors is deemed to operate (e.g. Shearmur, 2011; Vissers and Dankbaar, 2016). The particular partialities of individual concepts such as industrial districts, clusters, innovations systems, innovative milieux or learning regions come together as a wider whole under the umbrella of TIMs (Moulaert and Sekia, 2003). TIMs highlight the specific symbiosis between spatial and relational closeness and reflect a particular form of (neo)regionalism (e.g. Sunley, 2008; Shearmur, 2011). The most influential conceptions within the TIMs-family will be briefly illustrated in the following sections.

Industrial districts essentially base on Marshall's ideas (1890) and draw attention to the specific advantages available to actors in industrially specialised local settings. The district approach highlights in particular the importance of intra-sectoral relations between suppliers and clients and shared labour markets that provides for related qualifications. More contemporary industrial district literature (e.g. Becattini, 1990) enriched Marshall's initial ideas and emphasises that regions might gain from flexible, internal specialisation based on localised actor relations. The concept has been frequently applied to analyse processes and configurations within highly specialised, craft-based regions. A popular example in this respect are studies on the 'Third Italy'. The relative success of this area in maintaining and building continued success in traditional industries is primarily linked to its historically grown, i.e. path specific local actors configurations.

The *innovative milieu* concept, introduced by the GREMI research group⁵ at the beginning of the 1990s, highlights the role of local culture, traditions and trust. The milieu approach has a distinctive local and micro-level (rather than regional) focus and a particular orientation towards SMEs. It emphasises the role of informal, social and trustful relations for knowledge exchange and firm collaboration (Fromhold-Eisebith, 1999). The specific local actor configurations induce, based on mutual understanding and joint reference systems, solidarity etc., collective learning and wider synergies available within the local milieu. Stressing that particular relational configurations arise from social and cultural grounds, milieu approaches go beyond mere exploitation of agglomeration externalities (Camagni, 1995). Thus, it is mostly ‘soft factors’ related to social-institutional arrangements that support innovation potentials. The milieu is regarded as a homogeneous entity rather than a collection of individual agents (ibid.). The aggregate unit of the milieu, i.e. its underlying institutional fabric, and not individual actors within it, is considered to stimulate innovation. Thus, additional functions that go beyond providing context for interaction, learning and innovation are assigned to the bounded milieu space (Lorentzen, 2008).

Following the systems notion, the *innovation systems approach* (e.g. Lundvall, 1992; Cooke, Heidenreich and Braczyk, 2004) reflects a highly integrative and holistic concept that ascribes importance to the different components relevant for the wider system, e.g. organisations, actors, administrative bodies, institutions etc. The relations, connections and interactions between the individual components of the system feature central and relate to local institutions and culture (Tödting and Trippl, 2005; Shearmur, 2011). Early contributions within the innovation system literature applied the concept mainly to the national level, suggesting that primarily components at the national level shape innovation. More recently, the focus shifted towards regional innovation systems (RIS), highlighting the significance assigned to the regional scale, implying that regional differences might explain different innovation performance. On a similar vein, the notion the metropolitan innovation systems has also been raised, building on the argument that due to their size, diversity and openness, the unit of metropolitan regions might as well provide for the elements that constitute effective innovation systems (Revilla Diez, 2002). Conceptions of regional and metropolitan innovation systems span across sectoral boundaries. The evolution of the system perspective within innovation-oriented research illustrates how scales of organisational contexts, from the national scale to multiple subnational scales, might differ and change, resulting in different accentuations of certain aspects and elements and how they impact on innovation (Dettmann, 2012).

The *learning region* approach departs from a shift towards the ‘knowledge-based economy’. It emphasises in particular the role of research institutions and knowledge workers in providing key regional capacities to generate, capture and appropriate diverse knowledge types (e.g. Lundvall and Johnson, 1994; Florida, 1995). Regional competitiveness and innovation capacity is considered to be sustained by regional processes of knowledge generation and learning, inducing mechanisms by which interaction between agents is effectively governed. Governance systems of learning regions are characterised by co-dependent relations and decentralised decision making and constituted by ‘*formal rules, regulations and standards*,

⁵ Groupe de Recherche Européen sur les Milieux Innovateurs⁴ (GREMI).

and informal patterns of behaviour between and among firms, and between firms and government organizations' (Florida, 1995:534).

The *cluster concept* is probably the most influential model within the TIMs family and has not only provoked debates within academia, but has also influenced regional policy through widely adopted cluster policies and initiatives. In Porter's understanding (e.g. 1998, 2003), the idea of regional competitive advantage is at the core of regional clusters. The concept emphasises that regional advantages manifest locally through strategic specialisation, inter-organisational collaboration (amongst up-stream and down-stream firms, universities and governmental organisations), competition, and by specific policy priorities (e.g. infrastructure and education policies). Such multi-layered interplays between diverse actors within given, bounded localities give rise to knowledge exchange, mutual learning and ultimately innovation. Despite, or perhaps precisely because of its broad use within the regional development arena, the cluster concepts has also been critically debated (see for instance Martin and Sunley 2003, 2011). It has become increasingly blurred, leaving vast room for conceptual interpretation.

While these individual conceptual ideas emphasise different mechanisms by which regional economic dynamics might be induced, they overlap in a number of dimensions. By focussing on innovation-relevant processes emerging between actors located in bounded and self-contained units, these conceptions commonly share a rather absolute understanding of space. Mostly the regional scale is seen as the essential unit of economic and socio-spatial coordination (Moulaert and Sekia, 2003). Such bounded conceptions of space portray specific places as '*islands of innovation*' (Amin and Cohendet, 2005:467). The underlying logic is that mechanisms induced by geographical proximity provide most conducive contexts for innovation. Knowledge circulation and learning are eased by dense, localised networks and associated institutional arrangements activated by geographical proximity (Asheim and Coenen, 2005; Simmie, 2005). Thus, innovation, competitiveness and growth are fundamentally linked to regional environments and their particular attributes such as sectoral structure, density and related networks (Lorentzen, 2008). Mutual trust and understanding, common frameworks of interpretation and problem solving emerge as part of the specific interplay between actors and are facilitated by physical proximity which enables frequent face-to-face interaction. Cultural and social homogeneity between localised actors generates distinct 'in or out' settings (Torre and Rallet, 2005). This school of thought has very recently been revisited by Florida et al. (2017) who portray the city as the essential spatial reference unit and 'container' for successful innovation.

Critics on TIMs and their underlying assumptions argue that collaboration and interaction between co-located agents is often assumed rather than empirically corroborated (Vissers and Dankbaar, 2016). Per se supposing the existence of intense interactive relations between co-located actors somewhat rejects that actor networks in regional settings might also be fragmented and functionally rather unrelated (Feldman and Kogler, 2010). This argument is extended by Doloreux and Shearmur (2016) who suggest that oversupply of diverse information in actor dense and information rich environments – such as clusters or milieus – might actually hamper rather than foster innovation.

SPATIAL CONCENTRATION OF INNOVATION: PRESENTATION AND DISCUSSION OF EMPIRICAL EVIDENCE

Despite the diversity of ideas under the umbrella of TIMs, the wider conceptual family with its common emphasize on the spatial-territorial and mostly regional dimension has implicitly and explicitly contributed to the understanding of innovation as spatially concentrated phenomena. Accordingly, Feldman and Kogler (2010) refer to the spatially clustered nature and therefore uneven distribution of innovation as one of the essential ‘stylised facts’ interwoven in dominant understandings on the geography of innovation. The basic understanding is that certain places offer better conditions for innovation than others. Thus, economic activity does not take place in a featureless plain.

These theoretical considerations have been widely corroborated by empirical studies showing that, if framed and measured in a certain way, innovation indeed appears to be spatially concentrated – mainly in larger city regions. Taken together, these studies underpin the widespread acceptance of the notion that metropolitan regions concentrate disproportionately large amounts of innovative activities (Rodríguez-Pose and Wilkie, 2016). In the following paragraphs, I will only mention a number of studies that point towards concentration tendencies for a wide range of different national and regional contexts.

Rodríguez-Pose and Wilkie (2016) provide a valuable summary of empirical literature on the spatial distribution of innovation activities in the US, Canada, UK, China, India and Nordic Countries. Collectively, this literature supports the understanding that innovation activities tend to congregate in relatively few and specifically large urban locations. These empirical insights suggest that the distribution of innovation, measured by total patenting activity, somewhat corresponds with respective urban hierarchies. Additionally, the authors provide illustrative analyses of patenting activities for the US, France, Germany, Japan and Mexico. Despite these substantially different contexts, the analyses generate a picture that points towards geographical concentration of innovation in only a few metropolitan areas (see Table 1). While these data clearly indicate the uneven distribution of innovation across space, additional time-series analyses reveal that the concentration of patenting activities is not necessarily increasing, but rather stable (US, France, Germany) and in some cases even exhibiting decreasing trends (Japan, Mexico).

	share of total patent applications (2008)	
	most innovative cities	rest of country
United States	47.6%	52.4%
France	56.3%	43.7%
Germany	28.0%	72.0%
Japan	58.6%	41.4%
Mexico	42.9%	57.1%

Table 2: Concentration of patent applications in selected countries (own table, based on Rodríguez-Pose and Wilkie 2016)⁶

⁶ US data refer to the 10 most innovative cities; data for France, Germany, Japan and Mexico refer to the 5 most innovative cities.

Henn and Werner (2016) have recently analysed and mapped patent filings and illustrated specific spatial patterns of innovative activity for the German context (similar: Küpper and Margarian, 2012:86). They find pronounced differences regarding the spatial distribution of patent filings between the West and East German Federal States. More than 90 per cent of filings relate to actors that reside within Western States. Furthermore, the analysis exhibits distinct differences between metropolitan and non-metropolitan regions in Germany. These findings confirm previous studies on the spatial distribution of patenting activities within the German context. Meng (2012:167) illustrates that rural areas in Germany account for less than 10 per cent of total patent filings which corresponds with a significantly lower patent intensity⁷ of these regions compared to their non-rural counterparts. Accordingly, Meng (2012) also indicates that rural counties exhibit substantially lower endowments of (i) R&D-intense manufacturing and service industries, (ii) R&D-related employment and (iii) only few locations of universities and further research institutions which corresponds to a limited presence of research staff in rural regions.⁸ Bibliometric analyses on the geographical origin of publications confirm the general impression that scientific activities are spatially concentrated in a rather limited number of regions. Despite the given and pronounced spatial concentration of scientific activities, time-series analyses (e.g. Grosetti, Eckert, Maisonobe and Tellec, 2016) indicate certain de-concentration tendencies, i.e. existing centres do not continuously reinforce and expand their dominance. These indications can be related to the previously discussed indications of decreasing concentrations of patenting activities (Rodríguez-Pose and Wilkie, 2016).

Besides indications pointing towards a spatially uneven distribution of innovation (potentials) for the German context, these empirical examples further illustrate the role assigned to patents as a central indicator when it comes to measuring innovation. Even if some scholars suggest that the phenomenon of innovation is impossible to quantify directly (Smith, 2006), patents are widely considered a prime output measure and, accordingly, broadly used. Smith (2006) provides an excellent overview on the different approaches mobilised to measure innovation in contemporary scholarship and policy circles – discussing their respective advantages and pitfalls. While innovation surveys such as Community Innovation Survey (CIS) are considered valuable instruments to collect information of firm-level innovation on both input and output related aspects, traditional measures such as R&D data, bibliometric data and, as also the previous review of empirical literature illustrated, specifically patent data continue to have a central position within the set of available indicators. The focus on patent data is driven by the advantage that patent systems gather detailed information on new technologies with commercial promise (Smith, 2006). However, the use of patent data as a central measure for innovation is also associated with a several issues. It has been highlighted in particular that

- patent data mostly capture inventive rather than innovative activities as not all patents are commercialised;
- only few inventions underlying patents are of technological and commercial significance;

⁷ Patent intensity as an indicator relates to the total number of patent filings relative to the number of employees within a spatial reference unit (e.g. county level).

⁸ Analyses reveal that 12% of German universities and public research institutions as well as 6% of research staff are located in rural regions (Meng, 2012:161).

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- patent data systematically miss a large number of non-patented innovations such as incremental innovations/adaptions or non-technological innovations etc.

Likewise, it has been argued that taking R&D activities as an input measure for innovation and thereby implicitly referring to the linear innovation model substantially underestimates innovation as non-R&D related innovation activities are simply not taken into consideration (Brink, Nielen and May-Strobl, 2018). Empirical investigations indicate that a substantial number of manufacturing and especially service firms innovate without conducting formal research and development (ibid.). As private R&D activities tend to concentrate in agglomerations, a large share of firms that do not conduct own R&D are located outside of agglomerations (Meng, 2012; Brink, Nielen and May-Strobel, 2018). With reference to the seemingly clear picture these indicators draw on the geography of innovation, it is important to note that patent as well as R&D measures reflect a technologically-grounded understanding of innovation and have been identified to facilitate substantial under-coverage of innovation activities and, importantly, as being spatially biased. Due to the technological focus of indicator-systems, innovation generated outside of agglomeration is significantly under-estimated (Fagerberg, Srholec and Verspagen, 2010; Shearmur, 2017). The central criticism is that lower patenting as well as research and development activities in rural and peripheral regions should not necessarily be interpreted as a lack of innovation capacity (Brink et al., 2018).

Rural regions might generate a disproportionately high number of innovations that are not easily or not at all patentable, such as process, non-technological or incremental innovations. In fact, it has been suggested that these types of innovation prevail in peripheral regions (e.g. Keeble, 1997; Küpper and Margarian, 2012). Furthermore, it has been argued that certain industries use patents much more intensively than others (Fagerberg et al., 2010). In particular it has been shown that high-tech industries, which tend to cluster in larger city regions (Vence-Deza and González-López, 2008; Meng, 2012), account, in comparison with non-high-tech sectors, for substantially higher activities regarding knowledge protection, including patent filing or trademark registration (Heidenreich, 2009). Additionally, large companies, which reveal a preference to locate near or in city regions, tend to patent more frequently than SMEs, which dominate in non-core regions. This is for instance due to large corporations having more profound financial means available for patent filing. Accordingly, SMEs in distant settings, for multiple reasons, rely more on the secrecy of the knowledge they generate (Shearmur, 2017).⁹ Related to this, and as Henn and Werner (2016) highlight for Germany, it can be added that few large corporations located in city regions account for a substantial number of total patenting activities. Consequently, it can be expected that also the number of defensive patents, i.e. patents filed to block competitors rather than to register ideas intended for commercialisation, substantially drive the overall patent activities of urban areas. Collectively, these different facets suggest that patents, used as a central measure for innovation, are subject to an inherent bias towards urban regions.

⁹ Which has been confirmed by some of the actors interviewed as part of this dissertation: ERZ_CON1, ERZ9 and ERZ12.

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The previous discussion brought to the fore two important aspects with respect to the scope of this dissertation. First, that innovation, at least if measured using patent data, appears to be unevenly distributed across space and substantially concentrated in larger city regions. Second, it has also been shown that patent analyses need to be cautiously handled as they tend to reflect a bias towards larger city regions. From this discussion follows that throughout this thesis, I will acknowledge the specific indications established by innovation indicators regarding the spatially uneven distribution of innovation. However, due to the specific theoretical, epistemological and methodological position adopted throughout this thesis, these indications as well as their implications will not be overrated:

- as outlined in section 1.2.1, this thesis understands innovation as a process, whereas conventional innovation indicators such as patent or R&D data specifically relate to output and input driven perspectives;
- the epistemological position this thesis adopts (see 3.1.1) follows the principle to *understand* innovation processes of firms located in peripheral regions more profoundly rather than seeking to quantify and measure the phenomena;
- these foci, in line with the emphasize of this thesis on firms operating in LMT industries (see 1.4), implicitly address innovation processes that remain largely uncaptured by conventional indicators.

SECTION SUMMARY:

- Organisationally thick regions (e.g. Tödtling and Trippl, 2005) give rise to specific advantages of specialisation and diversification and provide valuable arguments for the accepted understanding that dense city-regions constitute the font of innovation (e.g. Shearmur, 2012).
- Agglomeration externalities are reproduced by the spatially sticky nature of innovation-relevant tacit knowledge (e.g. Gertler, 2003) which supposes a distinct localised nature of knowledge spillovers (e.g. Feldman and Kogler, 2010).
- TIMs reflect conceptual manifestations of dynamic regional economies that draw on the benefits induced by and available to co-localised actors (e.g. Moulaert and Sekia, 2003). TIMs focus on the regional scale as the central, distinctively bounded and self-contained unit for economic and socio-spatial coordination and therefore reflect a rather absolute understanding of space (e.g. Simmie, 2005; Amin and Cohendet, 2005).
- The phenomenon of innovation is spatially unequally distributed (Feldman and Kogler, 2010): it has been empirically corroborated that a substantial share of innovation activities concentrates in only a limited number of agglomerations (e.g. Rodríguez-Pose and Wilkie, 2016). However, conventional indicators like patents used to measure innovation imply an inherent urban bias (Shearmur, 2017).

1.3.2 Innovation in peripheral regions

In this section, I will elaborate on theoretical thought as well as empirical indications regarding innovation in peripheral regions and expand the distinct agglomeration perspective portrayed previously. Thus, this section directly links to the dissertation's main empirical subject, the innovation activities of firms from located in peripheral regions. Furthermore, this section is centrally positioned with regards to theoretical reflections. While providing a critical reflection on agglomeration-oriented theoretical scholarship, it is not my intention to argue against or question such agglomeration-oriented perspectives. These theoretical streams provide a coherent framework for explaining innovation processes that occur in urban settings and have also been widely echoed within policy circles (Shearmur, 2017). Rather, this section aims to draw attention to perspectives that go beyond this agglomeration centrism, which frequently portray co-location and agglomeration as quintessential aspects for innovation. These dominant views translate into a distinct representation of peripheral regions within mainstream innovation discourses. This representation, which I refer to as the 'periphery label', will be illustrated in this section. Its predominantly deficit-centred ascriptions will then be contested with empirical literature that takes a closer look at innovating firms located in peripheral regions. In doing so, this section not only aims for theoretical reflection and diversification, but also provides a more differentiated understanding of innovation, innovating actors and peripheral regions.

THE PERIPHERY LABEL IN INNOVATION STUDIES

The following section briefly outlines a specific narration of peripheral regions in wider innovation literature. This 'periphery label' in innovation studies and innovation-oriented economic geography is implicitly and explicitly (re)produced as the result of considering agglomeration-oriented theory as the seemingly only way to generate innovation (Gibson and Brennen-Horley, 2016; Shearmur, 2017). Merely transferring primarily agglomeration-grounded explanations for the phenomenon of innovation to non-urban settings suggests that these environments constitute uncondusive sites for innovation. Consequently, these urban-biased understandings are reproduced following a circular logic. This logic does not recognise that differentiated theoretical and conceptual approaches are required to understand innovation processes in peripheral contexts, as the mechanisms at work might operate outside agglomeration-oriented explanatory frameworks (Isaksen and Sæther, 2015; Shearmur et al., 2016).

Regional characteristics of peripheral regions are at the core of the periphery label. Features such as distance to urban areas and low actor densities are portrayed as particular deficits that set peripheral regions apart from their metropolitan counterparts – simply because proximity and density, manifested for instance as size, actor diversity, openness or localised networking opportunities (Revilla Diez, 2002), have been identified as factors that effectively support innovation in urban areas. Thus, the very concept of periphery is mostly defined through implicit and explicit comparison with urban centres (Lang, 2012), which results in negative definitions considering peripheral and rural regions as a residual category outside of urban associations (Torre and Wallet, 2016). Such unifying understandings '*tend to overlook the local nuances that can provide alternative bases for rural development*' (Bosworth and Atterton, 2012:259). The dominance of problem-centred views, a narrow understanding on the mechanisms that

potentially drive innovation and such direct comparison fuel widely held positions that *‘innovation is quintessentially urban and cannot occur in remote or isolated locations’* (Shearmur, 2017:453). This position was recently revived by Florida et al. (2017) who frame *the city* as the essential innovation machine and pivotal container for innovation to take shape – in their view, innovation itself is quintessentially an urban phenomenon. Such understandings are widely echoed and corroborated by empirical indications which suggest that the vast majority of innovation activities is indeed concentrated in only a minority of larger city regions (see 1.3.1). Against this background it is not surprising that development processes of rural and peripheral regions are often framed as a particular ‘problem’ (Murdoch, 2000; Bosworth and Atterton, 2012), especially if these involve the notion of innovation.

Against this background, the periphery label reflects the inherently negative and largely partial connotation associated with peripheral regions in mainstream innovation discourses: they are perceived as lacking and cumbersome rather than providing and dynamic settings. Woods (2013:116) highlights *‘that popular discourses may imagine the rural as a timeless, isolated place, disconnected from the modern world [...]’*, a view that links to up to persistent associations of peripheral and rural regions as being merely sites of agricultural production (Hindle, 2007). Even though the role of agriculture has substantially decreased within rural areas of the European Union. These associations conflict with the potential of peripheral regions to generate and implement innovative ideas. Within the innovation context, perceived shortcomings are particularly emphasised with regards to interrelated elements such as distance, density, networks and resources and, accordingly, integrated into distinct narratives on the state of peripheral places. Constituting both, a spatial and relational condition, distance indicates isolation and insufficient access to innovation relevant resources. Distance to agglomerations suggests a state of being on edge and outside of relevant interaction and communication systems, growth regions, markets and ultimately the hotspots of innovation and the core of the contemporary knowledge economy (e.g. Copus, Skuras and Tsegeledi, 2008). Peripheral regions seem to be located beyond the spatial limits of spatially sticky knowledge flows that diffuse ideas, information and knowledge generated in core regions, thereby somewhat excluding actors in these regions from relevant knowledge circulation processes (Rodríguez-Pose and Wilkie, 2016). Furthermore, physical distance and the associated barriers to participate in knowledge diffusion are considered to give rise to social or technological distances (Terluin, 2003).

Reflecting a related set of structural constraints, density closely relates to distance. Because peripheral areas account for lower actor densities firms operate from organisationally thin environments, which is considered a central innovation barrier (e.g. Isaksen, 2001; Tödtling and Trippl, 2005; Mahroum, 2007; World Bank, 2009). Consequently, peripheral regions are portrayed as environments that lack required resources such as a critical mass of actors and support organisations, complementary technological sectors and dynamic cluster structures. Furthermore, the absence of key elements constituting efficient regional innovation systems not only induces resource shortages but also impedes the effectiveness of localised networks (Onsager, Isaksen, Fraas and Johnstad, 2007). Because of their thinness, networks in peripheral regions are perceived as weakly developed, perforated and fragmented (Terluin, 2003; Tödtling and Trippl, 2005; Onsager et al., 2007). Thus, *‘peripheries are burdened by ‘weak economic fabrics’ that*

impair their capacity to develop new, original knowledge' (Rodríguez-Pose and Wilkie, 2016:67). From this perspective, local networks in peripheral regions only provide limited potentials for knowledge generation, collective learning and ultimately innovation. Consequently, their capacity to absorb and effectively exploit externally generated knowledge is considered to only be insufficiently developed. The assumed lack of resources as well as socioeconomic and institutional factors has fuelled descriptions of peripheral regions as per se 'hostile environments' for business development and innovation (Anderson, Jack and McAuley, 2001). Peripheral regions '*are therefore deprived of the catalyst for innovation. This deprivation would seem to all but completely stifle innovation in peripheral contexts*' (Rodríguez-Pose and Wilkie, 2016:67).

Collectively, these accounts project agglomeration-oriented arguments of mainstream innovation literature onto regional settings that are substantially differently structured and do not exhibit the specific qualities identified as drivers of innovation in metropolitan settings. Thus, the understanding that processes in urban settings support innovation most efficiently, as mentioned previously, is (re)produced in a circular way. Consequently, such accounts contribute to a distinctively negative and persistent label assigned to peripheral regions and their potential for innovation for at least two interrelated reasons. First, theories and concepts developed through research in metropolitan areas are frequently applied to study innovation in thin regions. For example, because of the absence of mechanisms such as local knowledge spillovers through informal and casual interaction, proofed to beneficially operate in core regions, negative impacts on innovation capacities in peripheral regions are deductively reasoned (Shearmur, 2017). This '*core region thinking*' (Isaksen and Sæther, 2015:65) surfaces in the dichotomy of per se innovative centres and non-innovative peripheries as well as generalisations on the state of peripheral areas which are often partial and subject to distinct 'stylised fallacies' (Hodge and Monk, 2004; Copus and Noguera, 2010). This logic reproduces distinct urban biases identified as shaping both theoretical assumptions and empirical investigations in economic geography and innovation studies (Shearmur, 2017).

Second, arguments linked to structural deficiencies are often expanded and projected to actors and their economic practices, even though not always explicitly stated (Anderson 2000; Tödting and Trippel, 2005; Fitjar and Rodríguez-Pose, 2011). Correspondingly, firms operating from peripheral environments are portrayed as lacking attitudes for innovation, entrepreneurship and growth (Anderson et al., 2001; Isaksen, 2001; Terluin, 2003; Copus and Noguera, 2010). In case businesses from peripheral environments generate innovations, considered exceptions rather than the norm, outcomes are perceived as being rather incremental, mostly relying on recombining existing knowledge (Asheim and Coenen, 2005).

EMPIRICAL ACCOUNTS OF FIRM INNOVATION IN PERIPHERAL REGIONS

The periphery label and the picture of inherently non-innovative peripheral settings it (re)produces, is widely held in mainstream literature as well as policy circles. Consequently, an urban bias in innovation research is frequently articulated, for example by Shearmur (2017) regarding theoretical assumptions and the way innovation is measured, or by Huber (2012) who questions the prominent argument of knowledge spillovers as main benefits of clusters. However, a growing body of scholarship questions the seemingly

indispensable connection between innovation and city environments. This body of work draws on case investigation of a broad variety of regional and national settings with a particular focus on Europe (Eder, 2018). Empirical research substantiates evidence that innovation is not limited to cities and clusters, but also occurs in peripheral regions. For instance, Küpper and Margarian (2012) find for Germany that firms in peripheral regions do not, compared with businesses in other regions, exhibit substantially lower innovation rates. In fact, and besides incremental innovations, firms from peripheral regions generate a rather high number of market novelties. It has been mentioned that innovation in peripheral regions might emerge precisely as a response to existing local/regional constraints. The potentials of marketing innovations have been particularly mentioned in this respect (Hindle, 2007). These indications might point towards a gap in the literature and somewhat challenge the seemingly established link between innovation and metropolitan regions, as well as central elements of the periphery label. A common interest of these studies is on how actors in such settings can innovate given the interactive and knowledge-driven understanding of innovation processes (Shearmur, 2017) which also guides the approach of the present study (see 1.2.2 and 1.2.3). Some of this emerging literature that tackles the urban bias in the ‘geography of innovation’ will be selectively presented in the following paragraphs.

A commonly confirmed finding of scholarship investigating innovation in peripheral regions is that processes of knowledge exchange and creation occur over distance. For example, Fitjar and Rodríguez-Pose (2011) show that innovative firms in southwest Norway collaborate with both local and extra-local partners and that in particular links to extra-local and international partners increase firms’ propensity to innovate. Likewise, Reidolf (2016) finds that firms located in remote Estonian regions mostly engage in collaborations with extra-local actors and often even skip the national level in search for relevant partners. Investigating entrepreneurial processes on Danish islands, Korsgaard, Ferguson and Gaddefors (2015) find that entrepreneurs effectively and strategically mobilise local and specialised extra-local links and resources to drive their ventures, thereby making use of the ‘the best of both worlds’.

Based on a sample of more than 2000 Swedish firms, Grillitsch and Nilsson (2015) show that innovating firms in peripheral regions exhibit a higher proportion of extra-local partners in their networks than similar firms in agglomerated settings. Based on this finding, it is argued that firms in knowledge thin regions might not only be able to complement local interaction, but that extra-local linkages are mobilised to compensate for a lack of local knowledge, thereby somewhat questioning the importance of local interaction. These results are echoed by Jakobsen and Lorentzen (2015) who find that firms from thin Norwegian regions collaborate more often with extra-local partners and with partners from diverse industries. Studying the innovation-related knowledge sourcing patterns of a small number of selected software companies located in a peripheral Italian region, Calignano and De Siena (2018) also find that the local context provides for only a limited number of relevant contacts. Collectively, these studies, investigating different contexts and drawing on different methodologies, suggest that organisational thinness urges firms to engage in collaborations at larger distances in order to generate innovation and, thus, such distanced collaborations might compensate for lacking regional knowledge sourcing opportunities. As Gibson and Brennon-Horley (2016:246) put it in their study on the interaction patterns

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of creative entrepreneurs in Darwin, Australia, firms in peripheral regions, *'are forced to make do with less, to fan out and source materials and connections and utilize spaces that are on offer regardless of their location'*. This study as well as related scholarship (Gibson, Luckman and Willoughby-Smith, 2010) from the creative industries highlights how actors utilise space in multi-local, multi-scalar and fluid ways to drive their innovation activities and to overcome limitations of their remote location. Conducting in-depth investigations of two globally competitive firms located in peripheral Norway Flåten et al. (2015) find that innovation relevant knowledge is mainly accessed by mobilising extra-local linkages rather than building on localised collaboration. Further, their findings highlight the importance of building high levels of internal competencies for firms from peripheral regions to sustain innovative capacity. These results reflect a distinct twin-strategy of building extra-local collaboration as well as internal capacities.

While some of these studies (Grillitsch and Nilsson, 2015; Jakobsen and Lorentzen, 2015) suggest that firms from peripheral regions engage with external partners more frequently, it has also been shown that firms might have reduced interaction requirements. Based on empirical findings from Canada, Shearmur and Doloreux (2016) argue that firms outside urban areas primarily pursue innovation activities that, coupled with internal capacities, have lower interaction requirements and rely mostly on technical and scientific information – which can be transferred more easily over larger distances. This finding suggests that firms align their innovation activities towards the specifications of their environments and the limitations and opportunities these might induce and that, in turn, high levels of internal capacities reduce firms' interaction requirements. Nevertheless, innovation processes usually require interaction and firms have to establish some linkages. In this respect, it is supposed that innovators in peripheral regions tend to target their collaborations partners strategically (Shearmur, 2017) because they cannot rely much on localised informal exchange. Such purpose-built collaborations were identified as dominant arrangements of partnerships operating over distance (Fitjar and Rodríguez-Pose, 2017). Despite variance in these accounts, in particular regarding interaction frequencies, the contributions underpin that engaging in extra-local collaborations, no matter how frequent, can compensate for lacking local opportunities. Thus, innovation-relevant interaction is by no means confined to any particular scale and, importantly, it can be suggested that localised interaction is not necessarily of higher importance. Strategically built relations spanning beyond local settings might be as productive for innovation as ties between co-located partners.

Another commonly shared argument of research on innovation activities in peripheries concerns episodes of (dis)connection and actor mobility. Concerning the creative industries sector of a small and remote Australian city, Gibson et al. (2010) highlight how innovation is situated in multiple locations, through different exchange and networking sites. Such altering periods of (dis)connection highlight on a more general level the role of actor mobility, which acts as a central means to overcome geographical isolation when needed. Analysing the knowledge creation processes of artists, i.e. not exclusively commercially operating actors, located in Finnish Lapland, Hautala (2015) points towards the importance of temporality in interactive knowledge creation processes. She finds that deliberate isolation is moderated by episodes in which artists seek interactions to connect with the field to source information and create knowledge. As the current globalised knowledge economy corresponds with high levels of mobility (Maskell, Bathelt

and Malmberg, 2006) actors are frequently involved in translocal knowledge dynamics, e.g. by travelling to access information and to meet partners. Recent literature suggests some formats by which remote knowledge can be accessed, generated and exchanged. Firm participation in industry trade fairs or conferences and more generally community gatherings, frequent business travel, translocal communities, digital networks and associations are considered effective mechanisms for knowledge (re)production and opportunities to establish new or strengthen existing (extra-local) linkages (e.g. Bathelt and Henn, 2014; Grabher and Ibert, 2014; Maskell, 2014).

TOWARDS A MORE DIFFERENTIATED UNDERSTANDING OF INNOVATION IN PERIPHERAL REGIONS

The confrontation of agglomeration-centred innovation theory with empirical evidence from non-agglomerated settings draws attention to the urban bias in innovation studies. The studies mentioned above, as well as numerous studies that have not been mentioned in this review (for a recent, comprehensive and systematic literature-review on '*innovation in the periphery*' see Eder, 2018), corroborate the empirical fact that innovation also occurs in and passes through peripheral regions. Such indications are by no means exceptions or peculiar outliers – even though it has been mentioned that studies on innovation in peripheral regions might imply a selection bias towards successful peripheral regions (Eder, 2018). Thus, the question emerges how this evidence can be positioned in spite of conventional views on innovation and peripheral regions previously synthesised as the 'periphery label'.

First of all, the evidence suggests that firm innovation is a phenomenon of both, urban and peripheral regions. Hence, there is no reason to assume that innovation does not occur in peripheral settings. Thus, the periphery label in mainstream literature and its continued reproduction needs to be called into question. Central ideas embedded in agglomeration-oriented accounts on the geography of innovation – e.g. that firms fundamentally benefit from the size, diversity, openness as well as interaction and knowledge sourcing opportunities found in metropolitan regions (Revilla Diez, 2002) – both, require re-examination and, thereby, encourage for thinking beyond agglomeration. Given that agglomeration inspired thought has seemingly become axiomatic in theories of innovation (Gibson and Brennan-Horley, 2016) such re-framing exercises appear inevitable to explain and further differentiate observations of innovation outside metropolitan settings and to underpin these observations with theoretical explanations (Küpper and Margarian, 2012; Isaksen and Karlsen, 2016; Shearmur, 2017).

From a theoretical viewpoint, innovation, seems to be largely defined by what is, supposedly, observed in cities: co-localised interaction and collaboration, diversity and inspiration, actor density etc. This dominant and urban-biased innovation model works better in urban than peripheral settings (Ibert, 2017), which would suggest that there is not much innovation outside cities (Shearmur et al., 2016:222). What this model, and the literature by which it is which echoed, denies, is that there might be differences regarding the types of innovation and the very nature of innovation processes that emerge in urban and non-urban regions (Isaksen and Karlsen, 2016; Shearmur, 2017). Given their specifications, there might be types of innovation that take shape more easily in peripheral regions. Stretching this idea further, Shearmur (2015; 2017) suggests a distinction between two roles/stages in the innovation process: its generation and its wider promotion. Taking into consideration the very characteristics of both urban and

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non-urban settings it is argued that generating innovation can occur in any given location. Urban environments and the very benefits they provide (e.g. Revilla Diez, 2002) do not necessarily play a critical role for the generation of innovation as actors might partly (re)create the benefits or circumvent limitations. Unlike innovation generation, the promotion of innovation, i.e. their scaling up, further development and wider marketing can clearly be supported most effectively in urban environments. Thick environments and the associated urban processes they facilitate act as essential and effective promoters and amplifiers. The following paragraphs provide an overview of theoretical thought that lies outside the agglomeration logic and that might be fruitfully mobilised to better understand *how* firms from peripheral regions drive innovation activities.

Since the 2000s, a shift from privileging configurations in geographical proximity to conceptions of innovation as processes involving dynamic and multi-local interactions between actors has been suggested (e.g. Bathelt and Glückler, 2003, 2018; Vale, 2011; Schmidt, Müller, Ibert and Brinks, 2017). Such perspectives emphasise the diverse social relations between agents and how these relations produce, reproduce and shape economic spaces (Boggs and Rantisi, 2003; Yeung, 2005; Sunley, 2008; Bathelt and Glückler, 2003; 2011; Jones and Murphy, 2011) and have been fruitfully mobilised to widen our understanding on the interconnections between innovation and space. However, as economic processes have to take place somewhere and as economic actors are localised in certain places, physical space and its characteristics cannot be completely neglected. Nevertheless, relational thought moves structural specifications of spaces and regions into the background. Instead of constituting territorially bounded units, spaces and places become contexts that provide manifold potentials for agency (Shearmur, 2011) and contexts in which multi-scalar actor relations are organised and mediated (Amin, 2004; Amin and Cohendet, 2004). However, the opportunities of actors to organise economic processes in multi-scalar ways are substantially bound by the capabilities and resources available (Yeung, 2009) – thus structural conditions exert influence on agency.

Conversely to the previously outlined and deficit-oriented ‘periphery label’, these perspectives provide expanded theoretical avenues to study innovation in peripheral regions. While it is acknowledged that actors are exposed to and influenced by the socio-spatial contexts from which they operate, actors are, and in this regard relational thought opens new avenues, in capacity to respond to and actively shape these contexts. Thus, firms from peripheral regions are considered to be equipped with the potential to build their very own (relational) environment needed for innovation. In this regards Bathelt and Glückler (2018:185) refer to the notion of *activity space*. In their understanding activity space is actively shaped by actors and their practices, resembles the specific space(s) of economic and social actor relations and, thus, exceeds the physical environment in which actors locate. Interestingly, such perspectives are frequently mobilised for research on core regions and empirically illustrate that firms’ network linkages and social relations are typically not determined by any geographical reference unit. Rather, it is widely acknowledged that processes of knowledge circulation and creation traverse spatial scales, connect multiple locations (Amin and Cohendet, 2004; Faulconbridge, 2006; Lorentzen, 2008; Vale, 2011; Bathelt and Glückler, 2018) and, thus, become territorially dynamic (Crevoisier and Jeannerat, 2009).

However, relational thinking is less frequently and less rigorously mobilised when studying economic processes in peripheral regions. Rather than simply transferring agglomeration-oriented ‘core region thinking’ (Isaksen and Sæther, 2015) to non-core regions, there seems to be a need for relational perspectives when studying economic processes outside of agglomerations. Relational perspectives allow to openly explore the phenomenon of innovation without *a-priori* privileging particular places or scales. Consequently, I see relational perspectives as an essential element to overcome ‘core region thinking’ in studying economic processes in non-core regions. Instead of (re)producing perceptions on the seemingly uncondusive structural conditions for innovation that peripheral regions provide for, relational thought can shed light on the specific practices mobilised by actors to pursue innovation and to bypass the structural constrains to which they are exposed (McAdam, McConvery and Armstrong, 2004). However, it has been suggested that the opportunities of peripheral places and their agents are, to varying degrees, constrained by structural challenges. Consequently, traditional challenges such as demographic decline and ageing, outmigration, deprivation in terms of physical/technological as well as educational infrastructure, higher transactions costs, lower local demands etc., many of which continue to persist especially in peripheral regions (Mahroum, 2007; Bosworth and Atterton, 2012; Kühn, 2015), exert negative impacts on actors’ innovative capacity and must not be downplayed or neglected (Woods, 2013). For instance, a relative lack of highly qualified personnel, coupled with continuously decreasing endowments of human capital due to demographic shrinkage processes, impedes the innovation potential of peripheral regions and their actors.

Based on the understanding that space constitutes only one of multiple contexts that confine or provide for agency. Space is considered a particular perspective and a starting point for enquiries on economic processes (Bathelt and Glückler, 2011). Perceiving the unit of the firm as the central nexus of collective and individual action with regards to innovation (Dicken and Malmberg, 2001), relational economic geography adopts a multi-scalar ‘*geographical lens*’ (Bathelt and Glückler, 2003). This geographical lens is mobilised to understand economic action and interaction as well as their outcomes and consequences from a spatial perspective (Bathelt and Glückler, 2018). The focus of REG is primarily on relevant actors for the phenomena and processes under investigation. With reference to innovation, it can be stated that the central interest is on how innovation and related interactive processes of knowledge creation and learning are shaped and conditioned by social and cultural processes (Bürcher, Habersetzer and Mayer, 2015), the multiple localities and spatial configurations these processes span across (Woods, 2013). Thus, in a way, innovation can be framed as a relational phenomenon. Linking these aspects of relational thinking to debates on the knowledge grounded understanding of innovation adopted in this dissertation (see 1.2.2), it is further suggested to study ‘*patterns of knowledge formation from a spatial perspective* [rather than] *interpreting spatial patterns from a knowledge perspective*’ (Ibert, 2007:110).

As previously outlined, empirical literature on innovation outside metropolitan regions and clusters (e.g. Gibson, 2010; Grillitsch and Nilsson, 2015; Jakobsen and Lorentzen, 2015) highlights the importance of engaging actors from multiple spatial scales as drivers to innovation processes. Hence, innovation-relevant interaction is not confined to any particular scale. Importantly, local interaction does not

necessarily have a more substantial role to play (Bathelt and Glückler, 2003; Malmberg and Maskell, 2006; Grabher and Ibert, 2014) which implies that also critical tacit knowledge can be exchanged and transmitted in settings that do not rest upon (permanent) co-location. In this respect Faulconbridge (2017) highlights that the relational perspective helps understanding the *'criss-crossing local-global geographies of innovation and challenges presumptions that local, face-to-face mediated encounters are always most productive'*. Arguing from a spatially open network perspective, Johansson and Quigley (2003:166) emphasise that actor relations spanning beyond local settings *'may lead to precisely the same benefits that arise from agglomeration'*. Interactive learning and knowledge exchange can be organised over distance and firms frequently combine knowledge externally acquired at distance with expertise available locally (e.g. Isaksen, 2001; Bathelt et al., 2004; Asheim and Coenen, 2006): *'connectivity with extra-local factors enables local development to take advantage of new technological, learning and trading opportunities from outside while continuing to build stocks of local capital and reinforcing and communicating local identities'* (Bosworth and Atterton, 2012:256). While innovation might benefit from the opportunities dense urban settings provide, it must not be supposed that associated urban processes quintessentially condition innovation. Accordingly, actors operating from localities in which opportunities for local networking are limited might build linkages to relevant external actors regardless of their location, or reduce their interaction requirements, for instance by building internal capacities (e.g. Flaten et al. 2015; Gibson and Brennan-Horley, 2016; Isaksen and Karlsen, 2016). These aspects highlight that firms adapt their innovation practices to the specific contexts from which they operate (Shearmur, 2017). Thus, as Grillitsch and Nilsson (2015) have illustrated, collaborations with extra-local partners might compensate for lacking local knowledge flows. For firms that rely to large extents on internal capacities such as technical expertise and/or experienced-based knowledge, understood to retain value over time, less dense environments might not pose innovation barriers but constitute productive and cost-efficient locations (Shearmur, 2017). Accordingly, these settings allow firms to innovate in rather slow fashions in the absence of immediate commercialisation pressures and requirements for frequent interaction, instead building on in-house developments and certain degrees of secrecy (Shearmur and Doloreux, 2016). If firms seek to integrate specific external expertise, they will target potential partners strategically to absorb information and knowledge rather than rely on informal interaction (Fitjar and Rodríguez-Pose, 2017; Shearmur, 2017).

These notions draw attention to the initiation and maintenance of extra-local linkages. In this respect, the internet and the way modern ICTs alter relations between urban and peripheral settings provide valuable opportunities for firms from peripheral regions to coordinate extra-local linkages (e.g. Hindle, 2007; Calignano and De Siena, 2018). However, despite multiple studies confirming the productive nature of ICT for isolated firms, such studies confirm at the same time that face-to-face contact between agents continues to play an indispensable role for building and maintaining effective and trustful ties (e.g. Townsend, Wallace, Smart and Norman, 2016). Thus, a simple transition from physical to virtual contact does not appear to be a viable option.

Although it has been suggested that geographical proximity is only one dimension that facilitates interaction between agents (Boschma, 2005), there seems to be the need for innovators to meet agents and be co-present in physical space. It follows that, when it comes to organising extra-local relations, a moderating role can be ascribed to actor mobility. Surprisingly, the notion of mobility and the relative and fluid meaning of localities and places which actor mobility entails have so far not been rigorously acknowledged and incorporated into innovation theory. Rather, theoretical understandings and methodological approaches, as well as associated visual representations, tend to geo-code actors to one specific location, thereby ascribing static and omitting dynamic features of actors in space (Yeung, 2009; Gibson and Brennan-Horley, 2016; Shearmur 2017).

However, a number of ways on how knowledge can be accessed, generated and exchanged in dynamic and mobile settings have been conceptualised within economic geography literature: trade fairs or conferences and more general community gatherings, frequent business travel, participation in trans-local communities, digital networks and associations. These formats are considered effective mechanisms and platforms for dispersed actors to connect, to (re)produce knowledge and to establish new or strengthen existing extra-local linkages (e.g. Henn, 2012; Bathelt and Henn, 2014; Grabher and Ibert, 2014; Maskell, 2014). In fact, such temporary formats might account for similarly knowledge-rich ecologies as permanent settings in urban agglomerations (Maskell et al., 2006; Bathelt and Schuld, 2008). On a more conceptual dimension, these settings refer to the notion of temporary proximity (Torre, 2008). Related scholarship supposes that face-to-face interaction has an indispensable role to play, but argues that temporary co-presence might suffice for knowledge generation. Thus, it opens up for a fundamental change in organising geographical proximity, moving from permanent to temporary arrangements. Such a fluid understanding of geographical proximity constitutes a substantial shift away from static perceptions of actors and space to multi-local and dynamic perspectives. At the same time, this understanding corresponds with the ever-increasing levels of mobility observed in the contemporary globalised knowledge economy (Maskell et al., 2006) which is no longer bounded to particular geographical contexts (Yeung, 2009). It has been suggested that actors, both from urban and peripheral areas, act more independently from their contexts and have become increasingly footloose – not least because of modern communication technologies (Bosworth and Atterton, 2012). Consequently, it can be argued that settings which offer temporary or even virtual opportunities for interaction might be particularly important for firms that operate from peripheral regions, by providing productive means to reach out and access dense settings. Rather than framing frequent face-to-face contact in co-location as the norm, it should be more widely acknowledged that infrequent or technology-aided interaction might suffice for certain kinds of innovation activities.

Furthermore, the problem-centred narrative denies that peripheral regions might account for distinct qualities and resources. These qualities might differentiate peripheral from metropolitan regions and can be transformed by firms into assets and facilitate specific and unique opportunities for innovation. These qualities can emerge if the notion of periphery is approached by perspectives other than the ones embedded in the periphery label (Ibert, 2017). The evolutionary perspective in economic geography

suggests that firms' innovation capacities are at least partially determined and influenced by the diverse paths of their local and regional environment. These place-specific conditions, partly shaping firm practices and strategies, are produced by the historic legacy of regions that surface as ongoing social, cultural, institutional and technological conditions (Martin, 2010). Peculiar local knowledge, practical know-how and place-specific resources found in peripheral places might foster distinct innovations that are unlikely to occur in regions that account for different sets of resources and qualities (Gibson et al., 2010; Shearmur, 2017). In this regard it has also been suggested that embeddedness of actors within the social contexts of peripheral places might provide access to distinct local resources and information that might generate commercial opportunities and create specific contextual competitive advantages (Jack and Anderson, 2002; Bosworth and Atterton, 2012).

It has also been mentioned that rural and peripheral regions typically host a wide range of commercial activities which often represent a cross section of associated regional and national economies (Hindle, 2007). Thus, peripheral regions, although being less actor-dense than metropolitan regions, potentially provide for diverse sets of innovation-relevant knowledge and expertise (Vale, 2011). Furthermore, specific practices associated with traditions and cultural heritage, which might conventionally be considered obsolete, old, out-dated or negative, as well as the persistent traditional challenges of peripheral regions offer distinct opportunities and assets that can be transformed into commercial opportunities (e.g. Anderson, 2000; Mahroum, 2007; Ibert, 2017). Entrepreneurs reconstitute traditional skills and benefit from the uniqueness of resources and products, created through deeply localised knowledge on seemingly outdated technologies or practices. The current boom of artisanal values associated with a new and post-modern craft-era regarding production and consumption can be considered a particular example that reflects a quality-focussed understanding as it relates to traditional manufacturing practices (Korsgaard et al., 2015; Gibson and Brennan-Horley, 2016). Along these lines, it is more generally argued that historical legacies of places and their technical and social inheritances, coupled for instance with modern marketing instruments, provide peripheral regions with unique sources for innovation.

As Gibson (2016) shows for the Texan boot industry, even situations that have locked-in regions with specific skills, technologies, production methods etc. might induce qualities precisely because they have sustained modernisation pressures. Thus, historical developments might also work in favour of peripheral regions rather than merely constituting inherited liabilities. Furthermore, natural and cultural landscapes might allow for specific kinds of innovation and shape the quality of products and allow for the authentic mobilisation of distinct images and associations in product marketing (Mahroum, 2007; Korsgaard et al., 2015). Related to what has been mentioned in previous paragraphs, peripheral regions might also qualify as experimentation sites for ideas and processes which can, in the absence of immediate commercialisation pressures, gradually mature and take loops (Ibert, 2017; Shearmur, 2017). Quality-centred views on regions and their actors open valuable avenues to identify resources that might support the emergence of innovation in settings outside the perceived hotspots of innovation.

The debates touched upon in the previous sections somewhat question if the advantages of co-location in cities and clusters are as important for knowledge exchange, competence building and innovation as conventionally assumed (Calignano and De Siena, 2018). Instead, engaging in multi-scalar relations appears a viable option to drive innovation and to overcome some of the structural limitations of peripheral settings. These theoretical thoughts, in conjunction with emerging empirical scholarship, contests the seemingly established and agglomeration-oriented geography of innovation, which appears to be in fact a complex set of multiple and contingent geographies: *'innovation has other geographies that overlay and unsettle the archetypal spatially confined cluster'* (Gibson and Brennen-Horley, 2016:245). Methodological sensitivity towards actor practices and contexts in the study of processes that constitute knowledge production, learning and innovation allows to explore their multi-local and multi-scalar nature openly. The previous discussion suggests that actors generate their own meaning of the environment they face, and, ultimately, are in capacity to construct their very own environments needed for innovation. It is important to consider local agents in peripheral settings as active participants in shaping environments rather than merely dependent, passive units. What matters for innovation capacity in peripheral regions is not solely a state of structural and material deprivation but how actors act upon these challenges by mobilising and adapting practices and strategies (McDonagh, Woods and Nienaber, 2012). Thereby, a contribution can be made towards a more differentiated and less partial, i.e. less agglomeration-oriented picture on the diverse nature of innovation geographies.

SECTION SUMMARY:

- Agglomeration-oriented theory, implicitly and explicitly (re)produces the understanding that metropolitan areas are the quintessential engine of the innovation machine (e.g. Florida et al., 2017) while peripheral regions provide actors with only limited opportunities for innovation. Although such representations have been identified as being partial (e.g. Hodge and Monk, 2004) and spatially biased (e.g. Shearmur, 2017) they are frequently echoed in mainstream literature.
- Conversely, growing empirical scholarship not only establishes the occurrence of innovation in peripheral regions as an empirical fact but indicates some of the very characteristics of these processes. Firms use extra-local ties to compensate for lacking relevant local knowledge (e.g. Grillitsch and Nilsson, 2015; Jakobsen and Lorentzen, 2015), tend to have rather infrequent needs for interaction (e.g. Shearmur and Doloreux, 2016) along with a high relevance of internal capacities (e.g. Flaten et al. 2015).
- This confrontation of urban-biased theory with empirical accounts emphasises the need for more differentiated perspectives within economic geography and to overcome core-region thinking (e.g. Isaksen and Sæther, 2015; Shearmur et al., 2016). A step deemed crucial for developing theory suited to explain innovation in non-core regions (Isaksen and Karlsen, 2016; Shearmur, 2017) and, thereby, to think beyond agglomeration.
- Integrating actor mobility and fluidity of processes (e.g. Gibson and Brennen-Horley, 2016) allows to perceive geographical proximity temporary and dynamic rather than permanent and static (e.g. Bathelt and Schuld, 2008; Torre, 2008) and provides a ground to understand how

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extra-local ties are formed. Following relational thought (e.g. Bathelt and Glückler, 2003) such perspectives invite for adopting a geographical lens in the study of economic processes such as innovation.

- Peripheral regions provide for specific qualities and resources which make these locations distinct from other places and metropolitan regions. These resources might relate to historical legacies (e.g. Gibson and Brennen-Horley, 2016) and are constituted for instance by peculiar local knowledge, practical know-how, technological production methods or cultural and natural resources (e.g. Korsgaard et al., 2015; Gibson, 2016; Ibert, 2017).
- The seemingly established and spatially confined *geography of innovation* appears to be a complex set of multiple and contingent *geographies of innovation* with multi-local and multi-scalar properties (Gibson and Brennen-Horley, 2016). Actors are in capacity to purposefully construct these geographies through practices and strategies.

EXCURSION - PROMOTING REGIONAL SPECIFICATIONS AS DISTINCT QUALITIES

Departing from the discussions in the previous section on innovation in peripheral regions, I would like to briefly draw attention to a practical example on how regional specifications, which, from an agglomeration-oriented lens, would be perceived as deficiencies are mobilised as specific qualities to portray the county of Vorpommern-Rügen as a distinct location and to attract entrepreneurs from outside the region.



The brochure titled ‘Free spaces for people with ideas’¹⁰ was issued by the economic promotion agency of the county Vorpommern-Rügen in the north east of Germany and distributed in spring 2017 as a supplement in the Leipzig city magazine. It features some entrepreneurial success-stories from within the county. Each example provides a succinct and personal account of how *space pioneers* transformed their initial ideas into viable businesses. Without going into details, the general framing of the brochure is that the county of Vorpommern-Rügen offers the freedom for ideas to develop and mature. It offensively promotes regional particularities such as the high quality

natural environment, its rather high degree of vacant, yet architecturally interesting buildings, its spatial structure by small and medium-sized cities and towns as well as its low density as particular qualities that provide pioneers with the required freedom to shape their ideas (Wirtschaftsförderungsgesellschaft Vorpommern mbH, 2017:17). The initial framing of the brochure concludes with asking: ‘Are you also seeking free space for your ideas? You find it here!’ (ibid:1) and then goes on to provide the individual examples related to diverse activities. Despite its anecdotal and promotional nature, this account illustrates the previously mentioned shift from a problem-centred to quality-centred perspective. It allows and provides for an alternative and positive interpretation of socio-economic challenges (low population density, population decline, distance to larger cities) which an agglomeration-oriented lens would perceive as distinct barriers for innovation.

¹⁰ online source: <https://www.yumpu.com/de/document/view/56227660/freiraume-vorpommern-rugen/2> (accessed: 28.08.2017)



Box 1: Excursion: promoting specifications of peripheral regions as distinct qualities

1.4 Innovation in low and medium-low tech industries

Besides the particular orientations towards peripheral regions, a further focus of this dissertation is on businesses active in low-tech and medium-low tech (LMT) manufacturing industries. Thereby, a specific sectoral bias in academia as well as industrial policymaking towards high-tech industries with high R&D intensities (e.g. Jensen et al., 2007; Hansen and Winther, 2011) is addressed. This sectoral bias is directly coupled with the spatial bias in economic geography and innovation studies as high-tech activities concentrate in metropolitan regions (Vence-Deza and González-López, 2008; Meng, 2012).

The overarching paradigm of the knowledge-based economy emphasises the idea that modern organisations and societies draw on processes in which knowledge operates as an essential resource. In this context research and development activities, i.e. science-based processes of knowledge generation and learning, have gained pivotal attention of policy makers at different scales – reflected for instance by the EU's 'Lisbon Strategy' devised in 2000. Such primarily R&D grounded interpretations on the constitution of knowledge-based economies have resulted in distinct policy obsessions focussing on high-tech industries (Hirsch-Kreinsen et al., 2003; von Tunzelmann and Acha, 2006). High-tech industries, defined by the OECD according to the industry's R&D intensities (OECD, 2009; see Table 3)¹¹ are, within policy and academic circles, widely considered as central drivers of competitiveness, development,

¹¹ Based on industry specific R&D intensities, the OECD classifies industries with a R&D intensity below 1 per cent as low-tech and industries with a R&D intensity of 1-3 per cent as medium low-tech industries. R&D intensity reflects the ratio of R&D expenditures and the turnover of firms and industries. It covers in-house R&D expenditures for R&D staff, R&D costs and investments as well as external expenditures for R&D activities bought in from external organisations.

growth and prosperity: ‘*the dominant view [...] is that such high-tech industries hold the key to the future*’ (Kirsch-Kreinsen et al., 2003:3). In contrast to high-tech sectors, LMT manufacturing refers to rather traditional activities such as textile, food, wood and paper production and manufacturing, or the manufacturing of metals and metal products (see Table 3). Many of these industries are characterised by rather stable market environments (von Tunzelmann and Acha, 2006). However, it has to be mentioned that, to sustain competitiveness, traditional industries have been largely affected by and operate on the basis of high-technology solutions. Additionally, it can be argued that also in these rather traditional and mature industries, R&D activities play an important role. However, on the firm level R&D might not be institutionalised and highly structured as formal procedures taking place in firm units dedicated to conducting research (Hirsch-Kreinsen, 2008; Santamaría, Nieto and Barge-Gil, 2009). Rather, research and development might relate to practical routines that occur across different firm units and, thus, relate more to the ‘doing-using-interacting’ mode of learning and innovation (Jensen et al., 2007). A recent empirical study conducted in the context of German Mittelstand firms (Brink et al., 2018) finds that a large share of both manufacturing and especially service firms innovate without pursuing formal R&D activities. Rather, these firms mobilise alternative innovation channels such as technology acquisition, on and off-the-job training of employees, external collaborations and consulting and, thereby, substitute for internal and formally conducted R&D.

high-tech	medium-high tech
Pharmaceuticals office, accounting and computing machinery radio, television and communication equipment medical, precision and optical instruments	chemicals excluding pharmaceuticals machinery and equipment not elsewhere classified electrical machinery and apparatus n.e.c. motor vehicles, trailers and semi-trailers railroad equipment and transport equipment n.e.c.
medium-low tech	low tech
coke, refined petroleum products and nuclear fuel rubber and plastics products other non-metallic products basic metals and fabricated metal products building and repairing of ships and boats	food, beverages and tobacco textiles, textile products, leather and footwear wood and products of wood and cork pulp, paper, paper products, printing and publishing manufacturing not elsewhere classified and recycling

Table 3: Classification of manufacturing industries (based on OECD 2009:32)

Some studies (e.g. Markusen, 1996; Hansen and Winther, 2011) have investigated the spatial effects of prevailing high-tech orientations in industrial policy. These discussions link back to the previously discussed agglomeration-centred approaches which have manifested itself in innovation geography. The focus on fostering R&D as the seemingly most crucial aspects of knowledge production re-produces spatial inequalities by privileging larger city regions within which high-tech industries tend to reside (Hansen and Winther, 2011:322). Analysing the spatial distribution of economic activities with different technology and knowledge intensities across Europe, Vence-Deza and González-López (2008) illustrate that LMT manufacturing and service activities with moderate knowledge intensities generally exhibit rather low tendencies to concentrate, and that these activities are more important outside metropolitan regions. Consequently, LMT industries and the regional contexts in which they locate receive far less, and by trend even decreasing, attention by industrial and innovation policy initiatives (e.g. Hirsch-Kreinsen, 2008; Hansen and Winter, 2011). Thus, most dynamic and structurally advantaged regions are supported and further strengthened by backing high-tech sectors and formal R&D, ultimately reproducing existing core-periphery disparities (Markusen, 1996; Hansen and Winther, 2011).

Furthermore, investigations on LMT are underrepresented in academic scholarship (Hansen and Winter, 2011). Against the background of this sectoral privileging it is argued that *'the industrial and technological development potentials of industries not based on high-tech are overlooked and possibly misjudged'* (Hirsch-Kreinsen, 2008:12), whereby industrial and innovation policy neglects the continued relevance of LMT industries (Hansen and Winther, 2011). It is further stressed that high-tech and LMT industries should not be seen as separate categories (Rehfeld, 2012) as they constitute highly integrated spheres of economic activity (von Tunzelmann and Acha, 2006; Heidenreich, 2009). For instance, Hansen and Winther (2011) emphasise that high-tech firms are significant buyers of low-tech products. Vice versa, low-tech firms frequently buy high-tech products such as specialised machinery. However, the interrelations are not confined to mere transactional relations. Rather, it is argued that LMT sectors directly influence the innovation capacities of high-tech firms, e.g. by providing knowledge, experiences and technology. Established networks between firms and organisations from LMT and high-tech industries facilitate flows of technology and expertise in both directions (Kirsch-Kreinsen, 2008). By following the path of specific innovation processes that originate from LMT manufacturing firms, the methodological approach adopted in this thesis is able to capture such interrelations (see 3.3.1).

Additionally, LMT industries continue to be of economic significance for employment, value-added, growth and innovation (Heidenreich, 2009). Within EU and OECD countries LMT activities provide the highest share of employment and value added within manufacturing, even though its proportion has, compared to high-tech activities, been declining over the last years (Hirsch-Kreinsen, 2008; Santamaría et al., 2009). Low and medium-low tech industries are particularly important economic activities outside of agglomerations and significantly contribute to regional economic development. Despite their economic significance and relations to high-tech activities, LMT firms are in the innovation context broadly perceived as *'unusual suspects'* (Mendonca, 2009). While it has been highlighted that innovation in LMT is anything but an infrequent phenomenon (e.g. Heidenreich, 2009; Brink et al., 2018), it is suggested at that from a regional perspective *'industrial specialisation in LMT innovations may not be a winning economic strategy'* (Heidenreich, 2009:483). Thus, it is argued that LMT industries should be considered a central element of advanced industrial regions if they are complemented by more research intensive activities (ibid.).

Regarding the characteristics and outcomes of innovation in LMT, it has been shown that these differ from industries deploying formal R&D as part of their innovation efforts more intensively. It has for instance been found that innovation in LMT essentially draws on rather practical knowledge, facilitated e.g. by distinct experiences and training of staff (e.g. Taylor and Asheim with reference to the synthetic knowledge base; von Tunzelmann and Acha, 2006; Santamaría et al., 2009). According to Hirsch-Kreinsen (2008), dominant innovation strategies in LMT are primarily concerned with incremental developments, i.e. focus on step-by-step developments of products, refinement and specialisation of production processes as well as customisation. Brink et al. (2018), suggest that innovation in LMT relates to lower degrees of novelty. These results are supported by Heidenreich's (2009) comparative analysis of innovation in high-tech and LMT industries based on CIS data: innovation in LMT industries is, compared

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to innovation in high-tech sectors, rather incremental, mostly related to process, organisational and marketing innovations and relies to large extents on external knowledge acquisition, mostly related to exchange with suppliers.

Within this project, I specifically investigate businesses active and innovation processes originating from low and medium-low-tech manufacturing. Thereby, I address and position this study towards the prevailing bias in innovation studies and economic geography in which investigation of low-tech activities are underrepresented. I also argue that interpretations of the knowledge-based economy should not stop at science-grounded, R&D-intensive economic activities. As the spatial focus of this research is on peripheral settings in which LMT industries are significant economic activities (see 4.1.2 and 4.2.2), its sectoral focus is aligned to regional and economic specifications of study regions, which increases the relevance (and potentially even representativeness) of findings.

2 Conceptual Framework

2.1 Networks

Networks provide central means to access external knowledge, organise interaction and mediate the associated and increasing complexities related to innovation. As innovation is typically not a process performed in isolation (see 1.2.3), networks, and in particular the formation, configuration and organisation of networks, can be perceived a crucial aspect of the innovation process. Consequently, networks can be considered a central element of innovation-related practices (Rammert, 1997; Amin and Cohendet, 2004; Huggins et al., 2012) and a key concept to understand how firms interact in and with their environments (Jakobsen and Lorentzen, 2015). Networks not only affect firm's innovative capacity but, as economic action is understood to increasingly occur in networks (Bathelt and Glückler, 2018), firm competitiveness more generally (Fitjar and Rodríguez-Pose, 2016).

Despite, or exactly because of its popularity, network is a fuzzy concept which includes a wide variety of meanings ranging from incidental contact to formal cooperation or the establishment of common units such as joint ventures. Defined broadly, networks can be considered '*nodes and links connecting these nodes, in order to facilitate interactions among agents*' (Johansson and Quigley, 2004:165). Adopting a distinct business perspective, this definition allows placing analytical focus on both, the actors involved in networks and the characteristics of links. Networks are seen as the result of complex interaction processes and as rich in resources such as knowledge, trust, finance etc. (Copus and Skuras, 2006). Accordingly, networks might be seen as structures that facilitate economic processes which, nevertheless, also constitute social constructs (e.g. Welz, 2003; Ter Wal and Boschma, 2009). Networks involve interaction and exchange between individuals and groups of individuals (Malecki and Tootle, 1996) and are, consequently, partly shaped by social and cultural elements such as mutual trust but also feelings and emotions of individuals (Bathelt and Glückler, 2018). Even if most empirical studies access networks on the organisational level, it has been highlighted that is not organisations interacting with each other but individuals that represent these organisations, underpinning the social dimension of innovation-related interaction (Faulconbridge, 2017). Additionally, networks exhibit specific spatial dimensions as the organisation of actor relations engages and traverses different spatial scales (Crevoisier and Jeannerat, 2009). While these spatial dimensions constitute central interests of disciplines such as economic geography in networks, it is frequently highlighted that networks themselves are not spatial constructs (e.g. Glückler, 2007). Thus, in order to adequately analyse the networks that underlie economic processes such as innovation, it is necessary for space-oriented disciplines to integrate both spatial and non-spatial network dimensions as well as the complex ways in which these dimensions are intertwined.

The focus in this dissertation is on the networks firms from peripheral regions mobilise as part of their innovation endeavours. Firms and their economic activities are at the same time embedded into multiple and overlapping contexts: regional, industrial or institutional (Taylor and Asheim, 2001; Vissers and Dankbaar, 2016). These contexts surface as multi-layered actor relations, generating specific environments within and from which firms operate. Thus, adopting a network perspective allows to shed

light on how firms interact in and with their various environments and, importantly, how actors construct, through practices and strategies, the specific environment(s) needed for innovation (Jakobsen and Lorentzen, 2015; Bathelt and Glückler, 2018). Adopting a network perspective in innovation-related research implies a shift from a focus on single actors to considerations of multi-actor configurations and the relations by which actors are linked (Powell, Koput and Smith-Doerr, 1996). The use of the network notion in the context of the particular focus of this dissertation on peripheral regions is also motivated by perspectives that consider networks potential substitutes for socio-spatial disadvantages. Johansson and Quigley (2004:166) underpin that *'networks among economic actors dispersed over space may act as a substitute for agglomerations of actors at a single point, providing some or all of the utility gains and productivity increases derived from agglomeration.'* Consequently, it can be argued that networks are a vital resource for the actors and local economies of peripheral regions (Bosworth and Atterton, 2012). Along a similar vein, Castells (2000:407) suggests that contemporary networked economies are composed by 'spaces of flows' whereby clear-cut divisions between spatial units such as the urban and the rural, gradually dissolve. Adopting network perspectives offers a means to identify mechanisms that drive firm innovation in peripheral regions and to investigate how firms overcome some of the challenges peripheral contexts might induce. Although networks can, and will in this research, be seen as potential enablers for processes of economic change in peripheral regions, it has been emphasised that networks might as well reproduce pre-existing conditions and, thereby, facilitate situation of lock-in. Furthermore, Murdoch (2000) argues that peripheral regions and their actors might be located low in the hierarchy of nodes that are central in organising the networked society and its associated 'spaces of flows'. Despite such potential limitations for agency, networks can be perceived as particular relational setups that can to certain extents be actively shaped, organised and managed (Bathelt and Glückler, 2003). In this sense, the spaces created by networks relate to the relations, interactions and ties that underlie and configure particular firm-networks (Huggins et al., 2012).

2.1.1 Types of networks and nature of linkages

Network literature provides a wealth of approaches to distinguish different types of networks and corresponding actor linkages. An overarching distinction of networks in economic geography is between physical networks and virtual networks (Nijkamp, 2003). Physical conceptions relate to infrastructural networks that facilitate connectivity and mobility. Virtual networks constitute organisational arrangements in which knowledge creation, knowledge diffusion and innovation take place (Nijkamp, 2003; Ter Wal and Boschma, 2009:741). Given the focus of this dissertation on networks related to firms' innovation activities, its focus will be on such virtual arrangements. I will now briefly outline some distinctions along the lines of organisational innovation networks and the nature of linkages. These conceptions guide the way in which innovation networks will be analysed in subsequent parts of this dissertation.

In terms of their organisational scope, innovation networks engage three dimensions: intra-firm, inter-firm and extra-firm relations (Yeung, 2005). Intra-firm ties relate to interactions and processes of coordination between individuals, departments, branches or units of the same firm or a larger

2 Conceptual Framework

organisational body. Intra-organisational linkages are considered essential for building core competencies in the sense of firm-specific expertise, social capital and organisational flexibility. Firm-internal capacities and their expansion are organised by intra-organisational ties. Concerning inter-firm relations, the central role of suppliers, customers as well as competitors as sources for knowledge and feedback is frequently emphasised. Such inter-firm relations are critical for firms to obtain ideas, acquire external knowledge, reduce uncertainties and risks and to minimise innovation time span (Hansen, 2014). Similar motives are considered to drive extra-firm relations that encompass linkages of firms to public and semi-public organisations from science and research (universities, research organisations) or the regional development arena and intermediary organisations (development agencies, public authorities, chambers, associations educational centres etc.). In this research, I will acknowledge these dimensions of firm's innovation networks by openly exploring the constellations firms mobilise as part of their innovation endeavours.

Another distinction relates to the nature of actor ties, typically portrayed as binary categories, to name a few: transactional or collaborative, formal or informal, hierarchical or flat, short-term or long-term, formed strategically or coincidentally. Despite this wealth in terminology, an implicit and commonly adopted distinction to assess the nature of ties is between transaction-oriented and knowledge-oriented linkages. This distinction suggests in principle two logics that underlie firm's networking activities: the logic of trade and the logic of collaboration (Dubois, Copus and Heström, 2011). According to Malecki and Tootle (1996), transaction networks are concerned with the formalised exchange of goods and services between buyers and suppliers, subcontracting relations, strategic purchasing alliances and the like. While knowledge networks are constituted by information flows, collective knowledge creation and learning processes and, thus, have a strong element of formal but also informal collaboration. Consequently, knowledge networks are typically coined by high degrees of mutual interests, familiarity and trust (e.g. Powell and Grodal, 2006; Dubois, 2013) and facilitate active partnership (e.g. Ozman, 2009; Ibert, Müller and Stein, 2014).

The initiation of both transaction-oriented and knowledge-oriented linkages as well as their maintenance necessitates substantial resources. Consequently, the number of collaborations, and especially the number of rather intense knowledge-oriented relations companies can maintain effectively is limited and, thus, their formation needs to be selective (Herstad, Palshaugen and Ebersberger, 2011). The emphasis of trust and mutual action in knowledge-oriented network linkages overtly and implicitly connects to the streams of social capital literature (Putnam, 2000). Within the realm of social capital, Granovetter's (1973) distinction between '*strong ties*' and '*weak ties*', which refers to the frequency and intensity of interactions, has been seminal. Although this distinction initially builds on considerations of informal and interpersonal relations, the notion has frequently been transferred to knowledge sourcing activities of firms. Based on rather close relational set-ups, strong ties are seen to provide access to information and expertise similar to own resources. Thus, knowledge mobilisation through strong ties is relatively restricted as understandings and competencies of actors overlap. Because of their low novelty content, strong ties tend to be less valuable for sourcing new and innovation-relevant knowledge (Powell and

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Grodal, 2006). Accordingly, it is argued that innovation-relevant knowledge is mostly acquired through weak ties, i.e. infrequently mobilised relations that carry higher degrees of non-redundant information. Such weak ties refer for instance to loosely related acquaintances or strategically initiated partnerships. Thus, Granovetter (1973) explains ‘*the strength of weak ties*’ with their capacity to facilitate access to information from rather distant domains. Consequently, weak ties contribute substantially to knowledge generation and learning. Considering the specific features of both strong and weak network relations, a balance between the two is considered most conducive for knowledge acquisition and network operation (Ring, Peredo and Chrisman, 2009).

Related to streams of social capital literature the notion of (local) embeddedness has also been prominently discussed in the context of knowledge-oriented network ties. Although embeddedness has initially been discussed without specific spatial interpretations (Granovetter 1985), scholars from spatial disciplines relate the notion of specific geographical, and mostly local/regional, contexts. In a spatial interpretation embeddedness relates to connections that, based on the cultivation of locally/regionally specific cultures, values and identities etc. provide access to distinct resources and information that link social and economic action (Bosworth and Atterton, 2012). Thus, embeddedness suggests that actors are or become part of social structures and contexts, which necessitates the establishment and maintenance of social networks with actors of the same context (Jack and Anderson, 2002). While the notion of embeddedness has been traditionally discussed and mobilised for local and regional configurations it has been illustrated more recently that agents can also be or become embedded trans-locally (e.g. Dubois, 2016). Linked to the network notion it can be suggested that embeddedness of actors might related to both, proximate and distanced linkages.

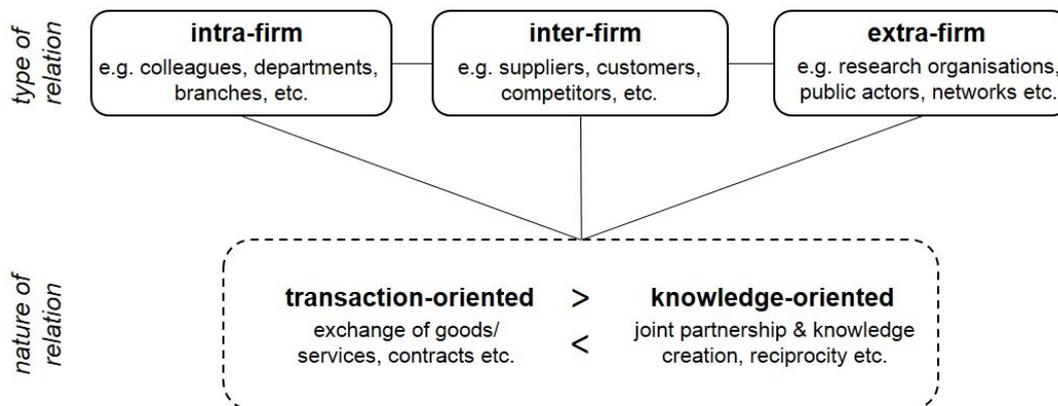


Figure 3: Conceptualising firm innovation networks

The previously discussed and rather clear-cut distinction between transaction-oriented and knowledge-oriented linkages provide useful analytical yardsticks. However, these categories might substantially overlap in reality. Thus, these categories should be considered distinct endpoints of a continuum of linkages ranging from transaction-related market linkages on one end to reciprocal and knowledge-intensive linkages on the other end. It is therefore proposed to perceive networks from a systemic perspective, as coordinated and ongoing sets of economic (e.g. transaction-oriented) and non-economic (e.g. knowledge-oriented) relations (Dubois, 2013). Contractual relations with suppliers and customers

might at the same time provide a common basis for knowledge-oriented interaction. Thus, ties that are initially concerned with business transactions might eventually be turned into specific knowledge-oriented linkages. Furthermore, it has been suggested that informal linkages such as friendship and family ties are frequently used by firms from rural and peripheral regions to extend personal relations into the business sphere (Copus and Skuras, 2006; Atterton, 2007; Ring et al., 2009; Young, 2010), thus '*leading to a particularly strong overlap of social and economic influences in rural communities*' (Bosworth and Atterton, 2012:261). Figure 3 illustrates the main conceptual dividing lines and the approach to networks that will inform the study with its distinct focus on the networks that drive firm innovation in peripheral regions.

2.1.2 Dynamic perspectives: network formation and evolution

Besides overlaps between the above mentioned binary categories, Powell and Grodal (2006) emphasise the importance to treat these categories non-deterministically as one might otherwise neglect the inherently fluid and dynamic nature of networks. Networks are formed by connections between previously unrelated actors or by mobilising linkages to existing partners. Over time, the nature of linkages might alter, or links might even disappear. Thus, the network notion closely links to process perspectives (Malecki and Tootle, 1996; Glückler, 2007; Ter Wal and Boschma, 2009). Within the context of the present study, it can be assumed that the networks firms activate and build on the project level somewhat relate to and reproduce existing networks on the firm level through repeated interaction. However, due to the specific information and knowledge requirements of particular innovation projects, it can also be assumed that new links activated in projects widen the overall firm network. Even though network theory widely acknowledges the process nature of networks, it is highlighted that the vast majority of empirical studies in economic geography adopt rather static perspectives and, consequently, reflect only snapshot views. This mismatch is to a certain extent driven by data availability and reflects specific ontological and epistemological positions as well as related methodological approaches. Furthermore, this discrepancy illustrates the dual understanding of networks as either static structures or dynamic processes. As structural understandings of networks prevail in empirical investigations, the need for studies that are sensitive towards the dynamic and fluid nature of networks, by investigating origins and evolutionary paths, is frequently articulated (e.g. Glückler, 2007; Ter Wal and Boschma, 2009). Frictions between partners might, for instance, be one trigger for why established links change their nature over time or might even dissolve. Conversely, successful collaboration between partners might facilitate repeated collaboration and strengthen existing linkages. On a more macro level, network dynamics and the investigation of changes in network structure over time also constitute a central interest of evolutionary economic geography.

The fluidity of relations and networks is closely related to the process of network evolution, which itself is driven by particular selection decisions based on certain preferences. Selection describes the formation of linkages between actors as the members of a specific network (Glückler, 2007). Network theory suggests that partnering decisions of actors, resulting in relations to certain actors and not others, are driven by a number of explicit and implicit intentions, decisions and strategies. Selection must not be

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understood as a one-sided process as a relation between partners needs the agreement of each of these partners involved, which might also choose to change a relationship over time (Glückler, 2007). In this sense, power asymmetries between actors are a potential barrier to tie formation and network development as some actors might simply lack resources to connect to certain actors. Thus, choice in partnering decisions can be either limited or enabled by actor characteristics and the multiple environments in/from which they operate (Balland, Boschma and Frenken, 2013; Vissers and Dankbaar, 2016). Although the network notion stresses agency, this agency might in practice have limits and, consequently, partnering decisions are not necessarily guided by free choice. Furthermore, the establishment of links to previously unknown partners might be guided by active search processes or involve chance encounters, both mechanisms imply limited awareness for potential partners at any given time. In this respect, the mechanism of 'preferential attachment' suggests that actors tend to link up with partners that account for a large number of relations (e.g. Fuhse, 2016), i.e. partners who are highly visible such as technology leaders in their domain. Another mechanism suggests that partnering decisions are somewhat biased towards actors with whom similarities across different dimensions (e.g. geographical, social or cognitive) are shared, i.e. if actors are relationally close (Boschma, 2005; Ter Wal and Boschma, 2009).

Departing from these understandings, the present study utilises the network notion to empirically investigate and understand more thoroughly the origins, configurations and dynamics of the networks firms operating from peripheral regions, mobilise for their innovation endeavours. Linked to the interactive understanding of innovation (see 1.2.3), this approach allows understanding more thoroughly the mechanisms that drive innovation in these settings.

Having gained popularity over the past years, the network concept in economic geography has also been exposed to critiques. Glückler (2007) for instance criticises the insufficiently formalised use of the network notion, in particular regarding the framing of strategic alliances between only two actors as networks. Network theorists do not consider dyadic linkages between two actors a network, as such dyads do not involve structural elements that are considered essential network features (e.g. Fuhse, 2016). In the present study I seek to go beyond mere considerations of dyadic linkages and to capture the multitude of ties between different kinds of actors relevant for specific innovation processes. Thus, this research focusses on the analysis of ego-centred networks on the level of firm's innovation projects which includes, however, also analyses of dyadic linkages between actors.

SECTION SUMMARY:

- Networks constitute central aspects of innovation-related practices (e.g. Rammert, 1997) that are rich in resources (e.g. Copus and Skuras, 2006) as well as social constructs (Malecki and Tootle, 1996; Welz, 2003).
- Networks reflect the various environments into which firms are embedded (e.g. Vissers and Dankbaar, 2016) and provide an analytical lens that links firms to their multi-actor environments (Powell et al., 1996).

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- From an analytical perspective different types of networks like intra-firm, inter-firm and extra-firm networks (Yeung, 2005) as well as different, overlapping natures of network linkages such as transaction-oriented and knowledge-oriented linkages (Malecki and Tootle, 1996) can be differentiated.
- Due to the fluidity of actor linkages that underlie networks, the concept is inherently dynamic (Powell and Grodal, 2006). The nature of ties between actors changes over time, e.g. certain ties might dissolve, new ties might emerge and existing ties strengthen (Ter Wal and Boschma, 2009).

2.2 Multi-dimensional frameworks of proximity and distance

As outlined in chapter 1.3.1 of this thesis, the concept of geographical proximity and its related notion of agglomeration has had and continues to have a central position in economic geography and innovation studies. Although I have already argued for a more nuanced understanding of the role of geographical proximity (1.3.2), the concept is re-visited as part of the conceptual framework of this study. In particular, two aspects, mobilised as analytical perspectives in this study, will be illustrated.

First, I propose to approach geographical proximity, and the benefits it might produce for processes of knowledge generation and innovation from a dynamic-temporary rather than a static-permanent perspective (section 2.2.1). Recent debates in economic geography continue to emphasise the productive properties of physical proximity, but argue that it does not need to be permanent (co-location) but can be effectively organised on a temporary basis (co-presence). Second, following Boschma's (2005) conception on the multiplicity of proximity, section 2.2.2 expands the notion of physical proximity in a multi-dimensional, non-spatial direction. Different proximity accounts are explored and the discussion explicitly addresses the notion of distance, which I suggest to include into the analysis of actor relations. Thus, the overall conceptual approach in this study retains proximity and distance as a central conceptual pair. Expanded understandings of proximity and distance provide a theoretical framework for understanding the multi-actor configurations of interactive innovation processes of firms from peripheral regions. Collectively, this chapter provides the basis for comprehensive analyses of the linkages firms from peripheral regions mobilise for their innovation efforts, including tie formation, network dynamics and actor mobility.

2.2.1 Being there: organising geographical proximity

The chapter on agglomeration-oriented perspectives on innovation (see 1.3.1) illustrated the pivotal role ascribed to geographical proximity in the discourse on innovation and space. However, suggestions that proximity in its geographical sense has experienced a process of de-territorialisation (e.g. Bunnell and Coe, 2001; Gertler, 2003; Amin and Cohendet, 2004), invite for more differentiated understandings of geographical proximity and the ways in which firms, including those firms located in peripheral regions, perceive distance and organise proximity. Agglomeration-oriented perspectives implicitly and explicitly suppose that proximity is per se permanent ('co-location'). However, settings that provide for temporary proximity ('co-presence') are considered potentially effective substitutes for co-location (e.g. Maskell et al., 2006), and, thus, provide ground for understandings which suggest that effective knowledge exchange and interaction does not necessarily rely on co-location of actors (Torre, 2008:870).

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These aspects have prompted some authors to proclaim the ‘death of geography’ (Morgan, 2004) – facilitated for instance by the rise of modern communication technologies. Conversely, it has been argued that geography continues to shape processes of knowledge exchange and innovation. Morgan (2004) argues that both of these fundamentally different perspectives co-exist and address different dimensions of processes that collectively shape contemporary economic systems: processes of globalisation and processes of spatial differentiation. Thus, the role of geography and its function for innovation processes continues to be controversially debated (Calignano and De Siena, 2018).

Accordingly, central protagonists of multi-dimensional proximity conceptions, despite somewhat reducing its role, suggest that geographical proximity between actors continues to be a substantial, yet not critical element in innovation processes (Boschma, 2005; Torre and Rallet, 2005). Amin and Cohendet (2004) argue that (permanent) spatial proximity and the notion of ‘being there’ should be decoupled from one another. Specific connections between actors might involve different scales (local to global arrangements) and might be permanently, temporarily or virtually organised: *‘The everyday possibility of striking and maintaining distanced links, the everyday possibility of action at a distance, the everyday possibility of relational ties over space, the everyday possibility of mobility and circulation, the everyday organization of distributed systems, make mockery of the idea that spatial proximity and ‘being there’ are one and the same’* (Amin and Cohendet, 2004:108).

Given the focus of this study on the innovation activities of firms from peripheral regions, mobilising the notion of temporary proximity opens some promising avenues. First, expanding the conventional, static notion of geographical proximity to a temporary understanding mobilises the notion of actor mobility in space (Menzel, 2015). Even though mobility and the maintenance of distanced links are considered everyday practices and features of contemporary economies (Amin and Cohendet, 2004; Maskell et al., 2006; Schmidt et al., 2018), mobility remains a largely neglected element in innovation theory (Shearmur, 2017). Second, given the lack of localised interaction opportunities of firms in peripheral regions, it can be argued that, coupled with high degrees of mobility, formats that allow for temporary co-presence constitute settings to balance organisational thinness. Thus, mobility allows actors located in peripheral regions to access interaction rich settings and to tap information and knowledge that circulates in these temporary settings.

The literature on temporary proximity discusses a number of mechanisms that generate ‘learning places’ (Amin and Cohendet, 2005) untied from permanent co-location. Temporary physical proximity enables face-to-face interaction through co-presence for a limited time. Such formats range from rather intimate, short- to medium term bi- or multi-lateral visits of partners and clients (Amin and Cohendet, 2004; Coe et al., 2007; Torre, 2008) to large-scale formats of international trade fairs or congresses (Maskell, 2014) as well as virtual arrangements (Grabher and Ibert, 2014) based on the use of the internet as a mediating technology. Trade fairs, conventions, congresses and the like have been conceptualised as ‘temporary clusters’, suggesting that they might provide for similar information rich and dense knowledge ecologies than spatial industrial clusters, bringing together functionally different actors from within industries and interest fields. Such settings define common spaces of representation, interpretation and sense-making

and link the various participants from related contexts. Consequently, arrangements of temporary co-location are regarded arenas for field reproduction (Bathelt and Henn, 2014) and vehicles that support network formation, interactive learning and innovation (Bathelt and Schuldt, 2008). According to Amin and Cohendet (2004), these mechanisms and formats, based on co-present relationships across territorial boundaries, are in capacity to generate relational proximity between actors which draws on more than permanent geographical proximity. Accordingly, it has been emphasised in both management and geography literature that face-to-face interaction in co-present arrangements also plays an important role in trust-building processes (e.g. Growe, 2018). An important additional function is that temporary events offer platforms for non-interactive types of learning and related practices such as monitoring and observation of competitors, products and artefacts as well as comparison (Glückler, 2013).

2.2.2 Being connected: non-spatial proximities and distances

In this section, I will briefly present and discuss some characteristics of the main families that can be identified within the proximity debate in economic geography. Although these approaches emphasise different proximity dimensions and address different analytical levels, the conceptions commonly share a number of understandings. Collectively, they argue that geographical proximity alone does not suffice for interactive collaboration, learning and innovation. Additional proximity dimensions that ease, besides geographical proximity, learning and innovation are introduced.

This stream of literature can be connected to some of the very characteristics of peripheral regions. They are coined by relatively actor-thin environments in which advantages of agglomeration as well as opportunities for frequent and casual face-to-face exchange are limited, if at all available. Consequently, geographical proximity, especially in its conventional permanent framing, only plays a subordinate role in the interaction practices of firms from peripheral regions. Identifying that firms from peripheral regions tend to engage more frequently in collaborations over distance (e.g. Grillitsch and Nilsson, 2015; Jakobsen and Lorentzen, 2015), emerging empirical literature supports this reasoning. Relating these indications to the multi-dimensional proximity debate, it follows that non-spatial dimensions seem to have a substantial role in driving collaboration, interactive learning and innovation.

A mutual understanding is that proximity, in its various dimensions, reduces uncertainties, risks and costs related to inter-organisational coordination and, thus, facilitates fruitful interaction and, consequently, learning and innovation. Thereby, multi-dimensional proximity concepts provide a framework to empirically investigate and understand processes of tie and network formation from both spatial and non-spatial perspectives. Given the focus of this study on innovation-related practices of firms located in peripheral regions, the proximity concept provides a valuable conceptual starting point. Arguing that *‘geographical proximity per se is neither a necessary nor a sufficient condition for learning’* (Boschma, 2005:62) emphasises the importance of non-spatial factors as drivers of interactive learning and innovation.

PROXIMITY CONCEPTIONS

Three main families can be identified as conceptual starting points of expanded, multi-dimensional proximity debates. Even though these accounts emphasise, based on diverging theoretical groundings, different dimensions and levels, they should not be seen as isolated, but rather as interconnected accounts (see Figure 4):

- The *institutional approach* (e.g. Kirat and Lung, 1999) is focussed at the macro level and primarily concerned with specific national or sectoral (i.e. broader) contexts of interaction. Formal institutions such as common regulatory frameworks are seen to create spaces that ease interaction between actors precisely because reference frameworks (e.g. regulatory, political, historical, cultural) are commonly shared amongst actors (Kirat and Lung, 1999; Balland et al., 2013). Despite its structural orientation and its focus on the macro-level, the approach further addresses, although more implicitly, the micro-level by also referring to aspects of social embeddedness between actors.
- Rather than focussing on wider contexts of interaction, the *interactionist approach* (e.g. Rallet and Torre, 1999; Gilly and Torre, 2000; Torre and Rallet, 2005) centres on interactions and more systematically on the formation of links between actors. It explores, from a micro level perspective, motives that underlie interaction and tie formation in innovation networks. The interactionist approach differentiates between two types of proximity, geographical proximity and, in a relational understanding, organised proximity. Organised proximity is further decomposed into two dimensions, the logic of belonging to both social and formally organised groups and the logic of similarity, i.e. actors sharing systems of representations/beliefs and knowledge (Torre and Rallet, 2005). While these approaches offer valuable starting points for understanding tie formation it is criticised, from an analytical perspective, for missing distinctions between the different drivers of network formation (Balland et al., 2013).
- The *evolutionary approach* to proximity developed by Boschma (2005) addresses this shortcoming of the interactionist understanding and conceptualises five proximity dimensions: geographical (spatial unit), organisational (organisational body), cognitive (capabilities), institutional (regulations/norms) and social (social relations). This approach departs from the understanding of evolutionary economics and evolutionary economic geography that heterogeneity between agents acts as a central feature of socio-economic processes. This multi-dimensional conception is directly coupled with aspects of interaction, collaboration and network formation (Balland et al., 2013). Thus, like the interactionist understanding the evolutionary approach to proximity reflects a distinct focus on the micro level which permits to understand processes and configurations that underlie the formation of linkages and networks.

Although touching upon the other approaches regarding specific aspects as well as general orientation, the evolutionary approach to proximity is deemed to be most useful for this study. Boschma's conception analytically separates dimensions which are only implicitly referred to in institutionalist and interactionist approaches. At the same time, the evolutionary approach places a distinct focus on the micro level and,

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thus, allows to generate empirical understandings on drivers of tie formation in the context of innovation activities. Within the scope of this dissertation, the micro-level focus constitutes an important criterion, as its methodological orientation, which is primarily inspired by the innovation biographies approach (see 3.3.1), also reflects a distinct micro-level focus. Thus, conceptual framework and methodological proceedings of this study are consistent. The approach to multi-dimensional proximity adopted in this research essentially grounds on:

- a differentiation between five dimensions: geographical, organisational, cognitive, institutional and social proximity,
- a non-deterministic understanding of proximity, which implies to also draw attention to distance,
- a dynamic rather than a static understanding,
- and an analytical focus on how proximity and distance condition tie formation in innovation processes.

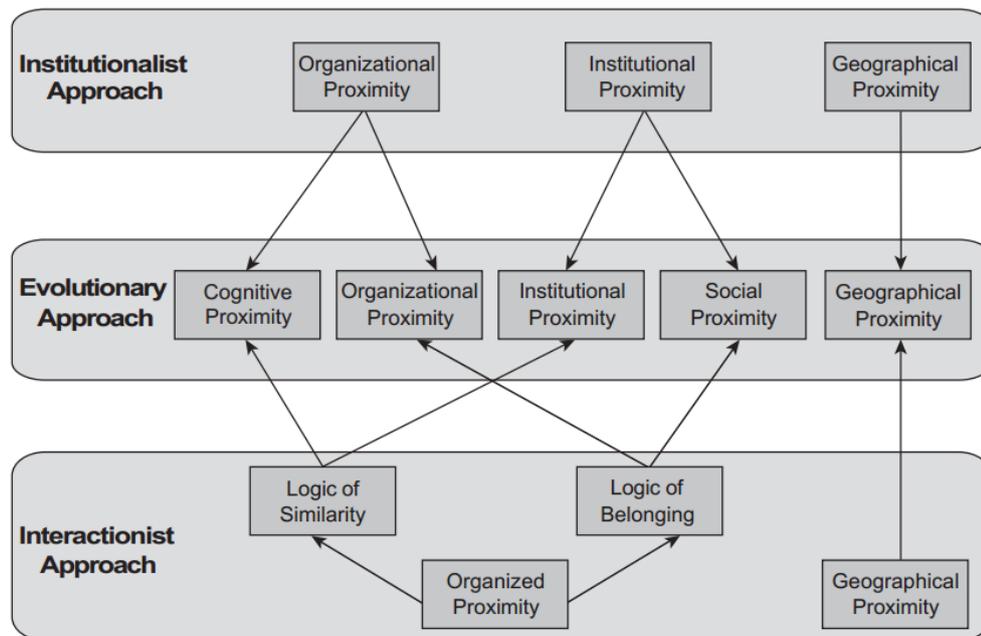


Figure 4: Families of proximity conceptions (Balland et al., 2013:193)

I will now provide a succinct overview on the conceptualisation of each of the five proximity dimensions. Doing so, I follow Boschma's work (2005), who offers conceptualisations that intend to avoid (significant) overlaps and therefore aim at analytical distinction.

Geographical proximity is defined in a rather restrictive manner and refers to physical/spatial proximity between economic actors in both absolute and relative terms (e.g. travel time). *Organisational proximity* refers to the set of relations by which knowledge exchange processes are coordinated, either by arrangements between organisations (e.g. firm networks, associations) or within organisations, for instance through subsidiaries. Consequently, the organisational dimension refers to ties between actors that somewhat belong to the same group. *Cognitive proximity* is, for analytic purposes, separated from the organisational dimension and relates to the capabilities of individual and collective actors, such as

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knowledge bases and experiences. In the context of interactive learning and innovation, cognitive proximity is seen to take on a pivotal role, and some degree of cognitive proximity is the only type considered a prerequisite for interactive learning as it ensures effective communication (Boschma, 2005). *Institutional proximity* refers to the contextual macro-level and is explicitly linked to formal institutions such as laws, regulatory regimes and informal institutions like cultural norms and beliefs, values, language etc. Thus, institutional proximity describes the degree to which actors share institutional frameworks. *Social proximity* is closely tied to the notion of embeddedness. Consequently, and unlike the institutional dimension, it refers to the micro-level and the specific social contexts in which actors are embedded. Social ties between agents might result from friendship, family relations or previous work-related interactions. Trust is a central constituting element of the social dimension, as mutually trusting relations might reduce the risk of opportunistic behaviour and, thereby, drive knowledge-sensitive interactions.

Illustrating references to the TIMs literature (see 1.3.1), some authors have devoted particular attention to explanations on how dimensions of relational proximity are negotiated and secured locally (Malmberg and Maskell, 2006). Accordingly, it has been argued that collaboration substantially benefits from co-location as geographical proximity facilitates relational proximity, i.e. a distinct overlap mechanisms is at play. Even though these authors do not per se suppose that effective collaboration requires proximity (e.g. Bathelt et al, 2004), the overlap mechanism, and thereby an implicit privileging of geographical proximity, is broadly maintained (Hansen, 2015). Boschma (2005), on the other hand, devotes a higher relative weight to the understanding that non-spatial forms of proximity can substitute for geographical closeness. This perspective suggests that effective collaboration, and thus relational proximity, can be achieved and maintained at distance (Amin and Cohendet, 2004), for instance by means of space-spanning mechanisms and temporary formats (Torre, 2008; see 2.2.1).

The proximity framework is guided by a particular assumption that higher degrees of proximity are per se beneficial for interaction, learning and innovation (Boschma, 2005). However, it has been argued that proximity in any dimension might as well induce lock-ins due to lacking flexibility and openness (Boschma, 2005), reflecting a certain paradox in the debate (Boschma and Frenken, 2010). Firms that exclusively collaborate with local/regional partners might, in the long run, become resistant towards identifying new developments because they are too narrowly focussed. Likewise, high degrees of organisational proximity might trap firms in tight exchange relations which limit the variety of information that can be accessed and which reduce the flexibility of organisational arrangements. While a certain degree of cognitive proximity is deemed necessary for effective collaboration, actor capacities that are too close to each other hinder mutual and interactive learning. Thus, heterogeneity in firm capacities and knowledge bases is considered essential for agents to connect (Nooteboom, Van Haverbeke, Duysters and Gilsing, 2007). Too much institutional proximity might result, through processes of institutionalisation, in rigid institutional systems that block awareness for new opportunities and oppose the restructuring and renewal of systems that innovation and learning require. Finally, too little social distance might result in situations of over-embeddedness which cannot be entered by external actors/ideas. Further, such situations might imply that opportunistic behaviour becomes underestimated.

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Based on these multi-dimensional lock-in indications, it is suggested that actor relations with balanced degrees of proximity are most fertile for interactive learning and innovation.

RELATIONAL DISTANCE

It can be argued that the previous references to multiple lock-in phenomena that might occur due to tight actor relations call for more balanced perspectives that do not per se privilege proximity over distance. Even though proximity and distance constitute a conceptual pair, i.e. ‘*categories of equal epistemological relevance*’ (Grabher and Ibert, 2014:98) (see Figure 5), debates in economic geography are pre-occupied with a focus on proximity. Consequently, explicit discussions on the potentially productive properties of distance are scarce. However, more recently some scholars have turned their interest to the notion of distance which is, both in its physical as well as relational dimension, mostly considered problematic and a constraint to learning and innovation. Conventionally, it is assumed that distance requires reduction or circumvention (e.g. Ibert, 2010). The following paragraphs will explicitly turn towards the notion of distance. Discussing distance as a distinct perspective relates to the motivation of this thesis to adopt a non-deterministic understanding of proximity. In a way, this perspective exhibits some reference to peripheral regions, the spatial focus of this study, as spatial/relational distance is widely held a major characteristic of peripheral regions (see 1.3.2).

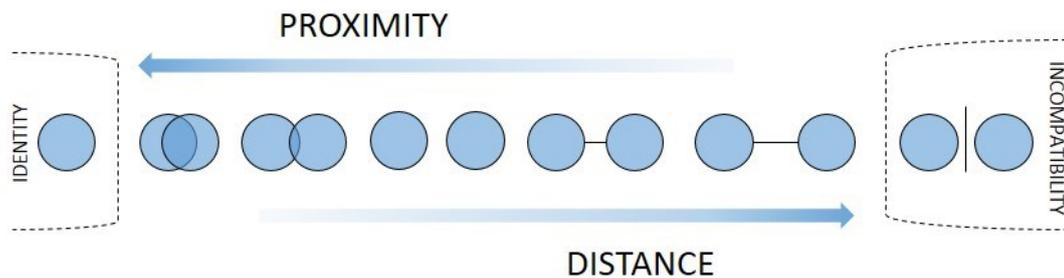


Figure 5: Proximity and distance (Ibert et al., 2014:36)

Distance as a condition is typically linked to situations that lack the (economic) benefits associated with proximity. However, distance is needed to avoid lock-in situations. Hence, distance might constitute a potential resource for learning and innovation. In this understanding, distance relates to differences and diversity between actors which, if the degree of distance is large, impedes interaction, provokes misunderstandings or even induces tensions and conflict. However, it can be argued that processes which mediate and negotiate such distanced relations provide occasions for rich learning (Ibert, 2011; Balland et al., 2013).

Heterogeneity, difference and diversity function as productive resources for learning processes, act as stimuli for new ideas and open avenues for novelties to arise: what can actors learn from each other if their set of capabilities is almost identical? However, there are only a few empirical explorations of collaborative actor relations that explicitly integrate distance perspectives. Mobilising the notion of relational distance allows for more comprehensive explorations/analyses of actor relations (Ibert et al., 2014). Despite the potentially productive properties of distance, too much distance results in situations in

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which positions of actors are incompatible. Distance in some dimensions requires mediation and bridging through proximity in other dimensions to avoid ineffectiveness. In this dissertation, the notion of relational distance is regarded a valuable extension of dominant proximity-oriented accounts. Additionally, it addresses the normative dimension of the proximity concept (Grabher and Ibert, 2014) and suggests that degrees of both proximity and distance provide productive grounds for interactive learning and innovation (Ibert et al., 2014; Trippel and Tödting, 2011).

PROXIMITY DYNAMICS

A further conceptual extension of proximity and distance relates to dynamic rather than static understandings. While interactive relations between agents imply that similarities/differences do not remain stable throughout collaborations, studies that empirically take into consideration their inherently dynamic and fluid nature are scarce (Balland et al., 2013). This primarily static perception neglects the dynamic and unfolding nature of actor relations and the evolving nature of related contexts (Sunley, 2008). This lack of sensitivity towards dynamics is considered a major limitation which not only requires re-conceptualisation but also empirical attention (Balland, Boschma and Frenken, 2015). Only recently, the evolutionary proximity framework has undergone an expansion aimed at connecting individual dimensions with specific processes perspectives (Menzel, 2015; Balland et al., 2015):

- learning – cognitive dimension,
- decoupling – of relations from initial context; social dimension,
- institutionalisation – institutional dimension,
- integration – organisational dimension and
- agglomeration – geographical dimension.

Learning processes between actors suggest that cognitive distance is smaller after a joint project than it was at the beginning. Thereby, it might affect future collaborations, for instance by strengthening this particular tie. Thus, proximities in firm's knowledge networks might increase over time (Balland et al., 2015) and thereby facilitate lock-in situations. To provide a complete picture, such dynamic aspects need integration into empirical analyses, even though this raises methodological challenges.

In this study, I will mobilise such conceptualisations of different dimensions of proximity and distance as analytical perspectives. However, given the explorative direction of this dissertation, it is not my intention to treat these categories in a deterministic and bounded manner. Rather, this study perceives these analytical categories as yardsticks that provide orientations, but seeks at the same time, to treat these dimensions flexibly. This relates to how the individual dimensions are approached/measured. Rather than assigning rigidly defined variables to each of the dimensions, the goal is to explore the dimensions on the ground, guided by the previously outlined understandings. Given the dominance of quantitative studies that mobilise the multi-dimensional proximity framework for the analysis of collaborative innovation processes (e.g. Ponds, van Oort and Frenken, 2007; Balland, 2012; Broekel and Boschma, 2012; Broekel, 2015; Hansen, 2015), this dissertation adds to the limited number of qualitative work (e.g. Hansen, 2014). In this sense, the potential to flexibly handle, departing from a methodologically sound and transparent

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basis, individual dimensions can be regarded a specific opportunity of qualitative approaches in the research of interaction and innovation.

SECTION SUMMARY:

- As it has been argued that geographical proximity between agents alone does not create synergies for interaction and learning (e.g. Boschma, 2005), multi-dimensional frameworks help to overcome the prevalent focus on geographical proximity.
- Geographical proximity can be organised temporarily and virtually, using a variety of mechanisms; permanent co-location of actors is not a prerequisite for effective knowledge transmission (e.g. Maskell et al., 2006; Torre, 2008).
- Multi-dimensional frameworks of proximity and distance distinguish the analytical categories of geographical, social, cognitive, organisational and institutional proximity. In this differentiated understanding proximity and distance act as drivers of tie formation and, thus, help explain why agents connect (e.g. Boschma, 2005; Broekel, 2015).
- A balance between closeness and distance in each of the proximity dimensions ensures effective communication and helps to avoid lock-ins (e.g. Boschma and Frenken, 2010). Relational distance between actors is not necessarily a constraint to learning and innovation but can act as a productive resource (e.g. Ibert, 2010).
- Dynamic perspectives on proximity and considerations of asymmetry in actor relations ensure more rigorous and comprehensive treatment of the proximity notion (e.g. Balland et al., 2013; Balland et al., 2015).

2.3 Synthesis of theoretical perspectives

In the following paragraphs, I will outline a succinct synthesis of key theoretical and conceptual positions adopted throughout the thesis. These positions constitute the theoretical foundations and guide the empirical procedures of the thesis. In this chapter, I also provide a visualisation that depicts the theoretical framework of this dissertation and how the multiple elements of this framework are mutually related.

The phenomenon of innovation is understood as the organisational process whereby ideas are transformed into new/improved products/processes. This understanding is based on three theoretical building blocks. Innovations are cumulative, knowledge grounded and interactive processes. Cumulative in the sense that they draw on previously existing insights, technologies and awareness levels. Knowledge grounded in the sense that innovation generates new knowledge or newly combines and expands existing knowledge. Interactive in the sense that firms, besides drawing in internal capacities, are urged to access external resources to drive their innovation endeavours, e.g. due to increasing complexities. Consequently, this dissertation assumes that substantial parts of relevant knowledge and expertise are located outside of firm boundaries, emphasising the role of networks as a means to mobilise these resources.

Economic processes in contemporary economies are increasingly organised in networks. Networks involve interaction between individuals and groups of individuals and are constituted by diverse sets of

2 Conceptual Framework

linkages. Networks effectively bundle resources of individual actors and can, consequently, be perceived as rich in resources and capacities. It is precisely these properties why (i) networks are considered a central means to access and mobilise external knowledge, to organise interaction and to mediate inherent complexities of innovation activities and (ii) why networks are regarded central elements of innovation-related practices.

The spatial dimension of networks has traditionally been a central aspect of inquiry in economic geography, contributing to a distinct representation on the state of innovation geography. Accordingly, there is a coherent theoretical understanding on the notion and role of geographical proximity, i.e. co-location of actors. Geographical proximity along with actor density operates as a facilitating element. It reduces coordination and transactions costs and provides opportunities for chance associations. Actors benefit from knowledge spillovers, eased by immediate channels of knowledge exchange. Actors share and co-shape regional institutional arrangements which provide useful bases for joint action and the exchange of implicit knowledge. Collectively, these aspects contribute to the emergence of specific agglomeration advantages and a buzzing industrial atmosphere available to local actors. The spatial focus of this study is on peripheral regions, i.e. settings in which actors are confronted with specific challenges and can only to a limited extent, if at all, benefit from the advantages proximity and density induce. Yet, networks among economic actors dispersed across space may act as a substitute for agglomeration of actors at a single point. This network understanding provides a perspective that exceeds agglomeration, implying at the same time that actors operating from peripheral regions are urged to adopt specific practices to effectively utilise networks for their innovation endeavours. In this sense, it is important to note geographical proximity, through various formats and mechanisms, can be organised on a temporary basis, a notion that devotes attention to actor mobility. These aspects suggest that actors do not have to permanently co-locate but can also be co-present in space and present a more differentiated understanding of geographical proximity and its potential role in networks.

Even though the networks explored and analysed in this research explicitly relate to economic (innovation) processes, networks constitute social constructs. Networks are not solely shaped by economic and rational interests as well as strategic considerations, but to large extents co-shaped by social and cultural elements such as trust, empathy, associations and emotions. Consequently, the constitution and effectiveness of networks, as well as related dynamics, are substantially interrelated with the individual level and human behaviour, even if networks primarily have economic intentions.

This individual grounding provides a basis to link the network notion to different dimensions of relational proximity and distance (social, cognitive, institutional and organisational) and to expand the focus on geographical proximity. Proximity in these dimensions can contribute to the efficacy of innovation networks through reducing uncertainties, risks and costs and, thereby, facilitate fruitful interaction and capacity building. Although it is broadly accepted that too much proximity in any dimension drives instances of lock-in, debates in economic geography are pre-occupied with a focus on proximity. The understanding that distance in any of these dimensions might as well operate as a facilitating element and give rise to learning processes is less established and actively adopted this research.

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These previously discussed conceptual aspects relate to the relational tradition in economic geography. Relational thinking is the overarching theoretical perspective adopted in this research. It emphasises the diverse social relations between agents and how these relations (re)produce and shape economic space. Space becomes a particular perspective and is considered a starting point to understand the coordination of economic (inter)action, its outcomes and consequences – all guided and investigated by a ‘geographical lens’. Relational thinking allows to openly explore innovation processes without privileging particular spatial scales or mechanisms. Instead, social and cultural elements are considered central units in these processes and associated actor configurations.

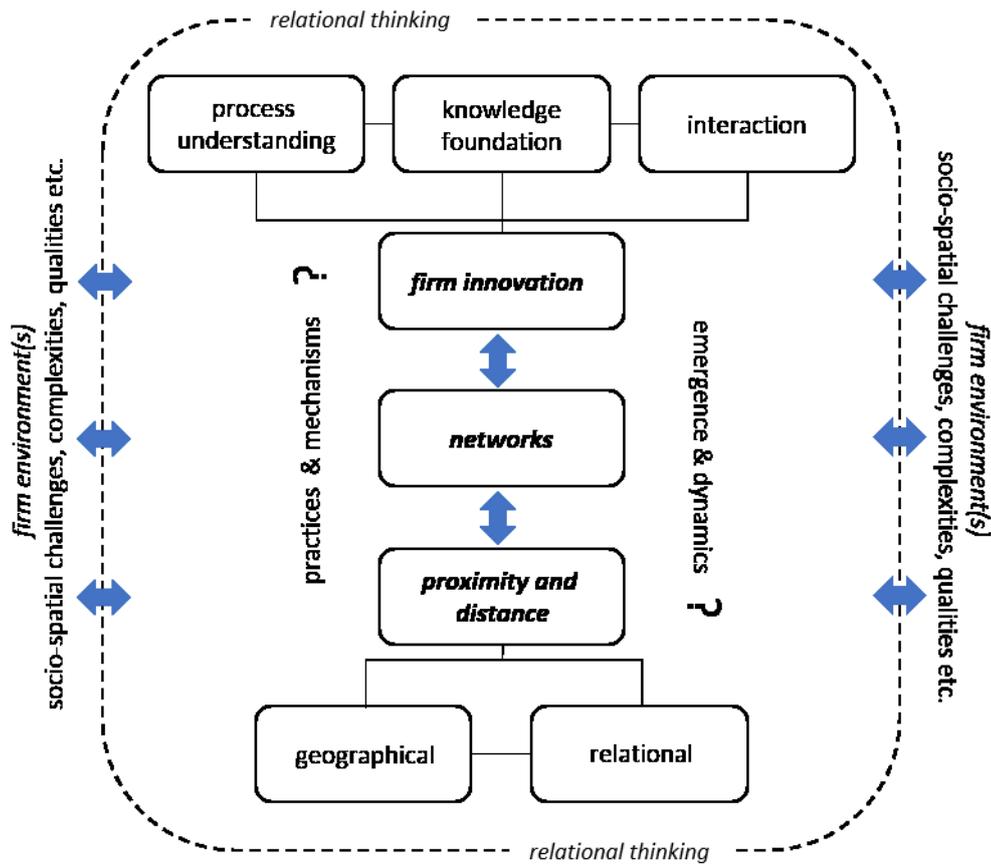


Figure 6: Synthesis of theoretical perspectives

The focus of this research is on firms that locate in and operate from peripheral regions. The notion is operationalised as regions being exposed to multi-layered socio-spatial challenges such as relative economic stagnation, on-going population decline as well as a geographical outside location. Consequently, firms face regional conditions that add additional layers of complexity to their innovation endeavours. However, such regional conditions are not the only environments affecting firms. Further relevant environments are for instance industrial and market environments, institutional environments or personal environments of firm members. Collectively, these environments exert external pressures but also open up for action, agency and collective processes, or provide for distinct qualities and potentials not found elsewhere. Environments affect, but do not determine actors and their practices. In fact, by developing specific practices, mechanisms and strategies, firms, implicitly and explicitly, respond to and thereby shape their environments. Given the specific innovation focus of the present study, it can even be

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supposed that responses induce positive change beyond organisational boundaries, such as regional capacity building. Thus, local agents in this research are considered both, being affected by external pressures and conditions but likewise active participants in shaping and building environments.

Such notions are explored in this research by investigating networks and action-practices as well as associated relational configurations firms from peripheral regions construct and mobilise as part of their innovation activities. Overall, this framework allows uncovering the complex, contingent and multiple innovation geographies and how actors construct these geographies through their practices and strategies.

3 Methodological Approach

The previous part outlined major theoretical positions and conceptual perspectives of this dissertation. This part illustrates the overall research design, including the utilised empirical and analytical methods to conduct this research. The purpose of designing a research methodology is to identify a set of methods suited to provide answers to research questions in the best possible way. However, this does not suggest that there is the *one* ultimate methodological approach. Especially in a qualitative and comparative framework, established methodological approaches need adaptation to study contexts and research interests. Hence, methodological approaches cannot be readily taken off the shelf, but require purposeful and careful construction. In this research, I have treated the individual empirical and analytical methods as providing inspiration and orientation rather than set-in-stone principles that must be deterministically followed.

In chapter 3.1, I will briefly reflect on ontological and epistemological issues and outline the *critical realist* perspective that underlies this research. Chapter 3.2 introduces the study design and describes the comparative research framework, the case approach and related analytical strategies. Chapter 3.3 presents individual methods applied in this project, including an overview on the innovation biography approach. Finally, I illustrate the three-stage selection process of this thesis, including relevant summaries on regional contexts, interviewees, businesses and development projects (chapter 3.4).

3.1 Basic ontological and epistemological perspectives

Social science research does typically not follow standard theories and conceptions. Consequently, it is necessary to make research positions explicit and to reflect on these positions. Ontological and epistemological perspectives shape the overall approach of conducting research and determine what is studied (object of inquiry), how phenomena are studied (choice of methods) and how potential results might look like and be presented (Furlong and Marsh, 2010). When it comes to these questions, the positionality of individual researchers is determined by one's very beliefs and perspectives. Thus, Furlong and Marsh (2010) suggest thinking of one's positionality as a skin rather than a jumper that can be changed. Nevertheless, it is legitimate and inevitable to adopt and combine different methods in mutually beneficial ways to coherently investigate the central study object(s). This chapter briefly outlines the basic ontological and epistemological perspectives from which I depart in this research and thus, sets the ground for in-depth discussions on the methodological framework (see 3.2 and 3.3).

3.1.1 Ontological and epistemological perspectives: critical realism

Doing research requires reflection on the fundamental questions of what can be studied, how the answers that can be obtained can be interpreted as well as which combinations of methods might lead to the most advanced answers to initial research questions. The position of researchers towards study objects is driven by researcher's belief and understandings of what exists in the world, i.e. the very nature of objects (ontology) and how we come to know about the world (epistemology). Given that epistemology is concerned with the inquiry and sense-making by humans of ontology, the two issues are closely related and directly tied to research methodology (Furlong and Marsh, 2010).

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Aligned with differences in ontological perspectives, philosophy of science distinguishes two opposing positions: *positivism*, also referred to as objectivism, and *constructivism*, also referred to as relativism. Positivist tradition assumes that research, by relying on scientific methods, can generate objective knowledge. Conversely, constructivism posits that all knowledge generated through research is subjective, i.e. socially and culturally constructed and that no objective reality exists (Sayer, 2000). The starting point of positivist traditions is that social relations can be directly observed and measured, in both natural science and social science alike (Furlong and Marsh, 2010). Consequently, observation of phenomena and their measurement constitutes scientific progress. Positivist legacy of observation and measurement results in a view that the world operates by laws of cause and effect which, using scientific methods, can be identified and disentangled. From a positivist point of view, the goal of science is to reveal ‘the truth’ through observation and measurement.

CRITICAL REALISM

This research operates from a *critical realist* position, located somewhere within the spectrum bounded by positivist and constructivist traditions. In the following paragraphs, I will outline the essential characteristics of the critical realist position which received broad attention in economic geography. In doing so, I will mostly refer to the work by Andrew Sayer (2000) and in particular his collection of essays ‘Realism and Social Science’. In contrast to constructivism, critical realism acknowledges the existence of an external, objective reality which is, however, independent of our knowledge of it. Thus, critical realism remains doubtful towards the idea that research can reveal the objective reality. However, acknowledging the existence of a real world suggests that there are certain relations between social phenomena that can be uncovered – at least partially. While some of these relations might alter and change over time and across space, others are more stable and enduring across contexts.

In distinction to positivist traditions, critical realism does not seek to establish causations and formal regularities between events. Critical realism posits that social processes occur in open systems and, thus, are exposed to and shaped by diverse interacting elements that generate contingencies. Specificities of contexts and spatial-temporal settings relate to the object of study and influence the path of events. Consequently, the idea that clear causations and predictions can be established is opposed. Put practically, in a given context the same mechanism might cause different results and, vice versa, the same result can be caused by different mechanisms. Thus contexts, contingencies and the specificities of (social) relations bear explanations which are independent of what can actually be observed. Thus, critical realism retains sensitivity towards the diverse elements that interact with one-another, orchestrated by the open systems in which social action is located. Mechanisms that cause certain events are treated non-deterministically, i.e. as not generating formal associations and regularities. However, critical realism does not altogether rule out causal explanation. Rather, it adopts a wider conception of causality which ‘*does not assume that all causes must be physical*’, i.e. directly observable (Sayer, 2000:18).

Furlong and Marsh (2010:204) synthesise that critical realism shares its ontological position with positivism, as both acknowledge the existence of a real world, but has great overlap with constructivist traditions when it comes to epistemological issues. Social processes might reflect underlying structures

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that cannot be observed and what can be observed might be subject to misjudgement because unobservable elements might have causal power (Sayer, 2000; Furlong and Marsh, 2010). Thus, critical realism draws a line between appearance and reality, i.e. what can be observed might not necessarily be the reality.

Thus, reality can only be partially uncovered and understood because researchers, as well as the individuals researchers engage with while doing research, might have different understandings of it. This is because humans are biased towards individual pre-conceptions, experiences and theoretical understandings that drive social and cultural constructions of the world and, therefore, prevent observation of the objective reality. The critical realist position argues that research can only provide for imperfect observation and, consequently, that theory based on these observations is only temporal and will be complemented, enriched or even falsified by future research. Critical realism neglects an absolute understanding of truth and emphasises that scientists' construction of the world, based on bundling different meanings encountered while doing research, will never be perfect.

3.1.2 Implications for research methodology

The previously described perspectives within social science research on what exists in the world and how we come to know about the world have direct methodological implications. Sayer (2000) as well as Furlong and Marsh (2010) clearly outline that critical realism is compatible with a wide range of different research methods. Thus, critical realism is not dogmatically linked to any specific set of methods, but encourages to attune the choice of methods to the specific object of study, research questions and objectives.

Sayer (2000) distinguishes between intensive and extensive research methodologies. Typically, intensive research emphasises the role of contexts and processes as well as the diverse functions of agency. Usually, intensive research considers samples with a limited number of observations and mostly relies on qualitative methods. In contrast to research approaches concerned with the investigation of larger populations, it does neither seek representativeness nor intends to draw generalisations for larger or even total populations. Nevertheless, supported by specific sampling procedures, intense research allows both, to understand cases and their particular contexts in detail and to go beyond contexts and contingencies of cases to provide understandings on more aggregate dimensions (Sayer, 2000; Yin, 2014). Devoting attention to context and contingency of social and economic action, intense methodologies take up vital elements of relational economic geography (Bathelt and Glückler, 2003, 2018) – which constitutes the overall theoretical approach of this study (see 1.3). Comparative research, deployed in this research along different dimensions (see 3.2.2), offers promising avenues in this respect. Potentially detecting similarities despite different contexts contributes to the study's scope of generalising and, thereby, allows to identify mechanisms and practices that provide for broad understanding and meaning.

The remainder of this part outlines individual methods used in this dissertation. Its methodological orientation and distinct, but not exclusive, focus on qualitative methods locates this research in the realm of intense methodological orientations. The goal of this research is to gain in-depth understanding on the processes and practices that constitute firm innovation, with a focus on firms operating from peripheral

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regions and in LMT manufacturing. The overall approach is to study a limited number of cases in different regional contexts: South Estonia and the Erzgebirgskreis in Saxony. Thereby, this research uncovers some of the driving mechanisms of firm's innovation activities. However, not in the sense of establishing universally valid causalities, but in a rather exploratory fashion that allows to gain comprehensive, yet contextually grounded understandings on the study object: firm innovation.

3.2 Study design

3.2.1 Methodological position and triangulation

Intensive research as a label for a specific methodological orientation incorporates multiple perspectives and approaches with regards to theoretical assumptions, understandings of research objects and methodological focus (Flick, von Kardorff and Steinke, 2004).

The theoretical orientation towards networks and relational actor configurations as well as the particular ways in which these perspectives are mobilised in this research induce openness into the research orientation. In this research openness relates to both, data collection and data analysis. Collection of primary data through narrative and semi-structured interviews allows to openly explore the phenomena under investigation, providing interviewees with freedom to express own perspectives and 'realities'. In this sense openness of qualitative research is, compared to more standardised procedures, intrinsically linked to a higher degree of subjectivity of both researcher and research subjects (Flick et al., 2004). Adopting principles of openness involves that this research refrains from formulating *ex-ante* hypotheses. I do not seek to empirically *test* specific predictions, or to formally *explain* causal relationships by separating cause and effect. Rather, I seek to *understand* central phenomena and relationships under investigation.

Emphasising openness and the epistemological principle of understanding, chapter 3.1 addressed some of the dividing lines between qualitative and quantitative research. Qualitative research allows to incorporate context(s) and contingency into empirical inquiry and analysis. Phenomena are explored and described by explicit reference to contextual embedding, based on which meaning is generated by analytical rather than statistical generalisation. However, I do not suggest to keep a clear divide between qualitative and quantitative approaches. Building a methodological framework suitable to address the research questions posed, this research adopts a pluralist approach and combines qualitative and quantitative methods. Besides being an integral part of the overall critical realist position, methodological pluralism highlights the role of triangulation at different stages throughout the research process.

Triangulation is a crucial element of qualitative research. It refers to the combination of different methods, researchers, study groups, localities and time settings (Denzin, 1978). Triangulation was initially established as a strategy to increase the validity of findings generated with single methods. While increasing validity remains a central intention of triangulation, its focus was more generally expanded to enrich findings. The rationale for combining different methods is to overcome the limits attached to any single method and therefore to balance strengths and weaknesses (e.g. Poteete, Janssen and Ostrom, 2010). Quantitative methods are considered appropriate when studying relationships between phenomena

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that are directly observable. Qualitative methods find application for studying phenomena which are not directly observable, emphasising, for instance, the role of context, agency and contingency (Poteete et al., 2010). In the present study, primarily qualitative methods were used to explore relational actor configurations in unfolding innovation processes. In particular, data were collected through qualitative interviews, analysed following the principles of qualitative content analysis which balances deductive and inductive approaches. This primarily qualitative approach was selectively complemented by quantitative analysis, for instance by analysing statistical data for selecting study regions (see 4.1. and 4.2) and describing regional contexts. Examining innovation networks (see 6.2), interview data were analysed quantitatively to describe the determining characteristics of project networks such as types, nature and spatial organisation of networks and to facilitate comparison between study contexts. Furthermore, triangulation not only refers to using different methods ('between-method triangulation'), but also to 'within-method triangulation' (Flick, 2009), reflected in this research by combining different interviewing techniques: narrative and semi-structured interviews.

In addition to the combination of qualitative and quantitative methods this thesis uses principles of triangulation in the following ways:

- Qualitative interviews with firm representatives about specific innovation processes were complemented by desk research activities such as document analysis, internet queries, etc. Hence, data on the same research object were collected from various sources. Consulting different sources followed two goals: first, to validate data gathered during interviews and second, to enrich the overall picture by further investigating aspects/events raised during interviews to an extent which would not have been appropriate within the actual interview situations (level of detail, geographical and time data etc.). In case study research, where all possibly available evidence is considered relevant for case construction and interpretation, the use of multiple sources is a key principle (Eisenhardt, 1989; Yin, 2014). Thus, triangulation facilitated the generation of information-rich innovation biographies.
- Multiple informants were present in some interviews [EE2, EE4, EE6, EE12 | ERZ5] and could therefore be simultaneously interviewed. Thereby, empirical material could be validated and additional material gathered. Furthermore, for some cases interviews with multiple informants from different organisations were conducted on the same innovation project [EE4, EE6, EE12]. Such additional interviews allowed to investigate individually specific and selective perspectives. Insights from these interviews on the relational configurations within innovation projects could be substantially widened and set into relation.

Despite its potential merits, the use of multiple methods also involves challenges. Poteete et al. (2010) mention for instance the capacities of single researchers to command multiple methods as well as the care required when combining methods, as complementarity is not necessarily guaranteed. Another caveat arising from combining qualitative and quantitative methods relates to the intermingling of data collecting and data analysis. Inconsistencies might rise for instance if qualitatively collected data are transformed into findings presented in a largely quantitative manner. The ways in which methods are combined follow

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different rationales, thus, there is no ideal way (Poteete et al., 2010). Consequently, the choice for particular methods used in this research must be considered as *one* out of numerous potential ways to conduct this dissertation.

3.2.2 Comparative research and multiple cases

DOING COMPARATIVE RESEARCH

The comparative dimension in this dissertation addresses two aspects. The first relates to investigating multiple cases and comparing observations across cases. The second relates to different national/regional settings within which cases are located. These approaches reflect a main intention of comparative research: to identify patterns of similarity and difference. In this regard, comparison is considered a tool to draw attention to differences and similarities between cases and to relate observations to contextual variation (Hopkin, 2010). By comparing regional settings that share similar characteristics regarding exposure to socioeconomic challenges, the logic of comparison in this research follows the similar systems approach (Hopkin, 2010). However, as it has been stressed that contextual conditions are never identical, it remains argued that '*qualitative approaches provide narrow grounds for comparison*' (Stake, 2005:457). Nevertheless, comparative research can generate meaning that relates to a wider whole and, thereby, allows to establish generalisations along certain dimensions.

The key interest of this study is to identify and understand specific strategies, practices and mechanisms that facilitate the emergence and drive the dynamics of innovation activities of firms located in peripheral regions. The intensive nature of its methodological approach conditions that a 'counterfactual' perspective, i.e. project investigations of firms located in agglomerations, is considered. As this particular comparative dimension is absent, this dissertation cannot, and does not seek to, claim that the innovation practices and strategies identified are unique for firms from peripheral regions.

Stake (2005) draws attention to the compromises of comparative research. Used as a tool to facilitate analytical generalisation, comparison focusses on the contextual elements that underlie similarities and differences. Therefore, comparative research somewhat loses more holistic perspectives. Consequently, as Stake (2005) argues, some of the '*uniquenesses and complexities [of individual cases] will be glossed over*'. To balance the strengths of both, detailed understandings and analysis of individual cases, as well as comparison between them, the strategy of this study is to openly explore firm's innovation activities as part of in-depth accounts (part 5: 'zooming in') as well as synthesising analyses across cases and contexts (part 6: 'zooming out').

Considering contextual attributes is seen as a particular strength of both, comparative and case study research (Hopkin, 2010; Yin, 2014). Context plays a substantial role in this research. A particular interest is devoted to understand firm's multi-layered and multi-scalar contexts and how these affect innovation. The cross-national comparative perspective can generate value by looking at phenomena from different perspectives and how they are influenced by particular national/regional and socio-economic contexts. Thus, it allows to gain thorough understanding on the decisive role of multiple and multi-layered contexts for innovation.

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CASE DEFINITION AND CASE STUDY DESIGN

This research employs a multiple case design. Case studies constitute detailed investigations through which in-depth understandings of analytical phenomena and the specific contexts in which these phenomena occur are gained (Hartley, 2004; Yin, 2014). Incorporating context is widely considered a key feature of case study research, linked to a specific interest to understand how context(s) influence phenomena and vice versa. Yin (2014) positions case study research as an all-encompassing research method that addresses the entire research circle of establishing research questions, data collection, data analysis and interpretation.

A crucial, yet non-trivial, aspect of case study research is to define case(s) and determine unit(s) of analysis. Defining case(s) requires precision on the phenomena under investigation. According to Yin (2014) identifying the case, i.e. the central phenomena under study, relates back to the research questions, where each research question might potentially address different units of analysis. To define the case(s) of a study, one needs to be clear about how cases relate to any broader body of knowledge, i.e. the unit(s) to be generalised on. Considering these aspects, firms constitute the cases within this study and are its primary unit of analysis. Introducing the specific focus of this thesis on firms from peripheral regions operating in LMT manufacturing and having successfully generated innovation narrows down case boundaries by establishing the total population from which investigated cases can be drawn (Eisenhardt, 1989:537). Another aspect of delimiting cases is to determine the scope of data collection. Outlining particular theoretical/conceptual perspectives ensures that data collection relates to the particular aspects of a phenomenon. Thereby, data about the central research subject are distinguished from data external to the case, i.e. their context(s) (Yin, 2014).

This project adopts an embedded multiple-case design (Yin, 2014:50). The central phenomenon of interest, firm innovation, is investigated for multiple cases. Multiple-case designs increase scope for analytical generalisation and robustness. However, it needs to be mentioned that this study does not provide representativeness (see 3.4.2 and 3.4.3). Stake (2005) highlights that the quality of multiple-case approaches is to gain understanding of central phenomena based on information-rich accounts, ultimately compromising on representativeness. Within the adopted multiple-case design each case involves multiple, i.e. embedded analytical units. While unit of the firm serves as a starting point for empirical inquiry, this research further investigates the subunit of concrete innovation projects. Given the specific micro-level orientation, concrete innovation projects emerge as relevant subunits as innovation activities in firms are typically organised as non-routine projects (Grabher, 2004). An embedded design was chosen over a holistic case study design, i.e. one which would consider either firms or projects as the central analytical unit, for a number of reasons:

- First, this study investigates firm practices and strategies within the innovation context which relate, but not confined to specific projects but also shaped for instance by strategic decision making. Thus, projects are highly intertwined with, and, therefore not to be considered detached from the firm unit. Organisational structures and strategies of firms shape innovation processes and, vice-versa, innovation processes might shape these structures and strategies. Due to this

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interconnection, the firm is ascribed a more substantial role in this study than merely providing contextual background.

- Second, the study's research questions (see Introduction) address both, the firm and the project level. Figure 7 illustrates the case study design adopted in this research.

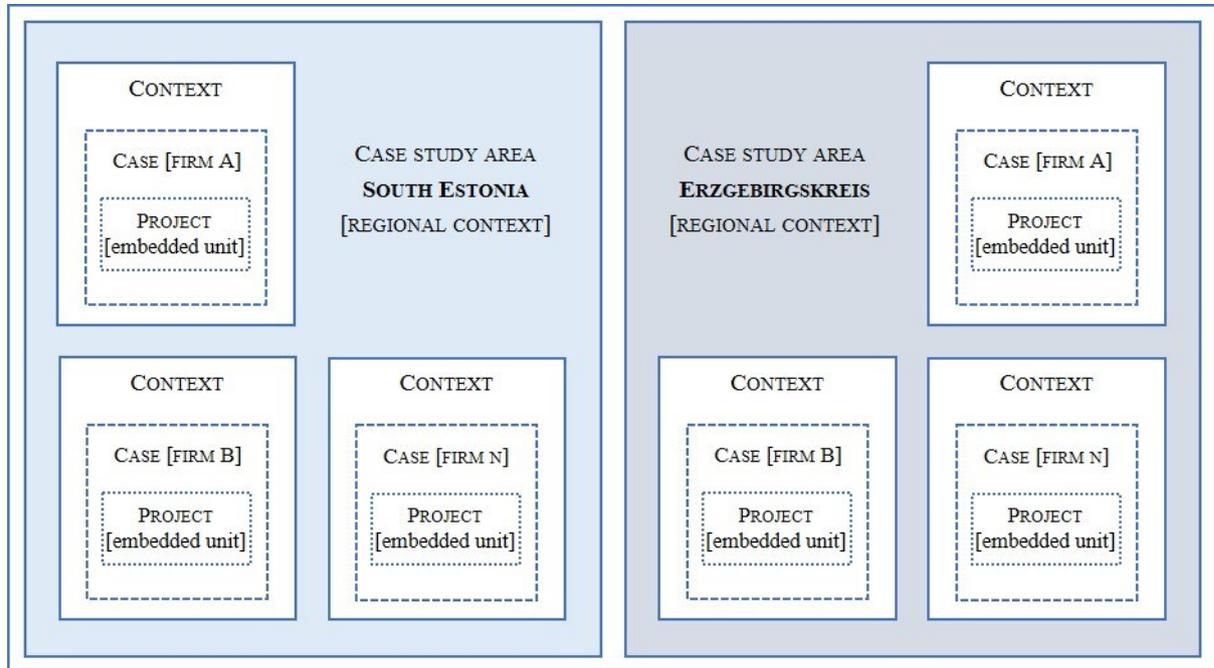


Figure 7: Case study design (inspired by Yin, 2014:50)

As this dissertation studies firm innovation in two different regional contexts, variation on the macro level is introduced. However, it is not the intention of this thesis to provide regional case studies on South Estonian and the Erzgebirgskreis. Considering the position of this study within the field of economic geography, the rationale is to relate the phenomenon of firm innovation to different regional settings.

3.2.3 Analytical strategy

The analytical strategy comprises of two stages, illustrated in Figure 8. The first stage relates to in-depth analyses of selected cases ('zooming in' dimension, see part 5). The second stage relates to cross-case and cross-context analyses ('zooming out dimension, see part 6). This strategy is commonly adopted in qualitative research where studies frequently focus on '*the analysis or reconstruction of individual cases and then proceed, as a second step, to summarizing or contrasting these cases from a comparative or generalizing viewpoint*' (Flick et al., 2004:8). Cross-case analysis departs from considering individual cases from comparative perspectives. At this stage, identification and analyses of similarities and differences across cases concerning the project's research questions constitute the focus. Besides comparison, cross-case analyses contribute to validating findings and facilitate analytical generalisation (Yin, 2014). Observations of particular aspects across cases and contexts indicate wider validity, implying a certain degree of independence from specific contextual conditions.

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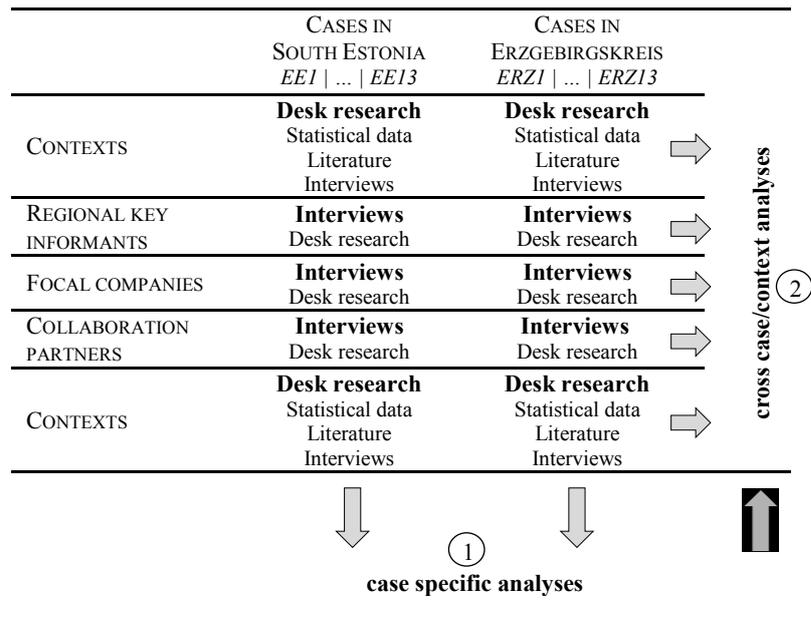


Figure 8: Analytical strategy matrix (own compilation, inspired by Brodda, 2010:55)

3.3 Empirical and analytical methods

This chapter introduces and reflects on individual methods used in this research. I start with outlining the innovation biography approach by which the overall methodological proceedings are guided. Thereby, I set the scene and provide rationales for the use of specific individual methods to be subsequently discussed.

3.3.1 Innovation biographies

The innovation biography approach (henceforth IB) recently emerged as a methodological tool in economic geography and innovation studies (e.g. Butzin, 2012; Ibert et al., 2014; Butzin and Widmaier 2015). In essence, concrete innovation projects of firms are reconstructed from an ex-post perspective – tracing projects back to the emergence of initial ideas, up until the final product/process is exposed to the market. The following chapter briefly depicts the overall IB approach, reflecting its qualities in terms of the present study. A discussion on issues related to the IB approach and a description on how the generic approach (Butzin 2012; Butzin and Widmaier, 2015) was adapted follows.

APPROACH AND PRINCIPLES OF INNOVATION BIOGRAPHIES

The IB approach links to the ‘*follow the thing*’ tradition in human geography (Cook, 2004). This tradition explores space and time-related configurations of production processes, often relying on multi-sited ethnographies. Innovation biographies expand the notion of ‘follow-the-thing’ to ‘follow-the-idea’ (Ibert et al., 2014:53) while keeping an open and explorative research direction, emphasising the multi-local nature of innovation. The IB approach is concerned with collecting space-time data on successfully implemented innovation projects. Innovation biographies yield thick and information-rich descriptions of specific innovation projects. The overall goal is ‘*to get a full picture of the main actors, what they have contributed in terms of expertise and competence, when they entered the development and where they were located*’ (Butzin, 2013:42). Due to their specific orientation and the high level of detail required, IBs constitute an intensive research procedure (Ibert et al., 2014).

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IBs not only refer to time-variant descriptions of innovation processes. They constitute a distinct methodological approach, purposefully combining empirical and analytical methods to structure the research process (Butzin, 2012). Departing from conceptual roots in sociological biography research, narrative interviews form the central mode of data collection (see 3.3.2). One particularity is that, ideally, interviews are conducted with multiple individuals involved in innovation projects, thereby capturing different perspectives from informants inside and outside focal organisations. Data gathered by narrative interviews with key informants provide the basis for subsequent ego-centred network analysis (3.3.4). Network analysis allows to reveal and analyse actor configurations that underlie innovation projects. To reconstruct processes and compose biographies, data from various sources and analytical stages within the research process are triangulated. The methodological building blocks of the IB approach are discussed in more detail in the following paragraphs.

MICRO-LEVEL UNIT OF ANALYSIS AND DYNAMIC PERSPECTIVES

Following Baregheh et al. (2004), innovation is defined as the organisational process by which ideas are transformed into new/improved products or processes. The IB approach allows to implement this theoretical understanding empirically. Due to its focus on concrete innovation projects, the IB approach devotes its empirical and analytical lens to innovation-related action and practices, thereby providing opportunities for empirical observation.

For empirical access, innovation activities are operationalised as projects by which firms created new/improved products or processes. Grabher (2002, 2004) provides insightful conceptual writings on projects as temporary and fluid organisational practices. Firm processes and especially innovation-oriented non-routine activities are increasingly organised as projects (Grabher, 2004). Projects can be considered a central organisational mode of contemporary economies. Adopting a network perspective, projects can be seen as bringing together short-term and temporary as well as more permanent and stable inter-organisational ties that are purposefully mobilised (Berthod, Grothe-Hammer and Sydow, 2017). Micro-level project perspectives in innovation-oriented economic geography exceed its dominant analytical focus on firms. Thus, it seems somewhat surprising that only a few studies have so far integrated projects as the central analytical unit.

Furthermore, the micro-level focus of IBs moves away from the exploration of static snap-shots views and integrates dynamic perspectives, which substantially expands the focus of existing empirical investigations in the field (Butzin and Widmaier, 2015; Ter Wal and Boschma, 2008). Innovation related network analyses typically focus on the firm level. Consequently, they are confined to static considerations and selective to certain points in time (e.g. Dubois, 2013; Krätke, 2010; Plum and Hassink, 2013). Thus, IBs provide a powerful methodological tool to expand research practice in innovation-oriented economic geography.

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PROBLEMS AND ADAPTATIONS

Despite the merits of the IB approach for stimulating disciplinary debates, there are also specific issues connected to the procedure and the methods it relies on. Caveats of individual research methods are addressed in respective sections (see 3.3.2, 3.3.4). Here, I will provide some reflections on the IB approach itself and the way it has been adapted to accommodate the goals of this dissertation.

One issue relates to the specific focus on successfully implemented innovation projects. This focus introduces a substantial bias towards success stories and undermines the vast number of ‘failed’ innovation projects. In this sense, conclusions drawn from IBs might lead to skewed findings, as failed projects are typically not considered. Unfortunately, these issues could, to a considerable extent, not be taken on board, even by careful sample construction. Very often, failed innovation projects are not visible as they are, typically and unlike successful projects that result for instance in new products, not promoted by firms. Furthermore, it can be supposed that firms are somewhat reluctant to talk about failed projects. However, this issue could at least be partly mediated by devoting attention to critical and problematic phases in the path of innovation projects. Thereby, certain perspectives beyond the distinct success story focus were integrated into empirical enquiry. In fact, this research implicitly integrated projects that initially failed (EE1 | ERZ3, ERZ4) but were, based on learning and expertise building from these failures, adjusted and successfully completed. Nevertheless, studies on failed innovation projects would not only provide alternative perspectives to conventional success stories, but also be vital to draw lessons for academic and policy making circles (Godin and Vinck, 2017; Vinck, 2017).

Furthermore, the value of individual IBs as detailed accounts of dynamic innovation activities is criticised as mere story-telling, especially from researchers operating within quantitatively-oriented and epistemologically different realms of social science research. However, analytical exploration of thick descriptions and specifically selected ‘critical cases’, i.e. cases relevant to the wider field of investigation, provide for analytical generalisation, especially when working with a multi-case design (Yin, 2014). A limited number of purposefully micro-level investigations allows, despite their specific contextual embedding(s) and contingencies, for broader generalisation (Patton, 1990:174). Even though logically derived generalisation might be possible, due to its qualitative and explorative nature, the IB approach cannot, and does not intend to, ensure representativeness. Nevertheless, the issue of generalisation beyond individual cases is taken up in this research by investigating a larger number of innovation projects, therefore compromising on the level of detail by which individual cases are explored.

Compared to the generic research procedure proposed by Butzin, the approach to IBs in this study has been adapted in various ways. This study relies mostly on interviews with key informants of innovating firms. Complementary interviews with relevant actors outside the focal organisation have only been conducted for few cases. Thus, while Butzin suggests that individual IBs, depending on scope and accessibility, may draw on up to 15 interviews (2012:133), IBs in this research involve fewer interviews on individual cases. These adaptations relate to limited research capacities¹² and, in a number of instances,

¹² Connecting to the fact that explorations of IBs only represent one of the central research interests of this project.

denied access to further actors.¹³ However, reducing the depth of individual cases also relates to analytical considerations, since *'it is impossible and unnecessary to speak to every actor involved in the innovation process'* (Butzin and Widmaier, 2015:7). The focus of this research is to explore the essence of innovation projects: characteristics of main actors, relational actor configurations and the dynamics of innovation projects. Such broader, but still in-depth accounts on innovation projects were, in the best possible way, explored through interviews with representatives of focal companies – and in a limited number of cases complemented through interviews with external partners.¹⁴ Importantly, purposeful reduction of the number of interviews on individual innovation projects was supplemented by extensive desk research, ensuring identification of complementary information from sources such as newspaper articles, websites, business portals etc. Including a larger number of heterogeneous firms in the sample potentially increases the scope for generalisation beyond individual cases. This extension in terms of quantity is compromised with a reduced level of detail regarding individual projects but, importantly, deemed adequate and productive with regard to the dissertation's research questions and objectives.

3.3.2 Qualitative interviews

This study draws on data collected through qualitative interviews. The particular interest of this project is to explore and understand business practices firms mobilise as part of their innovation activities. In this dissertation, qualitative interviews are considered a key method to impart actor practices and to address its research questions. More specifically, narrative interviews, constitute a central methodological building block of the IB approach: the narrative interview *'is the essential instrument in operationalising the open and explorative approach of innovation biographies'* (Widmaier and Butzin, 2015:6). Innovation projects constitute the central theme of narrative interviews. Narrative interviews were organised by taking into consideration distinct stages of the interviewing process (e.g. Hopf, 2004; Küsters, 2009; Flick, 2010): narration stimuli, negotiation of the stimuli, main narration, questioning phase and interview conclusion.

The use of narrative interviews is linked to the objective to gather detailed and processual information on innovation projects. Interviews constitute the central entry point to biographical research in this study. The narration stimuli represent one question that aims to activate interviewees to freely reflect on particular aspects, phases, experiences etc. (Küsters, 2009; Flick, 2010) related to the innovation project. After informant's main narration, the questioning phase of the narrative interview was opened, guided by a 'narration corridor' with immanent and exmanent questions. The narration corridor was pre-structured as part of a themed, semi-structured interview guide. A stylised version of the interview guide is provided in appendix AP3. Immanent questions relate directly to the main narration of informants. Gaps and

¹³ For the following cases requests for interviews with further actors/partners were denied on different grounds: EE1, EE4, EE6, EE8, EE9, EE11 and EE14. In some instances multiple interview partners were present during the initial interview allowing to capture different perspectives from within the innovating organisation: EE3, EE4, EE6, EE11, EE13. At the time fieldwork was conducted in the Erzgebirgskreis it has been decided to limit data collection to interviews with focal innovating firms and actors from the regional development arena.

¹⁴ Interviews with further actors were requested when the decisive role of certain actors became obvious during the initial interview. In approaching different external partners one goal was to consider functionally different actors. In doing so, different perspectives on the concrete innovation process were included, and with respect to the overall sample, distinctive, yet potentially relatively representative actors (investor, scientific and non-scientific collaboration partner, customer, consultant).

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underrepresented aspects deemed relevant were further explored, ideally by posing open questions to facilitate additional narrations (Küsters, 2009). The immanent character of questions can be further emphasised by using the specific language, key terms and phrases previously used by informants (Jovchelovitch and Bauer, 2000). Conversely, exmanent questions introduce new themes and aspects to the interview and gradually detach the conversation from the informant's main narration. In this research, exmanent questions were used to lead the interview over to relevant aspects and themes beyond its specific interest in innovation projects, e.g. to explore firm strategies and wider contexts. Exmanent questioning phases can integrate different types of interviewing techniques to follow the open and explorative nature of narration phases (Küsters, 2009:64). This study combined narrative interview sections with semi-structured sections.

Narrative interviews minimise the role of interviewers, allow respondents to narrate in their very own pace and language and, thereby, support accuracy of data (Flick, 2010). Interview guides of narrative interviews provide orientations but are not strictly and sequentially followed. Instead, central themes and questions are flexibly covered according to the overall interview flow, an interview situation which Gomm (2004:229) refers to as '*loosely structured*'. Accordingly, I have used interview guides mainly as (re)activation tools in case conversations stagnated. Notes were taken on potentially meaningful aspects mentioned by respondents and followed-up later on in the interview. Narrative interviews favour open questions and seek to avoid suggestive questions.¹⁵ This approach to interviewing requires conceptual competence of the interviewer regarding the interview's central theme, as well as attentiveness and responsiveness towards upcoming themes, aspects and topics. Flexibility and adaptiveness to different interview situations and the capacity to sense changes in the flow of direction are critical to effectively conduct narrative and semi-structured interviews. Consequently, interviewers take on multiple roles: the quiet listener who does not interfere narrations, the dialogue partner as well as the stimulating and sometimes insisting and contradicting interviewer (Brodda, 2010:53).

Employing interview and especially narrative interviews always bears the risk to fail. Therefore, it is critical to address and reflect upon potential caveats with respect to generating, handling and analysing data from qualitative interviews. I link particular issues frequently mentioned in the literature on (narrative) interviews (Jovchelovitch and Bauer, 2000; Gomm, 2004; Flick, 2010; Küsters, 2009) with innovation projects as central interview themes:

- dependence on key informants:

Quality and quantity of empirical material largely depend on two aspects: the informant's willingness to talk about central themes and the informant's ability to generate coherent narrations. Individuals are not equally gifted with story-telling capabilities. Furthermore, informants may also not be willing, or even permitted, to talk in detail about innovation projects, for instance because of intellectual property related issues. These issues were to some extent

¹⁵ Even though open questions prevailed, interviews contained closed-ended questions, especially in the sections aimed at collecting network data, e.g. on collaboration partners and their specifications.

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balanced by breaking the narration down into specific sections and by leaving the selection of innovation project with the informant (see 3.4.3).

- data access and availability:

Adopting an ex-post perspective on projects might result in losing informative details, either because they were forgotten or not recalled by informants during the interview. Furthermore, knowledgeable informants on projects may not be available for interviews anymore, for instance because they have left the company. Such issues were responded to by activating additional data sources such as documents, company website, internet queries and the like, and, to a lesser extent, by consulting multiple informants.

- accuracy of responses:

Informants may, intentionally and unintentionally, give incorrect or only vague answers or omit for instance problematic periods of innovation processes. Consequently, qualitative interviews might not capture the full picture or even collect false information. To certain extents, informants might follow their own agendas in interviews. Thus, informants induce their selectivity into the data which might be motivated by strategic considerations or influenced by hypotheses on what interviewers might want to hear.¹⁶ Again, such issues can be and were partly mediated by consulting additional data sources.

- misinterpretations:

Misinterpretations can for instance arise from the use of context-related language which may not necessarily be clear to the researcher as well as the interviewee. Cross-checking of researcher's interpretations with interview partners can minimise the risk of misinterpretations.¹⁷

DOING AND PROCESSING INTERVIEWS

Interviews for this project were carried out in two larger waves. The first wave was dedicated to cases in Estonia and conducted as part of a six-month research stay in Estonia. Interviews in Estonia were conducted from December 2015 to April 2016 with few follow-up interviews in November 2016. Interviews with actors from the Erzgebirgskreis were conducted from November 2016 to March 2017. Workflow related to interview activities included preparation and conduction of interviews, transcription, coding and interpretation¹⁸ (see 3.3.3). Table 4 provides an overview on the number of interviews conducted as part of this study.

Initial interview requests were sent via email. In case email requests remained unanswered for five working days, business representatives were contacted by telephone. After informants confirmed requests, interviews were prepared due in time. Interview preparation included extensive research on firms/organisations (core activities and competencies of firms, the organisational structure, history etc.) and interview partners, using publically available resources on the internet, newspaper articles etc. Interview preparation was essential to gain relevant background information on firm-related and

¹⁶ Such issues are collectively discussed as 'hindsight bias' (Roese and Vohs, 2012) in methods literature. Hindsight bias specifically relates to memory distortions, subjective beliefs of informants about specific aspects, events etc.

¹⁷ Two of the six cases presented in detail in part 5 were cross-checked by interviewees (ERZ1 (5.2.1) and ERZ6 (5.2.3)).

¹⁸ For coding and interpretation of data MAXQDA software package was used.

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potentially relevant interview matters. Furthermore, such background information eased communication with informants during the actual interview situation. Intensive preparation of interviews is critical to build conceptual and topical competence needed for case-specific interviews.

As previously detailed, interviews contained narrative and semi-structured sections. Therefore, interviews were structured along central themes (i.e. paths of specific projects, related actor configurations, explorations and perceptions of peripheralisation dimensions etc.) and conducted as guided conversations. The basic principle of interviews was to stimulate and access rich narrations, perspectives and positions of interviewees. Hence, I aimed at generating a comfortable conversational atmosphere during the interviews, including freedom for informants to develop, prioritise and formulate own ideas and perspectives on central aspects and themes (Gomm, 2004:211). During pre-interview communication respondents were asked to reserve a 60-minute slot. Interviews lasted between 40-120 minutes and were sometimes followed by discussions and tours during which production sites and facilities were presented, allowing for some direct contextual observation. Most interviews took place at the respondent's facilities such as company premises and offices. Few interviews were, to the convenience of interviewees, conducted at places of their choice other than their workplaces. Protocols were prepared immediately after interviews to document and reflect on the overall interview situation, interruptions or disturbances.

	South Estonia	Erzgebirgskreis
INTERMEDIARIES (e.g. regional development/ economic promotion agencies, chambers, etc.)	6	3
FOCAL FIRMS (follow-up interviews)	13 3 ¹⁹	13 -
PARTNERS	3	-
TOTAL	25	16

Table 4: Summary on interviews²⁰

With permission of interviewees, conversations were recorded and transcribed, using 'f4transkript' software.²¹ In few instances, interviews were not recorded as either the interview partner did not agree, or the interview situation did not allow for recording. In these instances, detailed protocols based on notes taken during the interview were produced for documentation purposes as well as for subsequent stages of analyses and interpretation. Preparing transcripts followed the philosophy to generate documentations as close as possible to what was said. However, sometimes sentences were, without changing their meaning, smoothed and fill words removed. Further transcription rules included documentation of breaks in conversations by indicating the length of respective breaks. As the process of transcribing constitutes the first step of data interpretation and facilitates acquaintance with the empirical material, the majority of

¹⁹ The goal of these follow-up interviews was to fill gaps identified in the material and/or to further explore aspects deemed relevant which were only identified after the initial interview.

²⁰ This table indicates the interviews analysed as part of this dissertation. As part of the entire RegPol² related project 9 additional interviews were conducted. However, due to methodological considerations not all interviews were considered (e.g. cases located outside defined study regions, pilot interviews). Appendix AP1 documents interviews considered for analyses in this dissertation.

²¹ Permission for recording was gathered as part of a consent form presented to and filled in by the respondents prior to the interview. Besides gathering permission for recording, the consent form detailed information on data protection, data handling and specified respective levels of confidentiality.

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interviews were transcribed by the author. Some interviews were transcribed by a carefully instructed student assistant.²² Transcripts were proof read and paragraphed for subsequent processing.

During fieldwork, notes on upcoming themes, ideas, issues, observations etc. were taken and documented. In addition to rather practical field notes, more formally documented memos captured emerging ideas, thoughts, theoretical considerations and reflections – both regarding individual interviews but also cross-interview aspects. Following Miles and Huberman (1994:72) memos in this research were used as conceptual write-ups tying together data as well as tools for personal sense-making and reflection. Accordingly, memos can be considered elements that help organising thoughts and ideas on interview data and, thereby, set out potential directions for subsequent stages of analyses and interpretation, for instance when it comes to inductive code development. Memos were mostly written during interview transcription and coding. Their documentation was given priority to ensure that ideas were captured, reflected on and expanded when emerging. Within this research, the use of memos assisted the process of continuous thought on and identification of patterns, similarities and differences within and across cases. Accordingly, memo writing was situated at the intersection of data collection and data analysis (Eisenhardt, 1989:539).

While conducting interviews, I encountered a number of issues. The first relates to a common problem of doing cross-country comparative research and the problem of not commanding local languages. Hence, interviews in Estonia were led in English. Respondent's command of English was sufficient to explore detailed narrations. However, language related difficulties arose in some interviews. Despite such issues, it was still possible to appropriately explore and discuss central themes. One intention of the interviews was to explore and stimulate free narrations on projects, thereby gaining insights on aspects to be further explored and followed-up. In this respect, translations would have constituted major obstacles to directly follow-up and expand narrations. Meaningful details would have potentially been lost and the overall flow of conversation distorted. Hence, I have decided against the help of translators for interviews on Estonian cases. The interviews conducted in this research addressed both, the project and the wider firm level (see 3.2.2). This 'scale-jumping' between the micro-project level and the firm level was, given the specific research interests, inevitable. However, at times it raised the challenge to keep conversations flowing. Clearly separating the different units as particular blocks within the interview was not feasible as project and firm levels are highly intertwined.

3.3.3 Qualitative content analysis

Data analysis and interpretation followed principles of qualitative content analysis (henceforth QCA) (e.g. Mayring 2000, 2014; Gläser and Laudel, 2004; Hsieh and Shannon, 2005; Schreier, 2014). QCA as an analytical approach allows to analyse and interpret interview-based text material. Analysis of qualitative data aims at examining and categorising evidence by search for patterns (Yin, 2014). Based on assigning codes to interview material through iterative loops of coding, QCA generates reflective meaning on the interview material. The systematic and often deductive, rather strict nature of QCA is frequently

²² Ten interviews were transcribed by a student assistant: EE_CON1, EE4 (follow-up); EE4_P1 | ERZ1, ERZ5, ERZ7, ERZ8, ERZ9, ERZ10, ERZ12.

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emphasised (Gläser and Laudel, 2004; Mayring, 2014). Thereby, QCA is differentiated from more open and primarily inductive approaches of analysing and interpreting text material, such as grounded theory.²³ However, and even though QCA constitutes a well-established analytical method it also allows for flexible approaches (Schreier, 2014). Some frequently articulated features of QCA include (Gläser and Laudel, 2004; Mayring, 2014; Schreier, 2014):

- Orientation towards categories that constitute central analytical themes. Following deductive approaches, categories express existing pre-knowledge, based on theoretical and conceptual perspectives. Despite a focus on deductive coding and category application, QCA leaves room to develop categories and meaning inductively from the material.
- Orientation towards systematic and rule-oriented procedures, following a pre-determined analytical protocol. Nevertheless, QCA underlies researcher assessment and interpretation. Hence, researchers take on a critical role within QCA, for instance by establishing subjective relations with the material.
- Capacity to integrate latent meanings. Interview material can be interpreted against specific contextual relations, understandings and situations of the phenomena under investigation. To recover such latent meanings, additional material needs mobilisation, for instance through triangulation (see 3.2.1).

In this project, QCA was used flexibly by combining ‘classical’ deductive principles to coding and category application and inductive principles for category development, leaving scope for the data to speak for itself and wider themes to emerge (Hsieh and Shannon, 2005). In this sense, I posit the use of QCA in this research as a balancing act of using theory-driven deductive and material-oriented inductive principles. Therefore, my role as a researcher in analysing and interpreting interviews can be described as *‘applying content-analytical rules in a mechanical, automatic way [and] being a free interpreter of the material, having content-analytical steps and rules only as orientation’* (Mayring, 2014:30). Concerning the multi-layered research questions and the overall explorative approach of this dissertation, combining deductive and inductive principles seems most promising for relating findings to existing theoretical insights and to develop theory. Inductive coding procedures are also closely related to and necessitated by the (cross-national) comparative and multi-case design of this study. Rigidly applying identical, deductively-derived category systems would result in losing context and case related specifications, while mere inductive coding would yield context-related category systems too differentiated for comparative analysis. Consequently, I consider deductive and inductive procedures as complementary and mutually benefitting rather than exclusive approaches (Hsieh and Shannon, 2005; Kohlbacher, 2006; Schreier, 2014).

²³ A particular distinction to grounded theory in this research was that processes of data collection as well as data analysis were not purposefully carried out as a coupled process. However, preliminary stages of analysis and interpretation were conducted parallel to data collection as interviews were transcribed and memos developed during fieldwork phases.

3.3.4 Network analysis

Another central building block of the IB approach is network analysis. To study firm's innovation networks, this dissertation adopts a micro-level perspective and focusses on the project level. Consequently, only a specific part of a firms' overall networks is captured: the relations that are specifically activated and built with the purpose of facilitating innovation. Mobilising network analysis links to the objective to capture and analyse key actors and key events, their role, function and specific contribution as well as attributes. Besides these structural elements, in this research I also seek to illustrate networking practices of innovating firms and relevant individuals as well as dynamics regarding conditions and processes of network formation and change. Linked to these objectives qualitative and quantitative approaches to network analysis are deployed, exploiting the particular benefits of different approaches, recently highlighted as a particular gap in the study of inter-organisational networks (Berthod, Grothe-Hammer and Sydow, 2017). Quantitative analyses of inter-organisational networks allow gaining understandings of structural elements and contexts (see 6.2). Qualitative, i.e. interpretive analyses allow to describe, understand and ascribe meaning to practices of innovation efforts and are in capacity to shed light on the mechanisms that underlie and drive networks, i.e. '*how things work in networks*' (Berthod et al., 2016:300).

This dissertation focusses on ego networks. Ego networks focus on a focal node ('ego'), typically a person or organisation, but in the context of this study a specific innovation project. Analyses of egocentric networks examine the relations of ego, i.e. an innovation project, to other actors ('alteri'), i.e. collaboration partners (Fuhse, 2016). In contrast to investigations of full networks, analyses of egocentric networks investigate the (relational) environment(s) from the perspective of a single actor (Herz, 2012). Hence, egocentric analyses capture only a significantly reduced, but with reference to related research objectives particularly relevant sections of wider firm networks.

Network data were collected as part of narrative and semi-structured interviews. Interviews with firm representatives were conducted in a way that informants integrated information on central collaboration partners (alteri) into their narrations. Subsequent immanent and exmanent questioning phases were deployed to identify actors, their attributes, contexts of tie formation and network practices. Thus, questioning phases during interviews were used to collect comprehensive data on project networks, referred to as 'name generators' and 'name interpreters'²⁴ in network terminology (Herz, 2012; Fuhse, 2016). To maintain the narrative and open interviewing approach and to keep the flow of conversations, attributes of alters were, as far as possible, investigated as part of subsequent desk research – rather than having highly standardised sections during interviews. Egocentric network analysis in IBs deviates from formal ego network analysis in decisive aspects. Data on the relations between different actors (alter-alter relations) are typically not collected, as being of secondary interest. Consequently, the overall structure of ego-networks is not, or only insufficiently captured. The strength of employing qualitative methods for the exploration and analysis of egocentric networks on the micro project-level is that dynamic aspects on

²⁴ Name generators generate lists of alters whereas name interpreters explore ego-alter relations, i.e. capture decisive alter attributes.

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the evolution and constitution of networks can be captured (Hollstein, 2011; Berthod et al., 2017). Conventional approaches to network analysis in economic geography as well as disciplines such as organisational studies, typically focussing on the firm unit as ego, tend to lack such dynamics in time and space (Ter Wal and Boschma, 2009; Berthod et al., 2017). Consequently, by employing qualitative principles to network analysis, the IB approach provides a suitable means to narrow down this research gap.

Nevertheless, it has been suggested that the particular value ascribed to qualitative and micro-level investigations come into play best, if approaches are coupled with quantitative investigations. Such a 'balancing approach' (Berthod et al., 2017) is mobilised in this dissertation and provides both, insights on structural network features as well as meanings and explanations of these structures. Guided by the particular network conception outlined in chapter 2.1, features of ego networks were descriptively analysed and provide an overview on the size and structure of project networks, basic orientations of these networks as well as their spatial constitution. These analyses were conducted on the level of individual dyads, i.e. each identified linkage was classified according to relevant dimensions (see AP3). The structural aspects of project networks on the aggregated macro-level are presented and discussed in chapter 6.2. These analyses are complemented by qualitative investigations regarding the specific meanings and motivations and network related practices, to better understand the configuration of project networks along multiple dimensions of proximity and distance, specific action patterns and practices (see 6.3).

Collectively, these complementary approaches have yielded detailed descriptions of individual cases that describe and summarise the emergence and evolution of innovation projects and the unfolding of network elements and practices, including synthesising project illustrations (see part 5). These thick descriptions of individual cases constitute essential elements of the overall IB approach. To construct unfolding project networks, related data were initially organised as chronological structure tables (Miles and Huberman, 1994), depicting the development of project networks.²⁵

3.4 Documentation of selection

This chapter provides an overview on selection and sampling processes at different levels during the research process: at the macro-level the selection of study regions (3.4.1), at the meso-level the selection of businesses (3.4.2) and at the micro-level the selection of innovation projects (3.4.3). Selection processes in this dissertation followed principles of purposive sampling (Patton, 1990; Flick, 2010) and mobilised different sampling approaches, i.e. homogeneous sampling and variation sampling. The following sections illustrate these approaches in detail and reflect on specific issues encountered during

²⁵ 'Event structure tables' (Miles and Huberman, 1994) were deployed as a tool to generate process-oriented displays of innovation projects. Structure tables constituted an interim stage in the construction of project biographies. The aim was to get the overall project and associated processes/events in order rather than determining precise chronologies including exact dates. Key events and processes shaping projects and start-up ventures were extracted and synthesised. Thus, event structure tables function as a tool to reduce empirical material. The goal of listing processes and events is to minimise the risk of establishing false chronologies.

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sampling and selection procedures as well as related implications. Table 5 provides a summary on different selection decisions.

	<i>stage in selection process</i>		
	<i>case study regions</i>	<i>businesses</i>	<i>projects/ processes</i>
	<i>macro</i>		<i>micro</i>
<i>purpose</i>	selection of regional starting points for empirical enquiry	case selection	case selection [embedded unit]
<i>sampling strategy</i>	homogeneous and variation sampling	variation sampling	variation sampling
<i>selection based on</i>	<ul style="list-style-type: none"> • economic indicators • population development • geographical location 	<ul style="list-style-type: none"> • local informants • data bases and media • field observation 	<ul style="list-style-type: none"> • choice by business representatives • for start-ups: establishment process
<i>advantages (+)/ disadvantages (-)</i>	<ul style="list-style-type: none"> + comparability across contexts - pre-definition of peripherality 	<ul style="list-style-type: none"> + cross section of businesses - potential bias towards active/visible businesses 	<ul style="list-style-type: none"> + cross section of projects + reduced researcher bias - potential bias towards successful projects

Table 5: Summary of selection strategy

3.4.1 Selection of study regions

This section provides a discussion on the rationale that underlies the selection of study regions. However, it needs to be mentioned that within the framework of the RegPol² programme, the regional focus of this dissertation project was to a certain extent pre-determined: the mission of the individual sub-project, as part of which this dissertation was realised, was to conduct a cross-national study comparing regions in Estonia and Eastern Germany. Thus, the macro level settings of this study were pre-determined by the orientation of the RegPol² programme towards studying polarisation and peripheralisation processes in Central and Eastern European contexts. However, the selection of study regions within the determined macro contexts was not conditioned by external requirements. As part of determining study regions, I will provide some initial contextual information on both study regions. More detailed presentations of contextual aspects follow in chapters 4.1 and 4.2.

SETTINGS AT THE MACRO LEVEL: ESTONIA AND SAXONY

The study regions of this dissertation, South Estonia and the Erzgebirgskreis, share similarities in the context of polarisation and peripheralisation dynamics. However, respective macro-level contexts (Estonia and Saxony) reveal a number of distinct differences, driving the motivation for their selection. Estonia joined the EU in 2004, more than a decade after independence in 1991. Saxony was immediately integrated into the EU when Germany reunified in 1990. Estonia constitutes part of the EU's north-eastern periphery, facing a somewhat geographically isolated location on the fringe of EU territory, being part of its external border.

Like all of the Central and Eastern European EU member states, Estonia faces substantial regional disparities and patterns of regional polarisation (Lang, 2015). Table 6 illustrates that regional differences regarding GDP per capita between the region with the highest GDP (Tallinn agglomeration) and the

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region with the lowest GDP persist. While regional disparities remain pronounced in Saxony they have decreased lately.²⁶

	<i>county with highest GDP per capita</i>	<i>county with lowest GDP per capita</i>	<i>county with highest GDP per capita</i>	<i>county with lowest GDP per capita</i>
	2000		2016(EE)/2015(SAX)	
<i>Estonia</i>	149	49	144	41
<i>Saxony</i>	146	75	133	77

Table 6: Development of GDP per capita on county level 2000-2016 (100 = country/state average; own calculations based on Statistics Estonia and Statistical Office of Saxony)

The Estonian economy is, due to its limited domestic market, largely export-oriented. While also being export-oriented, the Saxon economy is part of the EU's largest national economy, providing access to a large domestic market. Despite being a small country with only limited resources and a population of only 1.3 million, Estonia is widely perceived as a highly innovative country and has actively built a reputation for progressive technology and policy innovation (e.g. Ellis, 2016). The 2016 edition of the 'European Innovation Scoreboard' (EIS) (European Commission, 2016) classifies Estonia as a moderate innovator, indicated by an innovation performance of 86% of the EU average – although down from 97% in 2012. The scoreboard suggests that Estonia accounts for one of the highest innovation performance of countries that joined the EU since 2004. Furthermore, the scoreboard indicates that Estonia substantially outperforms its Baltic neighbours Latvia and Lithuania in the innovation context. Against this background, it is not surprising that Estonia actively brands itself as an innovation hub, which includes the promotion of a '*national culture of innovation*' (Ellis, 2016), especially in the telecommunication sector. This ICT and start-up centred Estonian innovation narrative, which from a spatial perspective is largely congruent with the cities of Tallinn and Tartu, makes Estonia an interesting setting to investigate innovation activities that occur outside high-tech industries in LMT manufacturing as well as outside its dominant agglomerations. Thereby, this thesis goes beyond Estonia's innovation narrative and addresses the aforementioned intertwined spatial and sectoral biases (see 1.3 and 1.4).

In the EIS 2016, Saxony's NUTS-2 regions are classified as either *innovation leaders* (Dresden and Chemnitz)²⁷ or *strong innovators* (Leipzig). Within the German context, Saxony is widely perceived as one of the success stories in terms of innovation and economic development (e.g. Bertelsmann Stiftung, 2009). Empirical studies attest Saxony's dynamic development and established position, besides Berlin, as the most successful trajectory of eastern German states (e.g. Franz, 2007; Bertelsmann Stiftung, 2009; Einwiller, 2016). However, regional variation regarding innovation potential of individual counties within Saxony is substantial. For instance, Prognos (2016) suggests that Saxony's main agglomerations Dresden, Leipzig and Chemnitz drive its overall performance. In its *Zukunftsatlas* (Prognos, 2016), investigating the prospects of each of the 402 German counties, the Erzgebirgskreis ranks 392 in the sub-field of competitiveness and innovation.

²⁶ GDP (gross domestic product) is an indicator of the output of a country/region. It reflects the total value of all goods and services produced less the value of goods and services used for intermediate consumption in their production. Expressing GDP in PPS (purchasing power standards) eliminates differences in price levels between countries. Calculations on a per capita basis allow for comparison of economies and regions that differ in absolute size.

²⁷ The Erzgebirgskreis is part of the Chemnitz NUTS-2 region.

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Moreover, Estonia itself can be considered a rather thin environment, assuming that its low average population density of 29 people per square kilometre (median in terms of local government units: 9.6) induces a certain extent of actor thinness – at least for settings beyond Tallinn and Tartu. Regarding such density considerations, Saxony is structured considerably different. An average population density of 220 people per square km (median on county level: 166) suggests overall thicker environments.

DETERMINING STUDY REGIONS

The rationale for selecting particular study regions is to investigate innovation in regional settings that both share similarities but also reflect differences. As discussed in the theoretical parts of this dissertation, it is widely assumed that regional settings, through different mechanisms, shape, facilitate and impede firm innovation. Accordingly, it can be argued that structural features and socio-spatial dynamics of South Estonia and the Erzgebirgskreis operate as contexts that partly determine firm's innovation activities. The overall rationale of this thesis is to select macro settings (Estonia and Saxony) that are deemed highly successful in wider innovation discourses and within these macros settings regional sub-settings that are not part of these innovation narratives – due to being affected by multi-layered socio-spatial challenges.

South Estonia and the Erzgebirgskreis were chosen as regional starting points as they match the abovementioned criteria. Selection at this stage is guided by the logic of similarity. Determining study regions, and therefore pre-defining particular regions as peripheral settings within the context of this dissertation, raises the general issue of propounding certain generalisations on regional contexts. Accordingly, in the following paragraphs I will outline and substantiate how the notion of peripheral regions is operationalised in this study and, subsequently, conditioned the selection of study regions. As part of this discussion, I seek to minimise random elements in the selection of study regions. Even though it has been suggested that any particular choice of study regions is, besides considering functional arguments, inevitably subject to arbitrary decisions (Hodge and Monk, 2004).

Referring to the multi-layered nature of economic peripheralisation processes, Kühn, Bernt and Colini (2016) argue that these cannot be comprehensively captured by statistical indicators. However, the outcomes of such multi-layered processes, e.g. de-industrialisation, population decline, stagnation of local economies etc., partially surface in and can, therefore, be approximated by socioeconomic indicators. To determine study regions I follow Steinführer and Kabisch (2004:81) and Kühn et al. (2016:5) who refer to peripheral regions as being exposed to three major challenges: economic stagnation, population decline and a geographically remote location (see Table 7).

With respect to the project's distinct focus on firm innovation and the theoretical discussion on the geographies of innovation (see 1.3), it can be assumed that economic stagnation, population decline and geographical isolation operate as additional layers of complexity to innovation. Population decline might for instance induce shortages of specialised staff and human capital while geographical isolation suggests that actors benefit only to limited extents or not at all from agglomeration advantages. Collectively, these challenges might surface as stagnating regional economic performance. Eder (2018) shows that geographical, demographic and economic indicators are frequently used to define peripheral regions in

3 Methodological Approach

studies that focus on firm innovation, even though combining related indicators is less frequently observed.

	<i>criteria</i>	<i>operationalisation</i>	<i>data source</i>
<i>static dimension</i>	geographically remote location	spatial classification (based on population density and accessibility)	BBSR (Federal Institute for Research on Building, Urban Affairs and Spatial Development)
	population decline	population development (since 2000)	Statistical Offices
<i>process dimensions</i>	relative economic stagnation	development of regional GDP per capita (since 2000)	Statistical Offices

Table 7: Criteria for selecting study regions

By mobilising statistical data that approximate such socio-spatial challenges, the selection of study regions follows a quantitative procedure. To identify peripheral regions with the macro-contexts of Estonia and Saxony, indications on the county level are compared with indications on the super-ordinate reference unit.²⁸ The use of statistical indicators to determine *peripheral regions* in the context of this study relates to a pragmatic approach that yields an absolute definition of peripheral regions. While certain problems adhere to this approach, especially when considering the overall relational understanding adopted throughout this research which seeks to overcome absolute understandings of space, it is intentionally adopted at this stage. Throughout the research process such a conventional approach of defining peripheral regions allows to uncover understandings, perceptions and meanings of actors towards the notions of periphery and peripheralisation. These actor perceptions, inductively recovered from the empirical material, can be contrasted with such absolute understandings. Part 7 reflects on these issues and devotes attention to actor perceptions and how these perceptions reflect, confirm and contest the periphery label outlined in section 1.3.2.

SELECTING STUDY REGIONS: SOUTH ESTONIA AND THE ERZGEBIRGSKREIS

In the year 2000 regional differences regarding GDP per capita in Estonia were substantial (see Table 6).²⁹ The Capital City region of Tallinn, including Harjumaa, accounted for the highest figure, exceeding the national average by 49%. On the end of the scale was the county of Jõgevamaa which only exhibited a figure of 49% of the national average. In sub-national comparison, South Estonian counties have been amongst the regions with the lowest GDP per capita in Estonia. GDP per capita accounted for 54% in

²⁸ Data were retrieved from publically available databases from Statistics Estonia (<http://www.stat.ee/en>), the Statistical Office of Saxony (<https://www.statistik.sachsen.de/>) as well as the Federal Institute for Research on Building, Urban Affairs and Spatial Development – BBSR (http://www.bbsr.bund.de/BBSR/DE/Home/bbsr_node.html) – see Table 7.

²⁹ Using GDP data, and in particular GDP per capita, for highly disaggregated spatial units such as the county level raises certain issues which have to be taken into consideration for meaningful interpretation. Such issues relate to the distorting effects of commuting patterns. GDP per capita is measured at the place of occurrence/production (i.e. the workplace) which is, on a spatially highly disaggregated level, not necessarily identical with the place of residence. It should also be added that for small spatial reference units, single events, such as closure/relocation of structurally important companies can have substantial effects and drive the data. Despite the issues, GDP per capita on the county level provides for an approximation towards economic development processes.

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Valgamaa, 56% in Põlvamaa, 57% in Võrumaa and 59% in Viljandimaa. Comparing data from 2000 with more recent data exhibits that the South Estonian counties stagnated or even declined in relative terms – despite growth in absolute figures. In 2016, GDP per capita in Valgamaa accounted for 51% of the national average (-3), Põlvamaa for 41 (-16), Võrumaa for 53% (-4) and Viljandimaa for 64% (+5).³⁰ These data suggest low regional economic convergence. The population development of these counties indicates further challenges. While Estonia as a country lost roughly 6% of its population in the period from 2000-2015, population losses in South Estonia were much higher: 15% in Valgamaa (down to 30,500), 12% in Põlvamaa (down to 28,200), 15% in Võrumaa (down to 34,900) and nearly 19% in Viljandimaa (down to 47,800) (see Table 12 in section 4.1.2). With respect to the geographical criterion, it can be mentioned that the counties in the South-East of Estonia exhibit large distances to the Capital City region of Tallinn and to Tartu. In its monitor on European NUTS-3 regions, the BBSR classifies the South-Estonian region³¹ as a ‘*rural region with low density*’. This classification reflects a certain degree of geographical isolation and can be translated along the lines of lacking agglomeration advantages. Map 1 provides an overview on the South Estonia study region.

The selection of a Saxon study region is based on the same set of indicators. GDP per capita in 2000 reveals that regional differences within Saxony were also substantial (see Table 6). Dresden was the strongest performing region with a GDP per capita 46 percent above State average, while the county of Görlitz accounted for 75% of the average. GDP per capita in the Erzgebirgskreis amounted to 77%, placing it within the lower performing counties. Until 2015, the Erzgebirgskreis stagnated in relative terms, exhibiting a GDP per capita of 77% (0) – the lowest in comparison with other counties in Saxony. These GDP data for Saxony (Table 6) also suggest rather low convergence. Even though the data reflect certain catch-up dynamics, they illustrate that some regions, such as the Erzgebirgskreis, could not narrow the existing gap. Looking at the population development of Saxony in the period 2000-2015 reveals an overall decline of about 8%. Again, regional differences in population dynamics are pronounced, with the Erzgebirgskreis losing nearly one in five inhabitants (-17%, down to 347,700). Only Görlitz county experienced more substantial population losses (-19.5%). The BBSR classifies the Erzgebirgskreis as a ‘*rural county with certain concentrations of population*’. Besides these socio-spatial indicators, additional reasons to select the Erzgebirgskreis as a study region is its location at the border to the Czech Republic, which underscores a historically grown geographical outside location of this mountain range area. Additionally, its economic past as an important mining region somewhat suggests the existence of old-industrialised economic structures. Map 2 provides an overview on the Erzgebirgskreis.

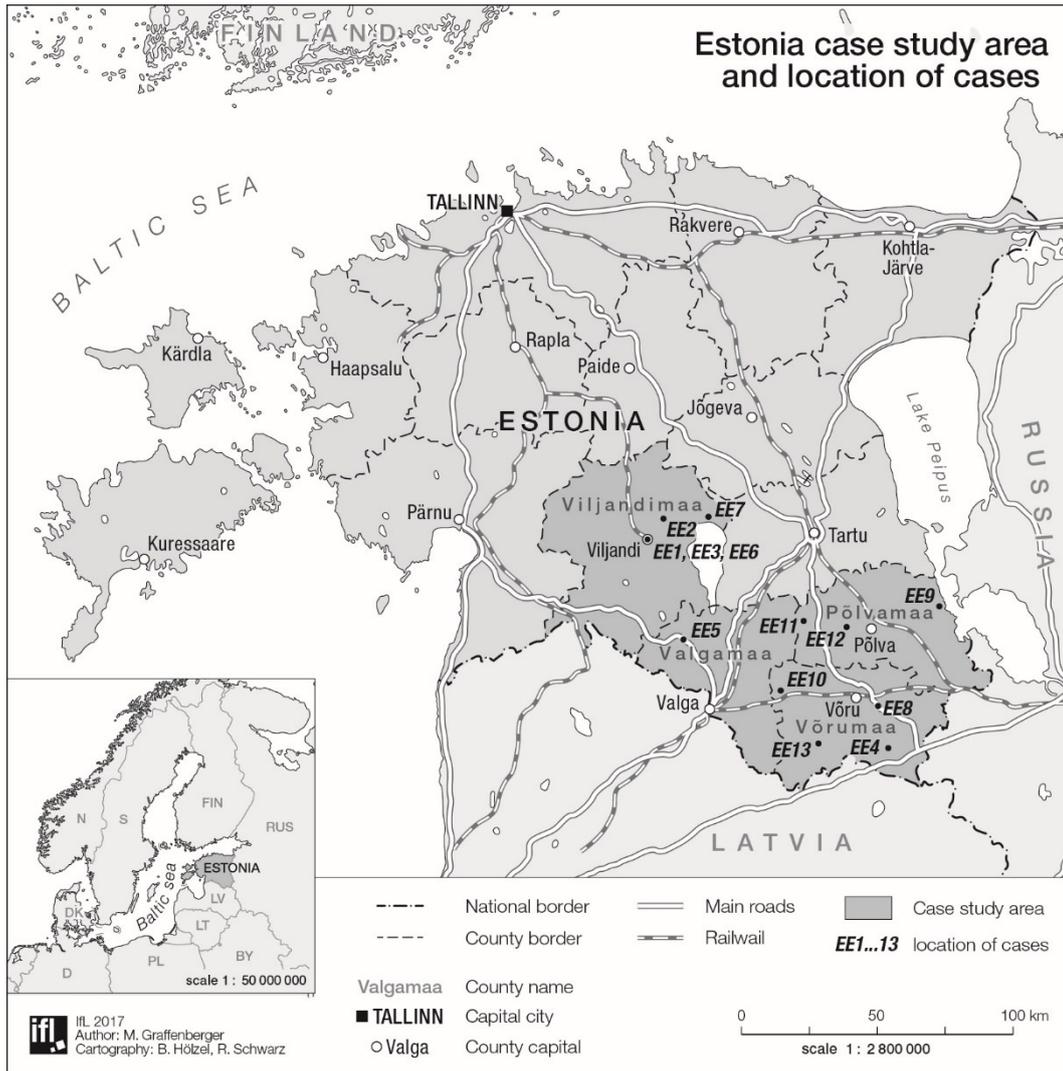
The South Estonian study region comprises of multiple counties (Valgamaa, Põlvamaa, Võrumaa, Viljandimaa) while the Erzgebirgskreis constitutes a single county. In the Estonian context, I decided not to select a single county as study region because of the small size of Estonian counties regarding (business) population. Focussing on a single county would be a confining factor during the research process. Given

³⁰ The overall regional gap in GDP per capita in Estonia was only insignificantly reduced during this period, ranging from 143% of the national average (Tallinn/Harjumaa) to 44% of the national average (Põlvamaa).

³¹ The European NUTS-3 unit of South Estonia (‘Lõuna-Eesti’) constitutes a purely statistical, non-functional and non-administrative, region. The NUTS-3 unit of South Estonia includes six Estonian counties: Valgamaa, Põlvamaa, Võrumaa, Viljandimaa, Tartumaa and Jõgevamaa.

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the very specific interest in innovation projects of firms from LMT industries, the overall population to draw cases from would have been limited. Considering multiple counties, this bottleneck in the research process was reduced. Thus, an aggregate study region was constructed which is more equal to the Erzgebirgskreis. Nevertheless, the selected Estonian counties match the original selection criteria well and can, collectively, be considered an area exposed to economic peripheralisation processes. The counties of the Estonian study region, together with the counties with Tartumaa and Jõgevamaa, belong to the NUTS-3 unit 'Lõuna-Eesti' ('South Estonia'), and therefore reflect a unit on a more aggregate level.³²



Map 1: Overview on study region and location of cases in South Estonia (IfL 2017)

³² Even though the introduction of the NUTS-3 classification in Estonia (which groups the 15 Estonian counties into five NUTS-3 region) serves purely statistical and not functional purposes, it can be observed that within the borders of the 'South Estonia' NUTS-3 region, some commonly coordinated actions across counties emerged, e.g. within the tourism sector under the umbrella label of 'South Estonia' can be mentioned as examples in this respect (e.g. 'Living on the Edge' (<http://visitsouthestonia.com/en/>); South Estonian Tourism Foundation (<http://www.southestonia.ee/eng/>); accessed: 06.10.2016)



Map 2: Overview on study region and location of cases in the Erzgebirgskreis (IfL 2017)

3.4.2 Selection of businesses and informants

As previously outlined (see 3.2.2), individual firms constitute the study's cases, therefore serve as key units of empirical interest. For initial identification and subsequent selection of firms, I have mobilised the expertise of knowledgeable informants from both study regions. To gain entry to the field,

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representatives of regional stakeholders and intermediary organisations were contacted and interviewed.³³ Due to their mediating function and direct contact to local businesses, these contacts were also used to get personal references to potential case firms.

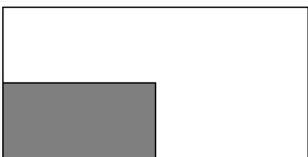
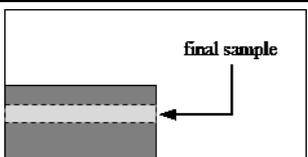
<i>specification stage</i>	<i>businesses population</i>	<i>stylised sample illustration</i>
0: no focus	all businesses in Estonia and Saxony;	
1: study regions; localities affected by peripheralisation processes	all businesses located in study regions;	
2: innovative businesses	businesses with product/process innovation, located in study regions;	
3: LMT manufacturing	businesses with product/process innovation, located in study regions, active in LMT manufacturing;	
4: variation across businesses (cross section)	businesses with product/process innovation, located in study regions, active in LMT manufacturing; → <i>purposeful and variation sampling</i>	

Table 8: Sample development and case structuration

The approach to consult regional informants to structure the sample refers to snowballing methods (Patton, 1990:176). While referential snowballing resulted in the identification of businesses and potential interview partners,³⁴ snowballing incurs certain issues. Solely relying on suggestions of regional key informants would introduce a selection bias, yielding a clustered sample (*geklumpte Stichprobe*; Merkens, 2009). Such a sample might be clustered according to contacts between informants and firms and, therefore, be driven by interpersonal relations and strategic considerations due to good relations, certain businesses representing good examples of the regional economy, large and structurally relevant companies etc. To circumvent this potential selection bias, cases were also identified using other sources such as business data bases, field observation or media coverage. Within the Estonian context, I have used

³³ Within the Estonian context I arranged interviews with representatives of county development centres CDCs ('Arenduskeskus'). County development centres were established in 2003, following a conception of the national government. There are 15 CDCs in Estonia, one for each county. CDCs consult businesses, local governments, non-profit association and foundations. The overall goal of CDCs is to establish and improve suitable support structures for different actors within the regional development arena to 'support the growth of the socio-economic competitiveness' (<http://www.arenduskeskused.ee/en/web/eng/general>; accessed: 04.10.2016). Within the Erzgebirgskreis, interviews with representatives from economic promotion agencies and chambers as well as a regional network initiative were arranged to gain access to the field and an overview on potential businesses but also local particularities, specific strengths, weaknesses and issues of regional settings.

³⁴ The suggested businesses were then extensively examined using internet enquiries, company websites etc. to check if the companies fall within the scope of the overall selection criteria (active in LMT manufacturing as well as development of new/improved product or process) as well as the specific variation sampling strategy.

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the ‘Äripäev TOP’³⁵ database to identify businesses. For selecting businesses from the Erzgebirgskreis, a comprehensive database on manufacturing firms provided by the regional economic promotion agency (WFE) as well as innovation competition databases were consulted.³⁶ Additionally, firms were identified through internet queries, e.g. on industry association websites, portals, brochures on study regions etc.

	South Estonia (n=13)			Erzgebirgskreis (n=13)		
	mean	min	max	mean	min	max
years since establishment (2017)	38	3	283	73	3	366
start-up companies in %	20			15		
number of employees	51	3	200	56	2	170
micro enterprises (<10; %)	24			15		
small enterprises (10 - <50; %)	38			39		
medium sized enterpr. (50 - <250; %)	38			46		
turnover (last financial year, t€)	5,360	58	33,820	8,250	10	32,000
export share (% of total sales)	50	0	99	31	0	75
location in county centre (%)	25			0		

Table 9: Summary statistics on firm samples

In contrast to the selection of study regions, which primarily followed the logic of similarity, business sampling followed the rationale to generate a heterogeneous sample. Therefore, I refer to (maximum) variation principles within the overall purposive sampling procedure (Patton, 1990:172). In particular, the dissertation explores innovation activities of businesses that differ along the following dimensions: firm size (number of employees), age (year of establishment), micro-location (location inside/outside county capital) and manufacturing focus. Introducing heterogeneity into the sample allows to ascribe significance to commonly observed patterns emerging from multiple cases, even if the number of cases is relatively small (ibid.). Thus, this strategy supports the generalisation of findings beyond the specifications and contingencies of individual cases.

Overall, final firm samples are layered (Flick, 2010), i.e. exhibit a set of common (active in LMT manufacturing, innovative firms) as well as different characteristics (variation according to firm characteristics). Table 8 illustrates sample development and associated case structuration processes. Size and structure of final samples were not pre-determined but co-evolved throughout the research process. Consequently, a higher weight was assigned to underrepresented criteria towards the end of empirical phases to make sure that final samples sufficiently reflect variation. As samples are rather small (South Estonia: n=13; Erzgebirgskreis n=13), this study does not intend to ensure statistical representativeness. On the contrary, its multiple case approach relies on the use of information-rich and intrinsically interesting cases (Stake, 2005). Table 9 provides summary statistics on the sample of study regions.

³⁵ Äripäev is an Estonian business newspaper, publishing five issues per week (<http://www.aripaev.ee/top>). The ‘Äripäev TOP’ database comprises an annual ranking on the TOP100 companies for each of the 15 counties in Estonia. I used the database to identify relevant companies. For instance, if a company was mentioned by one of the regional key informants and additionally appeared in the database, it has been considered a firm to be potentially included into the sample.

³⁶ In particular firms participating in the ‘futureSAX’ innovation competition. These information were cross-checked with suggestions by regional key informants or indications from media research.

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After businesses were identified, interview requests, briefly explaining project background and interview purpose were sent via email, usually approaching the management level. Due to their leading and steering function within the business, it can be assumed that the management level disposes of relevant information and knowledge regarding the central research interests: innovation activities, environmental perceptions etc. Especially in small firms management representatives cover a wide range of different tasks.

3.4.3 Selection of innovation projects

Following the IB approach, identification and selection of concrete innovation projects is indispensable, yet not trivial. Firm-internal projects, and especially process related innovation activities, are not easily observable externally, even if projects result in new/improved products or processes which may eventually become visible on the market. Within the research, I have left the decision to select specific projects to interview partners. Although, for few cases (EE2, EE13 | ERZ3, ERZ13) specific projects could be identified upfront, for instance with the help of regional key informants or media consultation. However, this approach induced certain issues. For most cases rich information on specific firm projects, which could be used for interview preparation, were only rarely available in the public domain. Furthermore, it occurred that externally identified/suggested projects were already finalised several years ago (EE2, EE13). Which raised the issue that detailed information on certain phases of the project could not easily be recovered by interviewees, ultimately resulting in rather fragmented and thin descriptions.

Therefore, I decided to leave the selection of projects to business representatives. When confirming interviews, informants were asked to select a recently finalised innovation project, either a product or process development.³⁷ Leaving this decision to interview partners reduced the risk of introducing a researcher bias. At the same, however, a bias might have been introduced by interviewees, for instance by selecting particularly successful projects. Overall, this approach to project selection yielded a cross-section of innovation projects in terms of degree of novelty, as well as the actors, dynamics and practices involved.³⁸

A number of cases are recently established businesses (EE3, EE4, EE8 | ERZ8, ERZ10), mostly centred on a single focal product/process, closely tied to the firm's development path. Thus, interviews with representatives of start-ups focussed on the development path the company's specific product, but also aimed at retrieving the company's wider development trajectory. Thereby, these cases refer to the establishment process as the central innovation process. Table 10 and Table 11 provide summaries on project samples.

³⁷ Respondents were asked to name the chosen development project prior to the interview and, if possible, to provide further information for interview preparation. However, only in few instances the chosen project was communicated and further information circulated prior to the interview. Which resulted in a number of situations in which it was not clear which development project would be the central theme of the interview, and if the respondents have at all chosen one. Despite this uncertainty, in all cases interviewees chose a finalised project which then formed the basis of the interview's narrative sections.

³⁸ It was deliberately decided not to formulate further specifications on the central innovation project, as the objective of this research is to openly explore firm's innovation activities. Thereby, the study deviates from other project-based investigations in the field that pose more rigid criteria (e.g. Hansen, 2014 who investigated project in which firms collaborated with external partners).

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CASE FIRM <i>innovation project</i>	INNOVATION TYPE	IMPETUS	APPROX. TIME FRAME	DIFFUSION
EE1 <i>new type of bed</i>	product/market innovation	external, project request	12 months	showroom, trade fairs, online sales, hotels
EE2 <i>meat products free of artificial additives</i>	product/market innovation	internal	9 months	trade fairs and degustations
EE3 <i>vegetable crisps</i>	start-up; product innovation	internal, establishment of company	established in 2014	trade fairs, degustations, supermarkets
EE4 <i>birch sap</i>	start-up; product innovation	internal, establishment of company	establishment in 2015	int. retailers, fairs and degustations
EE5 <i>new machinery</i>	implementation of new technology, facilitating new product range	external, project request	approx. 2 years, ongoing	internal with project partner; pilot project
EE6 <i>finishing line</i>	implementation of new technology, facilitating new product range	internal, long term project	multiple years	trading partners
EE7 <i>Igloo saunas</i>	start-up; product innovation	internal, establishment of company	established in 2014	Trade and country fairs, internet, int. retailers
EE8 <i>process change</i>	process improvements increasing quality	external: customer complaint	6 weeks	via customer base
EE9 <i>upgrade of paper mill</i>	technical process optimisation, cost reduction	mixed: internal technological upgrading and external market pressures	> 3 years	internal
EE10 <i>neutral fruit wines</i>	new product based on establishment of new process	mixed: request by key customer, monitoring	2-3 years	key customers and existing distribution channels
EE11 <i>floating sauna</i>	product/market innovation	internal	2 years	existing base of international customers
EE12 <i>smart packaging</i>	product/market innovation	internal: market monitoring	ongoing	existing customer base
EE13 <i>berry crisps</i>	product/market innovation	internal	-	-

Table 10: Overview on innovation projects investigated in South Estonia

CASE FIRM/ innovation project	INNOVATION TYPE	IMPETUS	APPROX. TIME FRAME	DIFFUSION
ERZ1 <i>functional working clothes</i>	(potentially leading to) product/market innovation	external, participation in project	Project started few months ago	internal, within the project consortium, project documentation
ERZ2 <i>multifunctional bag/case</i>	product/market innovation; facilitating organisational changes	external, project request (customer)	18 months	via customer, trade fairs
ERZ3 <i>flax wallpaper</i>	product/market innovation; facilitating organisational changes	mixed, exploitation of expertise accumulated during 'failed' project	multiple years; ongoing	Trade fairs, online shop, showroom, media, sales cooperation, new projects
ERZ4 <i>process efficiency glassine</i>	technical process optimisation, cost reduction	internal project	12 months project duration; plus preparation and follow-up	internal and with project partner, project documentation
ERZ5 <i>aquaponics</i>	technical process elaboration	external, project request	ongoing	internal with project partner; pilot project
ERZ6 <i>injection moulding and new product series</i>	implementation of new technology facilitating new product range	internal, long term project	6 years	technology: internal with partners; products: web shop, flagship store, social media, key clients, trade fairs
ERZ7 <i>solar panel under- construction</i>	technical process with market potential; construction of new component	external, partner from prior project	18 months	project documentation
ERZ8 <i>fair & regional clothes</i>	start-up; product/market innovation with social dimension	internal, establishment of company/project	established in 2014	crowdfunding campaign, internet, social media
ERZ9 <i>isolation fabrics</i>	product/market innovation	external, customer request	6 months	via customer, website
ERZ10 <i>iron sheet furniture</i>	start-up; product innovation	internal, establishment of company	established in 2014	website and social media, trade fairs, showroom
ERZ11 <i>wooden pipes</i>	optimisation of technological process; facilitating new product	external, project participation	start in 2014, ongoing	internal with project partners; project documentation; follow-up project
ERZ12 <i>abrasive sludge extraction</i>	continuous development of key product range	Internal; market monitoring, customer requests	ongoing	trade fairs, customer visits, website
ERZ13 <i>age appropriate furniture</i>	product/market innovation	internal; project initiation	18 months, ongoing	project documentation, sales cooperation; key customers

Table 11: Overview on innovation projects investigated in the Erzgebirgskreis

4 Study contexts

This part aims at providing contextual introductions on study regions. Information on contextual aspects such as regional specifications are considered important elements to (i) gain an overview on study regions and (ii) to take these specification into consideration for data analysis and interpretation (parts 5, 6 and 7). Some contextual elements like specific overarching innovation narrations, economic performance and population dynamics of study regions were previously presented in section 3.4.1. Consequently, chapters 4.1 and 4.2 constitute descriptions that extend these aspects.

4.1 Estonia and South Estonia

4.1.1 Overall Context: Estonia

GENERAL OVERVIEW AND BASIC GEOGRAPHY

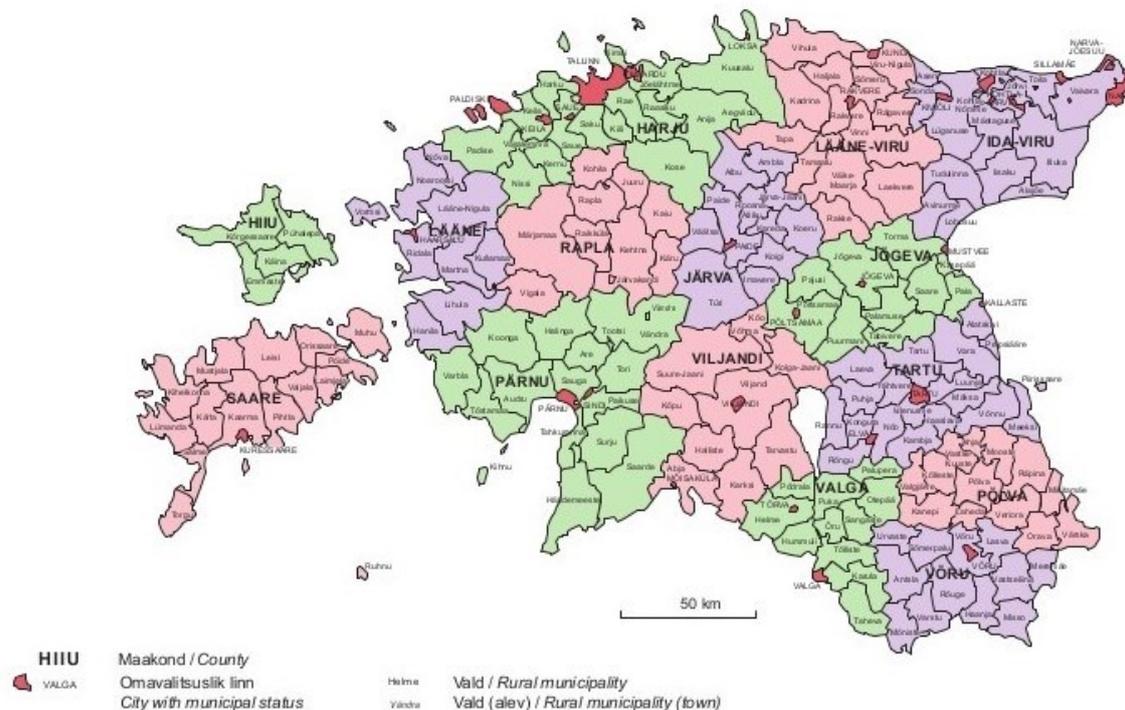
Estonia is a Baltic country in the northeast of Europe, bordered by Latvia in the south and Russia in the east. The longest stretch of the Estonian-Russian and the external EU border runs across Lake Peipus, Estonia's largest lake. To the west, Estonia is bordered by the Baltic Sea and to the north by the Gulf of Finland. Estonian territory covers approx. 45,300 km², including more than 2,000 islands. As of January 2018, Estonia had a population of 1,319,000³⁹ which makes it one of the least populated EU member states. The average population density is 29 people per square kilometre and one of the lowest in Europe (median in terms of local government units: 9.6). In this respect, Estonia differs substantially from other European countries of approximately equal territorial size such as Denmark, Belgium or the Netherlands which have substantially larger populations and higher densities. Amongst the EU states, only Finland and Sweden are, due to large territories and despite larger populations, less sparsely populated. The two largest Estonian agglomerations, the capital city region of Tallinn in the northwest and Tartu in the southeast concentrate large proportions of Estonia's total population. In 2017 the wider Tallinn agglomeration area, including the county of Harjumaa which surrounds the city of Tallinn, accounted for 582,500 inhabitants (city of Tallinn: 426,500) and Tartu county for 145,500 inhabitants (city of Tartu: 93,100). Taken together, Tallinn, Tartu and their hinterlands concentrate more than 55% of the Estonian population.

Since 1990 Estonia's population decreased by 16%, from an initial figure of 1,570,000. Population decline in the immediate post-independence period can be partly attributed to migrating Soviet-settlers. Today ethnic Russians account for approx. 25% of total population. Estonia is substantially affected by both, permanent and temporary outmigration, especially of people in the working age. These dynamics accelerated in 2004 when Estonia joined the EU. Finland and the UK are main destinations for international out-migrants.

³⁹ Unless stated otherwise this chapter uses statistical information retrieved from the Statistics Estonia online database (<http://pub.stat.ee/px-web.2001/dialog/statfile1.asp>).

4 Study contexts

Administratively Estonia represents a single NUTS-2 region. A subdivision into five NUTS-3 regions was implemented for statistical purposes.⁴⁰ Functionally, Estonia is divided into 15 counties. Counties are headed by county governors, appointed by the central government for a five year period, formally representing the national government on the regional level. County governors and county governments are responsible for implementing a range of central government policies, including development programmes and regional policy. Regional Development Centres – operated by Enterprise Estonia (EAS) – are located in each of the 15 Estonian counties. Regional Development Centres provide a range of services to regional stakeholders and businesses and, thereby, function as central bodies of regional development and economic promotion.



Map 3: Administrative division of Estonia 2015 (Statistical Yearbook of Estonia 2015:6)

Each of the 15 counties is further divided into municipalities, the smallest administrative unit of self-government within Estonia. Estonian municipalities are responsible for providing social services such as welfare, housing and infrastructural services such as physical and educational infrastructure. In October 2017 a major and long-standing administrative reform was finalised. As part of the reform the number of municipalities decreased from 213, 183 rural parishes and 30 urban towns, to 79, 15 of which are classified as urban towns.⁴¹ Map 3 provides an overview on Estonia's pre-reform administrative division. An official

⁴⁰ Põhja-Eesti (Harju County); Lääne-Eesti (Hiiu County, Lääne County, Pärnu County, Saare County); Kesk-Eesti (Järva County, Lääne-Viru County, Rapla County); Kirde-Eesti (Ida-Viru County); Lõuna-Eesti (Jõgeva County, Põlva County, Tartu County, Valga County, Viljandi County, Võru County).

⁴¹ The local government reform was approved by the central government in 2015. As specified in the administrative reform law, local municipalities with populations under 5,000 inhabitants had to merge to create larger administrative units to provide more efficient services. Prior to the reform 80% of Estonian municipalities had less than 5,000 inhabitants. Post-reform the figure decreased to 19% (pre-reform median population per municipality: 1,887; post-reform median population per municipality: 7,865). The central government paid financial reward ('merger subsidy') to municipalities finalising

4 Study contexts

post-reform map has, at the time of submitting this thesis in August 2018, not yet been issued by the authorities.⁴²

ECONOMIC AND SOCIAL TRANSFORMATION

Estonia is a former Soviet Republic and restored independence in August 1991. Declaration of independence was the final event in a process that started in 1988. Still under Soviet rule and driven by civil grassroots-movements and political activists, the ‘*Declaration on the Sovereignty of the Estonian SSR*’ was issued (Kasekamp, 2010). Becoming an independent nation state induced a far-reaching societal and economic transformation processes. Two interrelated aspects can be mentioned as particularly important elements of Estonia’s transition path: alienation from Soviet legacy and speedy integration into international institutions and the European Union. Both elements relate to tremendous political and societal transformations. Transition from a state-led towards a market-oriented economy paralleled EU integration initiated by formal application for membership in 1995 and finalised by EU accession in 2004.

Introducing market economy principles was considered one of the most important goals of the transition period. Implementation of reforms inspired by a liberal macroeconomic policy framework following the logic on non-intervention, sought rapid growth and quick economic convergence with western economies (Feldman, 2013). Core features of Estonia’s rather radical approach to economic and societal transition were (following von Tunzelmann, Hannula and Radosevic, 2006; Olenko, 2006; Bohle and Greskovits, 2007; Feldman, 2013):

- focus on installing market based coordination mechanisms; priorities on balanced budget and introduction of liberal trade policies;
- privatisation of property and infrastructure; changes in tax system, low corporate taxes;
- low levels of social expenditures and overall a small size of the welfare state;

The first years after independence were characterised by a ‘desperate’ economic situation (Kasekamp, 2010), due to efforts of installing free market policies. However, even if early reforms did not bring immediate economic progress, they were broadly accepted and legitimised to swiftly overcome Soviet legacy. It is mentioned that these market reforms and institution building processes implicitly related to Estonia’s identity politics, aiming at confirming ‘*Estonians’ Europeanness*’ (Bohle and Greskovits, 2007:451) by implementing measures sharply contrasting Soviet legacy. Up until 1995, the Estonian economy struggled severely, facing decline and high inflation: in 1993 the economy declined by about 9%, inflation hit 90%. Consequently, the transformation of the Estonian economy into an open and liberal

voluntary mergers, to avoid forced mergers and litigation. The reforms lead to changes in the borders of Estonian counties, resulting in population changes.

(<http://www.globalgovernmentforum.com/administrative-reform-bill-passes-first-reading-in-estonian-parliament/>;
<https://valitsus.ee/en/state-reform>; accessed 25.11.2016; <https://www.stat.ee/news-release-2017-121>;
<https://news.err.ee/638877/minister-estonia-s-administrative-reform-complete>; accessed 18.05.2018)

⁴² However, a map of Estonia’s new administrative division can be retrieved on the website of the Estonian Public Broadcasting Corporation (ERR): <https://news.err.ee/606664/administrative-reform-this-is-the-new-map-of-estonia> (accessed: 16.02.2018).

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market economy is referred to as a '*shock therapy*' (Kasekamp, 2010) and considered the most radical free-market transition amongst the CEE countries (Feldmann, 2013).

During the first transition years, Estonia had to cope with substantial de-industrialisation, tied to the collapse of core industries as well as sudden exposure of small manufacturing units to international markets, at which they were often unable to compete. Consequently, unemployment within manufacturing and the agricultural sector peaked. Kasekamp (2010) points out that peripheral regions were especially affected by these sector-specific transformation processes. Collective farms were unable to compete internationally, a large number of farms dissolved as land and property was re-privatised and as independent Estonia immediately cut agricultural subsidy payments. Only few agricultural entrepreneurs took the risk to modernise farms (Kasekamp, 2010). Accordingly, it has been postulated that post-socialist transition reforms were subject to a distinct urban bias that left '*Estonian rural areas [...] on the verge of marginalization*' (Nugin, 2014:53).

It has been stressed that besides farmers and industry workers also pensioners were especially hit by transformation processes and suffered from the small size of the Estonian welfare state (Bohle and Greskovits, 2007; Kasekamp, 2010). Up until today, Estonia accounts for one of the lowest levels of social spending in the EU (Feldmann, 2013). Furthermore, a drop in life expectancy was observed during the early 1990s, portrayed as one of the social transformation costs (Kasekamp, 2010). After economic recovery and stabilisation, mitigated also by introducing the Estonian *kroon*, Estonia suffered from the Russian and Asian crisis of 1998 as the Estonian and the Russian economy remained tightly connected. These crises triggered an increased economic orientation towards EU economies. In the first half of the 2000s the Estonian economy grew at double digit figures, a period frequently referred to as the '*Baltic Miracle*' (Olenko, 2006; von Tunzelmann et al., 2006).

ACCESSION TO THE EUROPEAN UNION

Along with nine other countries Estonia joined the EU-15 in May 2004. The accession period lasted for almost nine years and started with formal application for EU membership in 1995. After Estonia was formally invited to join the EU in December 2002, a referendum took place in September 2003. Despite broad support for EU membership from policy and business circles, there was a certain sense of reservation in the wider public. Many Estonians were sceptical about voluntarily joining another union after involuntarily having been part of the Soviet Union (Kasekamp, 2010). Nevertheless, following a referendum campaign in which economic aspects constituted key themes, 66.8% voted in favour of EU membership. Estonia joined the Schengen area in December 2007 and the euro-zone in 2011.

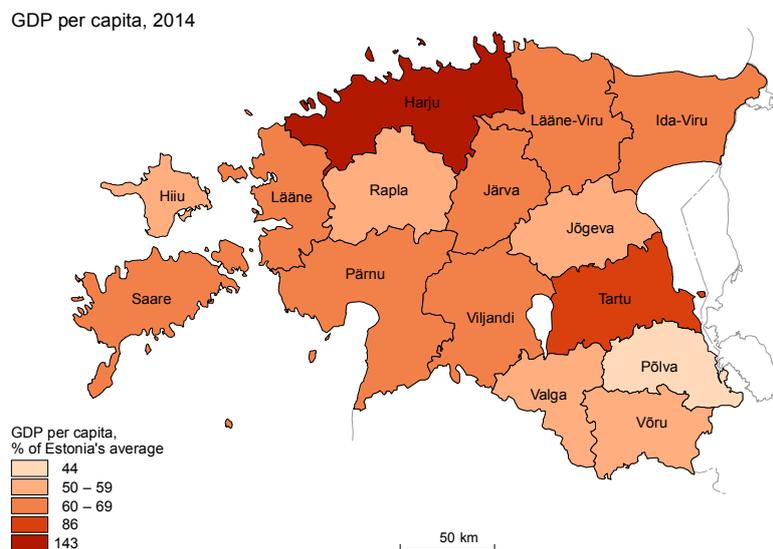
After overcoming the recession that followed independence, economic convergence in terms of GDP swiftly progressed and gained further momentum after joining the EU. Amongst the ten new EU members, Estonia accounts for the most rapid convergence towards incumbent EU states, reducing its GDP gap from an initial level of 31.2% of EU-15 average in 1995 (Varblane and Vather, 2006) to 75% (of EU-28 average) in 2014 (Eurostat). During this period Estonia experienced a substantial influx of foreign direct investment (FDI) in particular from Finland, Sweden and Denmark. It is emphasised that early and close cooperation to the Nordic states, especially to Finland, was an important aspect of Estonian transition

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(Kasekamp, 2010). Close relations to Finland not only originate from geographical closeness, but also relate to linguistic similarities and cultural ties. In this respect, Estonian's self-perception as 'the innovator' amongst the three Baltic States (Raun, 2001) as well as front-runner for EU membership can be linked to its (re)branding efforts as a Nordic rather than Baltic state (Kasekamp, 2010).

ECONOMIC STRUCTURE, KEY SECTORS AND RESEARCH INSTITUTIONS

Since EU membership Estonia's absolute GDP per capita has experienced a substantial increase: from 12,300€ in 2004 to 20,900€ at the end of 2014 (Eurostat), reflecting an increase of almost 70%. However, regional disparities in terms of economic performance remain (see Table 6, Map 4). These indications draw a double-sided picture regarding economic dynamics: convergence towards EU member states versus sub-national economic polarisation. This polarisation is fuelled by pronounced concentrations of economic activity in and the pace set by the two national agglomerations of Tallinn and Tartu. Taken together, Harju and Tartu County, including Tallinn and Tartu, generate more than 82% of the Estonian GDP, while only concentrating 55% of the population (Statistics Estonia, 2015).



Map 4: Regional Estonian GDP per capita (source: Statistics Estonia 2015)

In terms of sectoral structure, 68.4% of Estonia's GDP is created in the tertiary service sector. The secondary sector accounts for roughly 28% while the share of the primary sector is 3.6%. Again, regional differences are substantial. The service sector is more dominant within the national agglomerations of Tallinn (81%) and Tartu (77.2%). Conversely, the service sector is significantly less contributing to gross added value outside of Tallinn and Tartu (ranging between 40% in Ida-Virumaa and 59.9% in Läänemaa) where the industrial sector is more relevant. Manufacturing is a central economic activity for Estonia, contributing roughly 16% to the country's GDP and providing one in five jobs. While the overall value added of manufacturing as a share of total value added in Estonia corresponds with the EU average, the share of value added from high-tech manufacturing (1.7% in 2012) is significantly lower in Estonia than on EU average (2.5%; Ruttas-Küttim and Stamenov, RIO Country Report, 2016:14), suggesting that LMT manufacturing plays an important role within the Estonian economy. These indication can be attributed to the specific low-tech industrial profile Estonia inherited from Soviet legacy, followed by attracting

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only little FDI into complex manufacturing activities (Bohle and Greskovits, 2007). Nevertheless, some high-tech manufacturing activities such as electronics and ITC as well as associated services recently gained importance especially in Tallinn and Tartu. After a substantial increase of the national unemployment rate during the financial crisis, unemployment has come down to, in international comparison, a rather low national unemployment rate of 5,8% (2017; Tallinn: 5,1%; Tartumaa 3,8%; Põlvamaa: 5,7%; Valgamaa: 6,3%).

Wood is an abundantly available domestic resource, almost half of Estonia's land is covered by forest. Consequently, wood related industries such as timber, furniture or paper were and continue to be of high importance to the Estonian economy. Especially as the value generated from wood-related exports is largely kept within Estonia (Trade with Estonia). Otherwise, Estonia is relatively poorly endowed with natural resources. Even though the north-eastern county of Ida-Virumaa holds some larger oil-shale and limestone deposits.

Within the manufacturing sector, machinery, metalworking and as previously mentioned wood related industries, along with food and beverage production/processing constitute key activities (Trade with Estonia), especially outside of Tallinn and Tartu. Wood and food manufacturing provide the highest figures for both, value added and employment amongst manufacturing industries (Ministry of Economic Affairs and Communications, 2015). Estonian manufacturing is dominated by small and medium sized enterprises: of approx. 6,000 companies active in manufacturing about 200 have more than 100 employees. However, this minority of companies accounts for roughly 50% of manufacturing jobs (ibid.).

In line with the diverse functions of Tallinn and Tartu, these agglomerations also concentrate public R&D institutions and activities. All of Estonia's seven universities have their main campuses either in Tallinn (Tallinn University, Tallinn University of Technology, Estonian Academy of Arts, Estonian Academy of Music and Theatre and the private Estonian Business School) or Tartu (University of Tartu, Estonian University of Life Sciences). Tartu University is the largest public University with about 3,500 employees (1,700 academic staff) and 13,000 students. Besides Universities, there are six *Competence Centers* in Estonia, run as partnerships between public institutions and private actors. The function of competence centres is to provide application-oriented research and to support businesses development through knowledge and technology transfer. Individual competence centers cover a broad range of activities and are also located either in Tallinn or Tartu.⁴³

- Competence Centre on Health Technologies (Tartu)
- Competence Center of Food and Fermentation Technologies (Tallinn)
- Competence Center Eliko (ICT and Internet of Things, Tallinn)
- Bio-Competence Centre of Healthy Dairy Products (Tartu)
- Software Technology and Applications Competence Centre (Tartu)
- Innovative Manufacturing Engineering Systems Competence Centre (Tallinn)

43 Research in Estonia Website: <http://researchinestonia.eu> (accessed: 23.02.2018)

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Thus, public R&D as well as academic education is almost exclusively concentrated in the two national agglomerations. However, Estonia's main Universities maintain a number of satellite campuses and colleges: University of Tartu: Viljandi Culture Academy, Narva College, Pärnu College – Tallinn University: Haapsalu College, Rakvere College.

4.1.2 Study Area: South Estonia

GEOGRAPHY AND POPULATION

The Estonian study region comprises of the four counties of Viljandimaa, Võrumaa, Valgamaa and Põlvamaa. It covers an area of 12,396km² and has a total population of about 177,000. The population density of 13.6 people per km² indicates its low density. The largest towns in the study area are the county capitals. Of these, Viljandi has the highest population (18,500 inhabitants) and is the 6th largest town in Estonia. In terms of accessibility, the four counties exhibit substantive differences. Settlements especially in Võrumaa and Valgamaa are rather remote from both Tartu (70-90km) and Tallinn (about 250km) but also Pärnu in the west. All counties comprising the study area have substantially lost population since 2000, on average about 15%. Population decline is driven by both, negative natural population dynamics and outmigration, especially of individuals in the age group 20-39.

	population in 2015 (change since 2000 in %)	population county capital; (distance to Tallinn/Tartu in km)	population density (people per km ²)
Viljandimaa	47,835 (-18.8)	18,490 (160/80)	13.9
Võrumaa	33,937 (-15.2)	13,171 (250/70)	14.5
Valgamaa	30,524 (-15.0)	13,427 (240/90)	14.7
Põlvamaa	28,218 (-12.0)	10,005 (230/50)	12.7
total	177,190 (-14.6)		13.6

Table 12: Population indicators of the study regions (own calculations based on Statistics Estonia)

Since independence in 1991 the study area exhibits a continuous birth deficit. The number of births dropped especially during the immediate post-independence period. The study area is severely affected by continued outmigration, both internal and external migration. Within the study area outmigration and its particular focus on younger working age people is perceived as one of the mayor challenges for future development potentials by both actors from the public administration sphere and firm representatives (EE_CON1). On the national level, especially Tallinn and its hinterland exhibits a continued positive migration balance, especially of people in the working age which move to the capital for better education and job opportunities, in search for higher wages and personal development opportunities (Nugin, 2014).

Besides natural population decline and internal migration patterns, international out-migration constitutes the third determinant of continued population loss within the study area. Data on external migration (Statistics Estonia) reveal a continuously negative external migration balance. Since 2010 the area has, collectively, lost approx. 400 people annually due to international out-migration. However, despite continued out-migration in the past years, more recent data suggest that the balance is getting smaller (Statistics Estonia). This trend can be attributed to recently increased numbers of return migration, especially from Finland. Indications of increasing numbers of return migrants, from which not only Tallinn and Tartu but also rather peripheral settings in Estonia seem to benefit, sparked hopes of actors from the regional development arena:

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'People who have left Estonia to Finland, to Sweden, to Norway are coming back, and quite successfully coming back. In the meaning that they are finding good jobs, they are adding their value to the jobs and the companies can be more successful on the export business. [...]. They have worked [and gained experience] abroad and come back and starting new things here, start-ups but also by working on their main specialty in the companies.' (EE_CON1)

ECONOMIC STRUCTURE AND KEY SECTORS

One particular characteristic of the regional economic structure within the study region is the continued and even growing importance of the secondary sector. In this sense, the study region deviates from the overall national trend towards expansion of the service sector with particular concentrations in Tallinn, Tartu as well as the counties of Pärnu (tourism) and Lääne (recreation and heath). With the exception of Põlva county, the share of added value generated in services declined since 1995 (see Table 13), while manufacturing and construction activities gained importance. Manufacturing of wood and wood products is, besides food and beverage industries as well as metal manufacturing the largest sub-sector. Wood and food manufacturing constitute essential drivers of the overall manufacturing activities. Output in wood (+10.5%) and food industries (+6.7%) grew faster compared to the average of manufacturing industries (+4,9%) between 2011-2014 (Statistics Estonia, 2016:303ff). A further indication for the continued importance of manufacturing in the study region relates to the distribution of white-collar and blue-collar⁴⁴ workers. The proportion of blue-collar workers in the study area is amongst the highest in Estonia (Statistics Estonia, 2016:16).

Additionally, the study region accounts for a high share of agriculture and forestry activities (>14%), which is substantially above the national average (3.4%; see Table 13). The significance of the primary sector can mainly be explained by forestry-related activities, especially the production of raw wood and logs.

	share in value added (2014, in %)		
	(change since 1995 in %)		
	agriculture, forestry and fishing	industry and construction	services
Estonia	3,4 (-2,3)	28,1 (-3,7)	68,4 (+6)
Harjumaa	0,7 (-1,3)	22,2 (-7,1)	77,1 (+8,4)
Tartumaa	4,3 (0)	25,7 (+2,5)	70,1 (-2,5)
Põlvamaa	14,0 (-2,4)	30,3 (-0,4)	55,8 (2,8)
Valgamaa	14,5 (+0,5)	36,2 (+7,2)	49,3 (-7,7)
Viljandimaa	15,9 (0)	34 (+6,1)	50,1 (-6,1)
Võrumaa	14,1 (+1,6)	36,3 (+7,3)	49,5 (-8,9)

Table 13: Sectoral structure of regional added value in Estonia (Statistics Estonia)

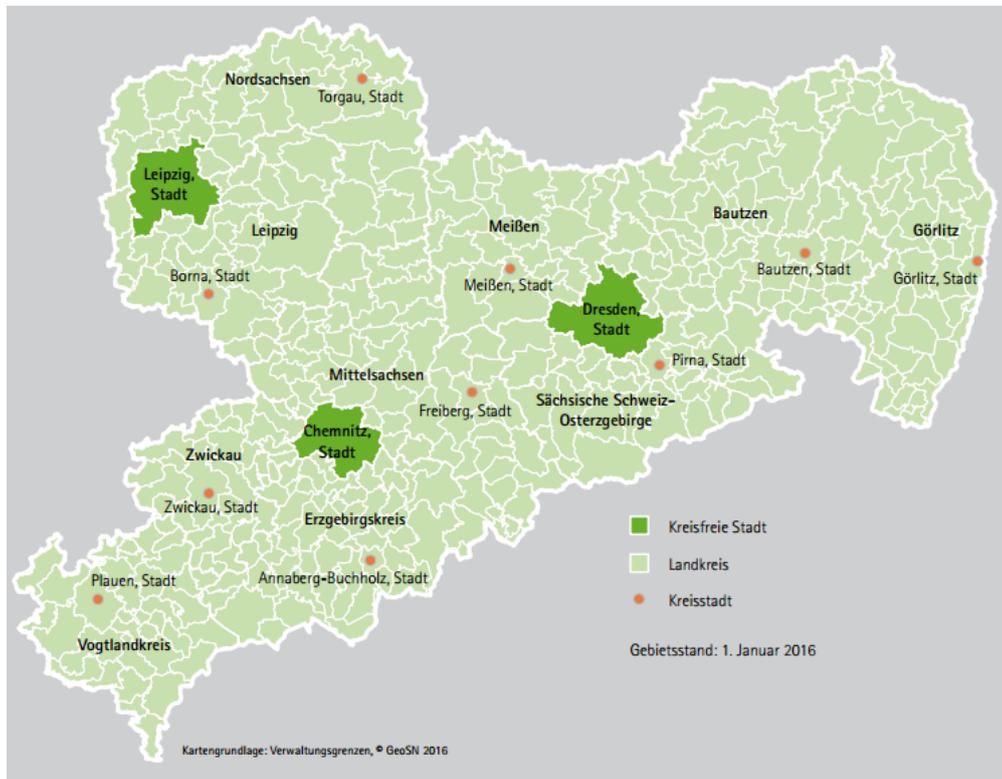
⁴⁴ Blue-collar workers perform manual labour which involves, amongst others, skilled and unskilled manufacturing (according to the definition of Statistics Estonia, blue-collar activities also include agricultural workers). White-collar workers typically perform activities in an office environment.

4.2 Saxony and the Erzgebirgskreis

4.2.1 Overall context: Saxony

GENERAL OVERVIEW

The Free State of Saxony is a Federal State of Germany. With a population of 4.077 million (2017) Saxony has the largest population of Eastern German States.⁴⁵ Saxony borders the Federal States of Brandenburg, Saxony-Anhalt, Thuringia and Bavaria as well as Poland to the east and Czechia to the south. Saxony covers an area of 18,420 km² and accounts for an average population density of 221 inhabitants per km². Dresden is the capital of Saxony and has a population of 547,300 (2017), however, with a population of 575,300 Leipzig (2017) is its largest city. The third major city in Saxony is Chemnitz, which has a population of about 246,500. Thus, about one third of Saxony's population lives in its major cities. These also take on a central function when it comes to higher education and research: most institutions are located in Dresden, Leipzig or Chemnitz with Freiberg being a further important location, especially with respect to mining and engineering (Wirtschaftsförderung Sachsen GmbH, 2016).



Map 5: Administrative overview on Saxony (source: Statistical Office of Saxony, 2016)

Between 1990 and 2015 Saxony's population decreased by almost 15%, from an initial figure of about 4,764,000. This population decline was driven by both births deficit and migration losses. However, since 2014 Saxony's population has been rising again. Much of this growth can be attributed to the dynamic developments of its major agglomerations, Leipzig and Dresden and more recently also Chemnitz. Furthermore, since 2011, Saxony accounts for a positive migration balance (Staatsministerium für

⁴⁵ Unless stated otherwise, data in the following sections originate from the Statistical Office of Saxony (<https://www.statistik.sachsen.de/>) as well as Regionalmanagement Erzgebirge (2017)

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Wirtschaft, Arbeit und Verkehr, 2016). Administratively, Saxony is divided into ten counties. In addition, the cities of Leipzig, Dresden and Chemnitz have urban district status. This structure is the result of an administrative reform implemented in 2008 by which the number of counties was reduced from 22 to ten and the number of urban district from seven to three. Görlitz, Hoyerswerda, Plauen and Zwickau lost their urban district status. On the sub-county level, there are 426 municipalities in Saxony (2016), thereof 170 towns (see Map 5). 258 (61%) of Saxony's municipalities have a population of less than 5,000.

ECONOMIC AND SOCIAL TRANSFORMATION

Reunification of Germany in 1990 was accompanied by the establishment of a market-oriented economic system within former GDR territory. Transformation resulted in drastic changes of economic structures. Saxony has a long tradition in manufacturing and operated as an industrial core region in the GDR. In 1989, the manufacturing sector accounted for more than half of total employment in Saxony (Baude, 2003). Similar to what has been described for the Estonian context, the sudden exposure of the Eastern German economy to a market regime is described as an '*extreme shock*' (Brenke and Zimmermann, 2009). To organise (re)privatisation of state-owned enterprises a privatisation agency ('Treuhandanstalt') was established as the central body in 1990. The initial state of the Saxon economy after reunification was characterised by outdated technologies, inefficient production methods, non-competitive products and gaps in infrastructural endowment (Baude, 2003; Brenke and Zimmermann, 2009). The majority of enterprises was unable to compete under market conditions and had to close operations, resulting in substantial job losses especially in the first half of the 1990s. To increase competitiveness, a crucial step of (re)privatised and newly established firms was to modernise production units and product portfolios.

Economic adaptation facilitated processes of severe de-industrialisation in Saxony. Dominant fields of activity such as engineering and textile manufacturing/processing had to substantially reduce capacity and, consequently, employment. Additionally, rather mono-structured regions such as Riesa (steel industry), Görlitz, Zittau and the areas south of Leipzig (lignite mining) as well as parts of the Erzgebirge (textiles, light industrial production) were hit especially hard by job-losses. Out-migration and outflow of human capital, in particular towards Western Germany, were immediate effects of economic transition processes (Baude, 2003:25). Taken together, these paralleling processes have induced far reaching socio-spatial distortions and triggered an extreme decline in birth rates (Mittring, 2012). Despite these fundamental restructuring processes, it is highlighted that Saxony's economy recovered rather quickly. In 1994 its economy grew at a rate of 14%. In the following years Saxon growth rates considerably exceeded those of the other Eastern German states. However, much of its economic progress concentrated in the agglomerations of Dresden, Leipzig and Chemnitz. Due to their infrastructural endowment, diversified economic structures, availability of human capital and R&D institutions, Saxony's main agglomerations provided most conducive conditions to attract external investments (Baude, 2003). As a consequence of these processes, spatial disparities in Saxony have substantially widened after reunification (idid:69).

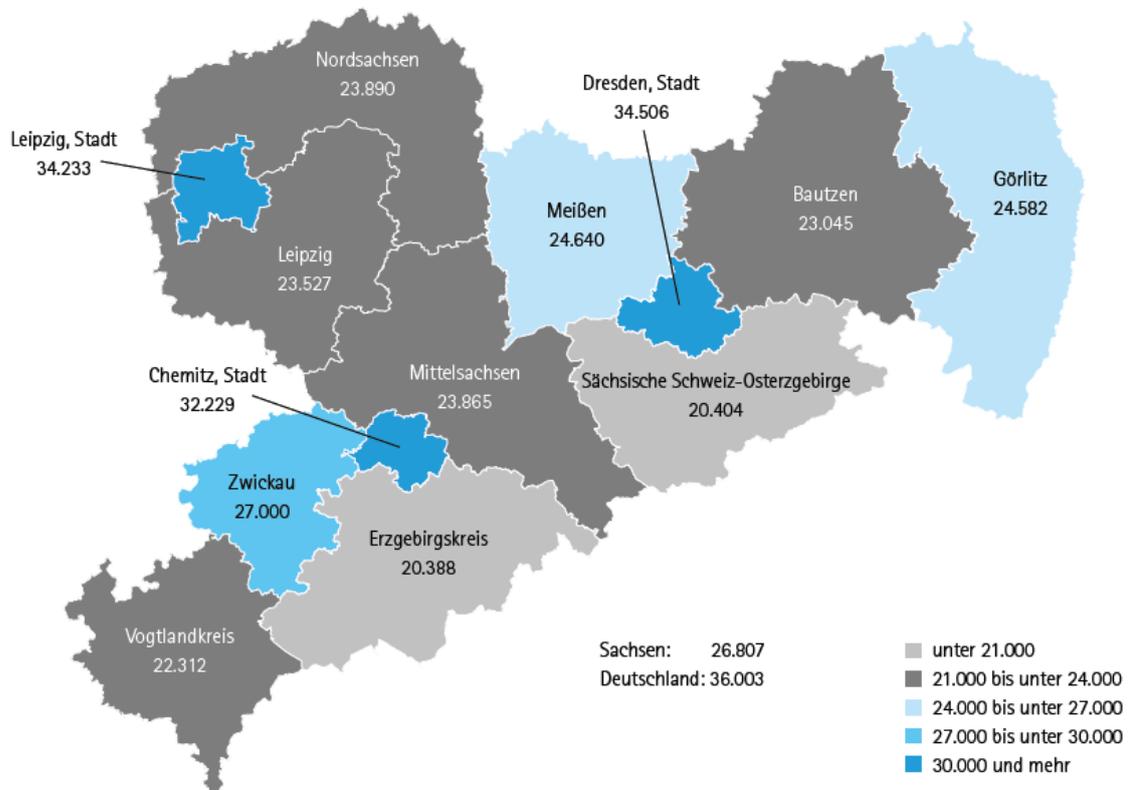
Post reunification, the construction sector benefitted immensely from accumulated needs and the following large-scale investments into infrastructure, housing and commercial estates. Consequently, large parts of workers made redundant in manufacturing, the energy sector as well as agriculture and

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forestry could be absorbed by the rapidly expanding construction sector. Besides construction, service industries rapidly expanded from 1992 onwards (Baude, 2003; Mittring, 2012). De-industrialisation processes also induced a decrease of firm sizes and a shift from large-scale combine structures to privately owned SMEs. Despite challenges of economic transformation, the Saxon economy is broadly considered a particular ‘*success story*’ of ongoing restructuring processes (Bertelsmann Stiftung, 2009; Einwiller, 2016).

ECONOMIC STRUCTURE, KEY SECTORS AND RESEARCH INSTITUTIONS

Much of these dynamics are tied to manufacturing industries that have historically played an important role. Internationally competitive structures within Saxony’s economy emerged for instance regarding engineering activities. These achievements are attributed to continuous investments into upgrading physical infrastructures as well as ongoing policy priorities in the fields of innovation, research and development and education (Habermann, 2007). However, within Saxony, distinct regional variations continue to exist. Especially its main agglomerations Dresden, Leipzig and Chemnitz drive Saxony’s overall performance (e.g. Prognos AG, 2016). Map 6 illustrates such disparities in terms of regional GDP per capita, emphasising the important role of its main cities. In 2014 Leipzig, Dresden and Chemnitz have generated 41% of Saxony’s GDP while concentrating 33% of population. The Erzgebirgskreis, the county with the lowest GDP per capita, accounts for only 59% of Dresden’s figure.



Map 6: GDP per capita on county level (SMWA, 2016:44)

With a share of 65% the service sector is the biggest contributor to value added in Saxony, while manufacturing contributes about one third. Substantial regional differences can be observed regarding the

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relative importance of manufacturing and service industries (see Table 15:). The service sector is more important in larger cities while manufacturing accounts for a higher weight outside main agglomerations. Despite the dominance of the service sector, manufacturing continues to play a crucial role in Saxony's economic structure, which also reflects in high export ratios. Most relevant manufacturing industries in Saxony are automotive, engineering, plant construction, microelectronics and ICT (Wirtschaftsförderung Sachsen GmbH, 2016).

Dynamics of the automotive sector can be partly attributed to historical legacy. Saxony has been a major site of the automotive sector during GDR. Global players of the automotive industry invested substantially in Saxony: for instance Volkswagen in Zwickau, Chemnitz and Dresden; BMW and Porsche in Leipzig. Investments of major car manufacturers were accompanied by investments of subcontracting firms. Furthermore, these investments have been complemented by private and public automotive-related R&D capacities. Collectively, this large number of complementary players facilitated the emergence of an automotive cluster within Saxony (Regionalmanagement Erzgebirge, 2017).

Dresden has experienced a dynamic development of microelectronics and ICT – driven by investments of companies such as Infineon Technologies. ICT firms found attractive pre-conditions such as experienced workforce and related research institutions due to Dresden's historically important position within the industry, namely the '*Robotron-Kombinat*' (Baude, 2003). Engineering and plant construction continue to have an important position, supported by a diverse range of engineering-related R&D institutions in Chemnitz, Dresden, Mittweida, Zittau/Görlitz and Freiberg. Engineering plays a substantial role across Saxony, in its main agglomerations but also in outside of agglomerations in regions such as Oberlausitz, Vogtland and the Erzgebirge.

Despite a substantial decline during the early transformation, textile industries have retained importance, especially the sub-section of technical textiles, in which innovative and collaborative structures emerged across Saxony (Baude, 2003; Habermann, 2007; WFE, 2015). Manufacturing activities also play a crucial role because of their high export ratios. While the average export ratio in Saxony is about 37%, automotive, engineering and electronics export roughly half of their production (Statistisches Landesamt des Freistaates Sachsen, 2017:13).

Furthermore, Saxony's economy can draw upon a large number of diversified higher education and research institutions. Saxony provides for four Universities, Leipzig University as well as the Technical Universities in Dresden, Chemnitz and Freiberg, the world's oldest mining and metallurgical research institution. Additional research and educational capacities are provided by five Universities of Applied Sciences located across Saxony (HTWK Leipzig, HTW Dresden, Hochschule Mittweida, Westsächsische Hochschule Zwickau, Hochschulen Zittau and Görlitz), art academies in Dresden and Leipzig as well as numerous state-approved academies with diverse thematic orientations. Additionally, Saxony has also become a major site of extra-mural research institutions. Especially relevant from the perspective of businesses are 14 Fraunhofer institutions as these provide application oriented research. Additionally, Saxony locates six Max-Planck institutes, two Helmholtz-Centres as well as eight Leibniz institutes (Forschung in Sachsen). This diverse range of Universities and R&D organisations, along with a number

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private research organisations as well as educational academies (Studienakademien), provides for a dense research and development landscape. However, it needs to be mentioned that the majority of these institutions are concentrated in Saxony's three major agglomerations, and to a lesser extent in Freiberg. Even though the Erzgebirgskreis itself does not host any major public research and development institutions, actors from within the study regions broadly confirm their integration into excellent overarching research structures:

'[Regarding application oriented research institutions Saxony provides for an] absolute density. Many of the companies here have direct contacts to these institutions. Metal construction and coating etc. to Freiberg University. Concerning electronics and IT TU Chemnitz is important and Mittweida regarding marketing. But also TU Dresden and Zwickau University.' (ERZ_CON1)

'regarding materials they [firms from the Erzgebirgskreis] are looking towards Freiberg. [...]. Regarding processes and production planning the competence is in Chemnitz.' (ERZ_CON3)

4.2.2 Study Area: Erzgebirgskreis

GEOGRAPHY AND POPULATION DYNAMICS

The Erzgebirgskreis covers an area of 1,828 km². The county was formed as the result of the 2008 administrative reform when the previously existing counties of Aue-Schwarzenberg, Annaberg, Stollberg and Mittlerer Erzgebirgskreis were merged. As part of the reform, Annaberg-Buchholz became the capital of the Erzgebirgskreis. There are 61 municipalities within the county, 27 of which are towns. In terms of its natural landscape, the Erzgebirgskreis comprises a hill and mountain area and has in the past been a site of intense mining activity. The Fichtelberg, located in the South of the county, is the highest peak in Saxony at 1,214 meters. With a population of 342,300 (2017) the Erzgebirgskreis is not only the most populated county in Saxony but in Eastern Germany as a whole. Additionally, the Erzgebirgskreis belongs to the 25 most populated counties in Germany (Regionalmanagement Erzgebirge, 2017). It accounts for a population density of 190 inhabitants per km², a figure that indicates a rather high population density. Consequently, the Erzgebirgskreis is classified as a 'rural county with certain concentrations of population' (BBSR). The largest towns in the Erzgebirgskreis are the capitals of the pre-2008 counties, out of which the current capital Annaberg-Buchholz is the largest with a population of about 20,000. In terms of accessibility, the county exhibits substantial differences. In the North, the county borders Chemnitz, however, settlements in the South of the county on the border to Czechia are positioned in relative distance to Chemnitz: Johanngeorgenstadt 64km, Oberwiesenthal 56km or Seiffen 56km. Overall, the Erzgebirgskreis accounts for rather unfavourable accessibility measures (BBSR, 2015).⁴⁶

Since 1990, the Erzgebirgskreis has lost almost one out of four inhabitants (WFE, 2016). Its population decline was substantially higher compared to the overall population dynamics in Saxony (-15%). It is projected that the population of the Erzgebirgskreis will drop by another 20-25% by 2030 (WFE, 2015). These projection figures indicate that the Erzgebirgskreis will have the largest decrease of all Saxon counties. Population decline has been and is driven both by natural decline as well as outmigration.

⁴⁶ Laufende Raumbewertung des BBSR; Interaktive Regionalprofile

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However, after outmigration peaked in 2006, with a negative balance of 3,496, it has continuously become smaller and recently, since 2014, the Erzgebirgskreis accounts for a small positive balance. Nevertheless births deficit continue to be pronounced and drive the overall population decline (Regionalmanagement Erzgebirge, 2017). Given these indications, and especially the projected data, population decline and the associated reduction of people in the working age is perceived as one of the major challenges by regional actors both from the regional development area as well as firms.

	population in 2017 (change since 2000 in %)	population density (people per km ²)
Saxony	4,077,464 (-7,7)	221
Erzgebirgskreis	342,376 (-16,7)	190
Leipzig (city)	575,355 (13,6)	1882
Görlitz	257,480 (-19,5)	123
Nordsachsen	197,760 (-14,1)	97

Table 14. Population indicators (Statistical Office of Saxony)

ECONOMIC STRUCTURE AND KEY SECTORS

Mining in the Erzgebirgskreis can be traced back to the 12th century. Since then, there have been recurrent periods of mining activities related to the extraction of ore, silver and, during the latest period up until 1969 also uranium by the GDR regime (Neugebauer and Roch, 2014). The mining university in Freiberg, not located within the Erzgebirgskreis, was founded in 1765 and continues to serve as an important educational as well as research institution, even though actual mining activities in the region ceased after reunification. Besides mining, the textile industry, glass and paper production became important activities from the 16th century onwards (Neugebauer and Roch, 2014). Besides the historical legacy of the region in mining, a number of economic activities were also actively concentrated in the Erzgebirgskreis during the GDR legacy: e.g. furniture and wooden toys, brushes and brooms, activities which still shape, although on much lower scales, today's economic structure. Like the entire Eastern German territory, the Erzgebirgskreis was also exposed to a severe and sudden economic restructuring, which resulted in severe de-industrialisation and the decline of various manufacturing industries.

Today, the Erzgebirgskreis is characterised by a diverse economic base which relates to previous circles of economic activity and to newly emerging sectors and activities. Manufacturing industries are overrepresented in the Erzgebirgskreis and provide one in three jobs (Regionalmanagement Erzgebirge, 2017) while 20% of jobs relate to manufacturing in Saxony. Prior to reunification, manufacturing accounted for almost 60% of employment within the region (Hecker, 2000). Today, the Erzgebirgskreis accounts for one of the highest industrial densities in Saxony: 104 people per 1,000 inhabitants are active in industry related employment, compared to 76 for Saxony and 82 for Germany (SMWA, 2015:46).

The manufacturing sector provides for a broad mix of activities, suggesting that the regional economy is not mono-structured. Within this diversified range of manufacturing activities metal production and processing, engineering, electrical engineering have a disproportionally high standing: 53% of manufacturing companies (Saxony: 43%) and 63% of manufacturing workers (Saxony: 46%) are active in these 'key industries' (Regionalmanagement Erzgebirge, 2017). Additionally, food and textiles are further important activities within the overall manufacturing profile of the Erzgebirgskreis.

Even though manufacturing has been substantially affected by economic restructuring processes in the aftermath of reunification, it is exactly these industries which were traditional core competences of the region that continue to determine its current economic structure. In many of these, successful and innovation-oriented companies emerged, for instance in particular niches of traditional industries, such as technical textiles (Neugebauer and Roch, 2014). These indications, in line with the pronounced industrial density of the region, suggest that companies are able to draw on specific knowledge and expertise that has been gradually built up and is somewhat embedded within the region. The relevance of manufacturing corresponds to a high number of craft-related businesses in the Erzgebirgskreis, most of which are active in metal processing and construction. The Erzgebirgskreis hosts 12% of all Saxony manufacturing companies (share of population: 8.4%). A high number of manufacturing firms operate as subcontractors for larger companies, especially for major automotive companies.

SMEs dominate the economic structure of the Erzgebirgskreis. In 2016 16,390 businesses were actively operating in the Erzgebirgskreis. 97.8% of these firms had less than 50 employees (88.4% fewer than 10). Less than 30 firms employed more than 250. The dominance of SMEs can be considered both an advantage and disadvantage. On the one hand, small and medium-sized enterprises can, coupled with pronounced innovation activities, act flexibly (Regionalmanagement Erzgebirgskreis, 2017). Conversely, their small size also constitutes limitations for instance in exploiting size-related synergies (Habermann, 2007).

The unemployment rate within the county has been steadily declining and accounted, at the end of 2016, for 5.9%. Furthermore, the Erzgebirgskreis accounts for a high ratio of out-commuters, mainly to Chemnitz, Zwickau and neighbouring counties. Given the significance of manufacturing activities, the service sector is, compared to the Saxon average and other counties, less important within the Erzgebirgskreis (see Table 15). However, the Erzgebirgskreis is an important and attractive tourism destination, especially regarding winter tourism.

	share in value added (2015, in %)		
	(change since 1995 in %)		
	agriculture, forestry and fishing	industry and construction	services
Saxony	0,6 (-0,6)	32,1 (-1,7)	65,0 (2,3)
Erzgebirgskreis	0,9 (-1,1)	39,4 (4,2)	59,7 (-3,1)
Leipzig (city)	0 (-0,1)	20,9 (-1,6)	79,9 (1,7)
Görlitz	1,0 (-0,9)	39,8 (-4,2)	59,2 (5,1)
Nordsachsen	1,9 (-1,3)	30,5 (-7,3)	67,6 (8,6)

Table 15: Sectoral structure of regional added value (Statistical Office of Saxony)

5 Zooming in: Detailed Case Explorations

The central objective of this research is to gain a more profound understanding on the mechanisms that facilitate the emergence and drive the dynamics of innovation processes of firms located in peripheral regions. South Estonia and the Erzgebirgskreis serve in this research as exemplary study regions, reflecting the broad variety of regions that might be referred to (for analytical and operational reasons) as *peripheral*.

	NACE code	year est.	employees sales (t€) export ratio (%)	central features of innovation project
OSKAR (EE2)	10131: manufacture of other food products	1992	≈ 100 7,300 0	<i>'green label' assortment</i> <ul style="list-style-type: none"> • internal stimulus • single external partner; largely building on internal capacities • duration approx. 6 months
Nopri (EE4)	10891: manufacture of other food products	1998	11 (2)* 800 (80)* 0 (35)*	<i>birch sap</i> <ul style="list-style-type: none"> • external request • establishment of new company • multiple external actors involved • ongoing project
Nett (EE6)	16231: manufacture of products of wood, cork, straw	1998	38 3,600 99	<i>finishing/painting line</i> <ul style="list-style-type: none"> • internal process development • multiple external actors involved • duration approx. 2.5 years
Jakob Winter (ERZ2)	15120: manufacture of luggage, handbags, saddlery and harness	1886 (1991/ 2005)	32 5,800 -	<i>multi-functional bag</i> <ul style="list-style-type: none"> • external request • few external actors • internal capacity building • duration approx. 12 months
Norafin (ERZ3)	13300 manufacture of textiles: finishing of textiles	1995	160 32,000 75	<i>flax wallpaper</i> <ul style="list-style-type: none"> • internalisation of external idea • mobilisation of competence from preceding project • substantial organisational changes induced by new product
MÜHLE (ERZ6)	32910: manufacture of brooms and brushes	1945 (1990)	73 12,500 >70	<i>new product range</i> <ul style="list-style-type: none"> • internal idea • multiple external actors involved • expanding internal capacities • duration approx. 6 years

Table 16: Characteristics of case firms and innovation projects
 (* reflect data related to a new business established as part of the project)

This part of the dissertation looks at firms in these case study areas that have successfully implemented innovation processes in the past. The chapters in this part provide micro-level investigations which shed light on the practices and strategies firms mobilise as part of innovation projects. Three illustrative and information rich cases from each of the two study regions are presented – each case is synthesised and summarised as individual *event structure maps*⁴⁷. These case illustrations provide the opportunity to

⁴⁷ The main intention of *event structure maps* is to provide a visual and chronological synthesis of central actors, main events and spatial dynamics of innovation projects. Event structure tables, i.e. chronological orderings of events, actors, activities etc. in process investigations (Miles and Huberman, 1994; see footnote 25), are the basis of these project visualisations. Besides this ordering function, event structure maps specifically include reference to the spatial scales innovation projects involve.

address both analytical units of the integrated case design (see 3.2.2), innovation projects and the firm unit. Thus, each case description contains detailed sections on the concrete innovation projects investigated as well as elaborations on wider firm strategies and practices regarding innovation activities.

These thick descriptions are followed by brief reflections on the observed practices, strategies and relational configurations that underlie these investigated innovation projects and set the ground for subsequent analyses across cases and contexts (part 6). Table 16 summarises main characteristics of firms and projects illustrated in the following chapters.

5.1 Cases from South Estonia

5.1.1 OSKAR (EE2)⁴⁸

OSKAR, a meat processing company, was established in 1992 in the village of Saarepeedi in Viljandi County. OSKAR has around 100 employees and its sales of approx. 7.3 million Euros were exclusively generated in Estonia. OSKAR is a small player in the highly competitive Estonian meat market which is largely dominated by Finnish companies. Despite its small size, OSKAR claims market leadership in multiple product categories and has in the past frequently acted as a ‘*pioneer*’ (EE2_CEO), by introducing new products in niches that were eventually adopted by competitors and thereby diffused more widely. A recent strategic re-orientation has been a focus on high-price products, resulting in substantially increased sales, while processed quantities remained stable. According to the interviewees, OSKAR further differentiates itself from competitors in a number of ways, e.g. by rejecting controversial technologies (such as MSM)⁴⁹ or by manufacturing products with high meat contents.

DEVELOPMENT PATH OF ‘GREEN LABEL’ PRODUCT ASSORTMENT

The ‘green label’ refers to a product assortment free from artificial additives, first launched in 2009.⁵⁰ The development was mainly driven by two intertwined factors. First, a situation of fierce competition on the Estonian meat market, facilitated for instance by MSM technology as a common practice to achieve lower prices. Second, by a public discourse on more healthy and natural nutrition. Within this field of tension, products free of artificial additives were identified as a potential niche and considered a ‘logical’ progression for OSKAR, as the technological pre-requisites for such products closely aligned with OSKAR’s manufacturing practices:

‘As we have never used MSM raw material, our products have anyway a high meat content. Which is what you need to produce E-free products. If you have too much fat, water or starch there is no way to keep the product in one piece. [...]. So cleaning products from E-numbers was a logical next step for us.’ (EE2_CT)⁵¹

⁴⁸ This account is based on a joint interview with the company’s CEO (EE2_CEO) and chief technologist (EE2_CT). The interview was conducted in English.

⁴⁹ MSM (mechanically separated meat) is a method by which leftover meat scraps are harvested using mechanical tools to remove remaining pieces of meat from animal carcasses.

⁵⁰ OSKAR markets these products using a ‘green label’, which is placed visibly in green colour on the product’s packaging. The label says ‘E-vaba’ (translating ‘E-free’), thereby indicating renouncement of substances such as artificial colouring agents, preservatives, emulsifiers, stabilisers, flavour enhancers etc. which, if used, must be indicated as ‘E-codes’ on conventional products. The ‘green label’ is a marketing tool by OSKAR and does not have official recognition by Estonian regulative bodies.

⁵¹ Quotes in this dissertation, if containing 25 or more words, are presented as indented blocks. Otherwise quotes are integrated into running text.

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To produce green label products, OSKAR needed to acquire external technology, in particular natural substitutes for artificial additives and recipes for their application to start the development. Consequently, OSKAR went through an iterative consultancy process with different European suppliers, finally acquiring technology from a leading firm based in Germany. Key for successful product development was to combine the acquired technological tools with internal practical knowledge and experiences, in particular involving OSKAR's food technologists. Rather than acquiring a ready-to-use technology, substantial adaptations were necessary to meet the desired product specifications regarding taste, texture and visual appearance:

'We had to accommodate components and recipes to our conditions, and sometimes we got different results. So we had to find ways to get good results. [...]. We had to combine their knowledge and our knowledge [...]. We were testing every day to find out which compounds work. The components are not always working as sales representatives say, so you have to test and test all over again, which is time-consuming and expensive.'
(EE2_CT)

This iterative firm-internal process took about six months, at the end of which the first product was finalised. The 'green label' assortment was gradually expanded with each of the individual products requiring specific iterative circles. Product development was followed by marketing activities, including elaboration of suitable packaging, creation of the indicative 'green label' and, importantly, the process of building trust and authenticity with consumers:

'There was a certain discussion with our first product, also from the media. They didn't understand the E-free products. [...]. It was hard for us to get the customers to trust our product, it maybe took a year until people accepted the concept.' (EE2_CT)

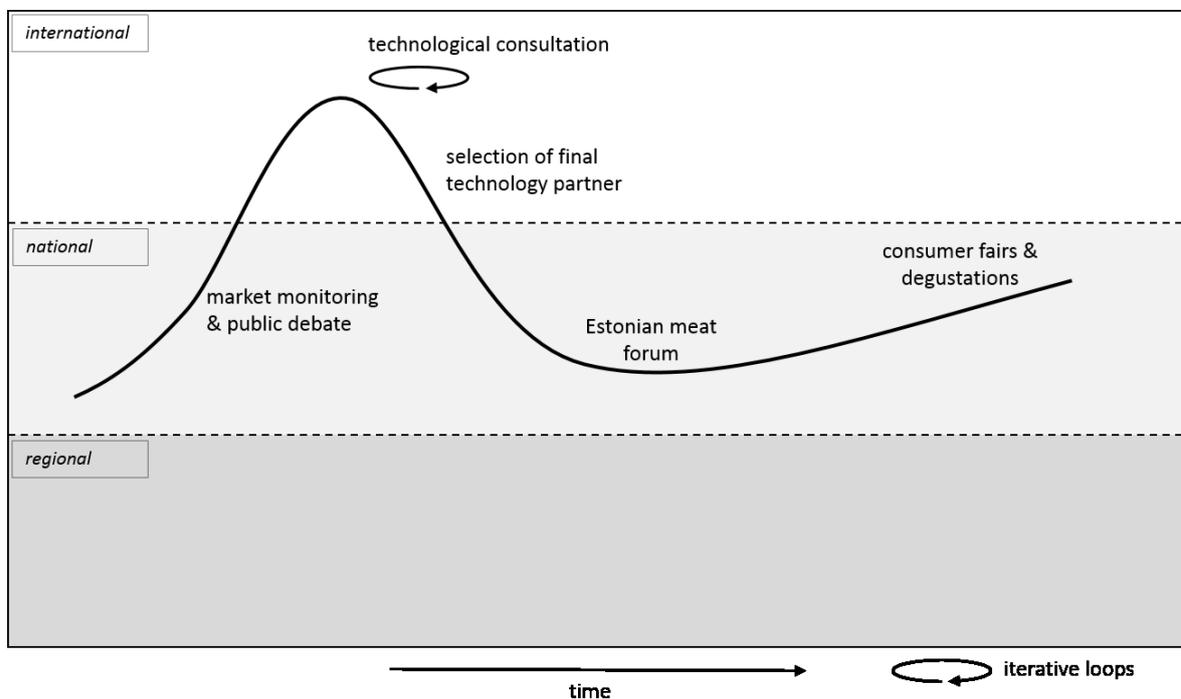


Figure 9: Project structure map of OSKAR's 'green label' development

The launch of 'green label' assortment coincided with a gathering of the Estonian meat industry, during which products were presented. According to anecdotes provided by the interviewees, competitors mostly reacted with incomprehension. However, this reaction illustrates OSKAR's mindful deviation from

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conventional industry practices, opening a particular market niche. As the interviewees report, most competitors have introduced their own E-free product range.

FIRM-LEVEL STRATEGIES

The 'green label' project illustrates the role of firm-internal, practical expertise for effective assimilation of strategically acquired external knowledge. Going beyond this development, the importance of internal expertise for innovation-related activities is also evident on the wider firm level. Besides emphasising the important role and experiences of specialised food technologists for product development activities, OSKAR's range of internal capacities relates for instance also to the construction of specific manufacturing equipment by its technicians. These aspects indicate that OSKAR draws on a comprehensive in-house manufacturing depth:

'We even build our equipment. We have excellent guys in-house who produce equipment for new technologies. Thereby we can test in smaller charges and make larger equipment for producing larger quantities later on.' (EE2_CEO)

Being exclusively active in Estonia, distance to its primary market Tallinn is described as somewhat problematic and associated with high transaction costs. At the same time it is crucial to be visible on the Estonian market, despite having only limited resources available for marketing activities. In this respect OSKAR's participation in national trade fairs (food and non-food related) and the organisation of supermarket degustations generates visibility and help to bridge distances to main markets:

'Trade fairs in Estonia are a good place for us to get in touch with end-consumers. There are lots of experts but also normal people who are simply interested in what we show. [...] The main reason for us to go to fairs is to catch the end-consumer.' (EE2_CT)

5.1.2 Nopri (EE4)⁵²

This innovation project has its origin in a small, family-owned dairy processing farm (Nopri) established in 1998. In 2015, Nopri had 11 employees and sales of 800,000€. It operates from Misso, a municipality with 800 inhabitants in Estonia's South-Eastern part. Nopri is an established brand in Estonia and its products (cheese, milk, yoghurt etc.) are stocked by all large supermarket chains. According to the interviewees Nopri has experienced a dynamic development and has been growing annually by more than 10%. Development plans for the dairy farm include substantial expansion of production, a shift to organic production as well as export activities. Besides its clear focus on the dairy business, small quantities of fermented birch sap were sold on the Estonian market since 2013 under the brand of the dairy farm. Thus, Nopri had first experiences regarding commercial harvesting and processing of birch sap. The birch sap project involved the establishment of a new company (Nopri Mahlad) in October 2015, exclusively dealing with sap related businesses.

⁵² This account is based on one joint interview with the CEO of the newly established company (EE4_CEO) and the owner of the dairy farm (EE4_OW) in 01/2016, a follow-up interview with EE4_1 in 11/2016 and one interview with the collaboration partner at the Tallinn based research centre (EE4_P1) in 04/2016.

DEVELOPMENT PATH OF THE BIRCH SAP PROJECT

Besides selling birch sap products on the Estonian market, in 2016 one third of the production was exported to European companies for further processing. Birch sap is a traditional beverage in the Baltic and Nordic states. Currently, new international markets are emerging as birch sap is becoming more widely recognised, especially in high-end health product markets, for instance due to its detoxifying and purifying properties (e.g. Caballero, 2013; EIP-AGRI, 2016). Such expanding commercialisation opportunities of birch sap are considered a potential for rural areas, as it offers a complementary activity to timber production (EIP-AGRI, 2016).

At the end of 2014, the dairy received a request by a German importer for producing birch sap on a larger scale. This request sparked processes during which Nopri took the decision to access international markets more widely and to establish a new venture exclusively dealing with the sap business. During this early stage of the birch sap project a local partner provided financial support and became co-owner of the new business. In this function, the partner is involved in strategic decision making and negotiations with (new) clients.

One of the first actions after Nopri Mahlad was established was to get the raw material organically certified. Organic certification, awarded by Estonian authorities in February 2016, is considered a strategic and essential step to position birch sap within health product markets as it ensures higher margins and a better position for negotiating contracts.

Alongside ongoing negotiations with international clients, collaboration with a research partner from Tallinn Technical University, specialised in food and fermentation technology (TFTAK), commenced. For this collaboration, existing links between Nopri and TFTAK were purposefully re-activated. Pre-existing contact eased this collaboration regarding a number of aspects. Nopri were aware of the technological and analytical capacities of TFTAK, furthermore it was considered essential to clarify expectations and to quickly establish a common base, thereby to facilitate effective collaboration, both content-related as well as interpersonal. Nopri describes the collaboration with the research centre as follows, indicating a clearly fruitful and positive relation:

'It is because of the partner I'm working with. He is just very knowledgeable and has lots of experience. He has been working on similar projects, like making Cider for instance. He takes things really serious.' (EE4_CEO)

The initial activities of TFTAK focussed on analyses to determine the biochemical properties of birch sap, needed by Nopri to handle incoming requests and to ensure transparency, especially regarding its specific health properties. Besides providing analytical results, TFTAK coordinated a grant application to access innovation funds by EAS (Estonian Enterprise). This initial collaboration provided common grounds for strategic follow-up projects, involving a more substantial grant application, again administered by TFTAK.⁵³

⁵³ Activities were funded via Enterprise Estonia (EAS under the EAS product development scheme: an 'innovation voucher' (worth 5,000€) and a 'development voucher' (worth 25,000€).

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'[Writing funding applications] is something we usually suggest. We know that small companies usually don't have enough money to pay for the analyses, so we just try to find some funding.' (EE4_P1)

Thus, coordination and management of funding proposals has been another major input by TFTAk and allowed to take the collaboration to a stage which would not have been possible without funding. In this sense, TFTAk not only provided analytical expertise but also experiences in writing projects. Securing funding for these applied research activities does, however, not only benefit research clients. It allows TFTAk to conduct research more comprehensively, thereby inducing competence building also at their end:

'They [Nopri] have clear questions and they want to have applied answers. But with this funding we also want to have some scientific findings. [...]. So in this case I am combining the two sides, the applied side and the scientific side. Maybe we'll publish something on birch sap. Because it's very new, there is not enough scientific information of birch sap around. So we might get results from the analyses that we can publish. And that's why I'm also writing these funding applications [...]. Publishing the results is an important element for our centre [...].' (EE4_P1)

These statements indicate that both partners have benefitted from a collaboration that brings together the individual and specific motivations of Nopri and TFTAk.

Birch sap was for the first time collected on a larger scale (130 tonnes) in spring 2016. This harvest required some crucial up-front arrangements and investments. Due to its limited shelf-life, fresh sap needs freezing after collection. A local company, specialised in processing berries and mushrooms, was approached to handle activities related to freezing and packaging raw birch sap. Since the initial target amount of 130 tonnes for the 2016 collection period⁵⁴ exceeded the own forest capacities of Nopri, local and previously-known partners were involved. Thereby, the birch sap project also exhibits a distinct local dimension that exceeds the organisational boundaries of Nopri. To avoid opportunistic behaviour at this stage 'local people that we know and trust' were preferably involved (EE4_CEO). This local dimension and the collaborative nature of sap collection is connected to distinct community potentials:

'It's good income for country people. In four weeks of the year you can make a considerable amount of money. So if birch water will be famous in future, then Estonian country people will be happy.' (EE4_OW)

Throughout the development path of the birch sap project several trade fairs were visited. While the dairy was exhibiting at Tallinn FoodFair, Estonia's main food industry event, contact to a South Estonian firm specialised in manufacturing organic food and beverages was initiated. Amongst others, this company produces organic lemonades from Estonian grown fruit, and as Nopri states: *'I realised we could maybe do the same thing with birch sap'* (EE4_CEO). Building on its diverse manufacturing experiences, the partner developed different varieties of birch sap lemonades (flavours, fruit contents etc.) which were adapted based on tastings with Nopri. The soft-drinks that resulted from this collaboration became available on the Estonian market in March 2016. Linked to the overall strategy of Nopri's sap business, this collaboration is considered crucial in multiple ways: it facilitated the development of own retail products

⁵⁴ target amount for the 2017 collection period were 300 tonnes.

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and, thereby, constitutes an essential piece of the strategy to deliver final retail products rather than raw birch sap to foreign market:

'It is more profitable for us to sell final products than raw material [...], which is why we try to develop different products at the same time. Maybe next year we will sell all birch sap we have as our final product and not just as raw sap. This is our aim.'
(EE4_CEO)

While the previous aspect illustrates that trade fairs might act as arenas to knit contacts, attending international fairs has also become increasingly important for Nopri Mahlad in terms of its marketing activities. At this stage, fairs have typically been frequented as visitors, seeking to generate visibility and to establish new contacts by informally approaching potential partners. During fairs in Amsterdam (05/2016) and Nuremberg (11/2016) both, new contacts to sales partners were established, and existing partners were met. Further channels used to generate visibility beyond Estonia are internet-related activities (website, blogging) and the establishment of the 'Estonian Birch Sap Association'. The association, in which Nopri Mahlad does have a leading role, seeks to join forces by creating a higher impact on international market through facilitating collective action by Estonian exporters.

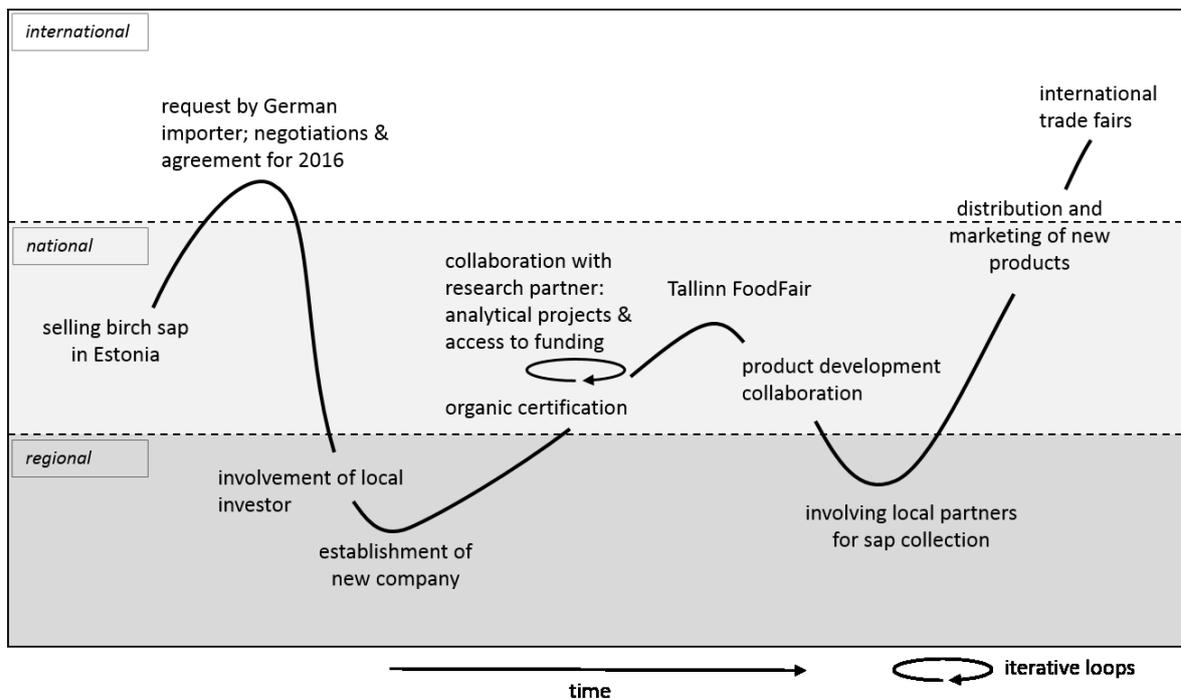


Figure 10: Project structure map of Nopri's birch sap project

The birch sap project is also subject to a number of challenges. One of these challenges relates to the fact that birch sap is a fairly new product, especially to international importers. While these aspects induce uncertainties regarding price and contract negotiations they also provide a source for organisational learning:

'Contracts are a problem. Birch sap is a new product for all partners involved. They don't know the right prices yet. Critical is also that the export partners don't know much about birch sap, they simply want to have it. [...]. So we also have to think for them. But I am sure we all will have more understanding next year.' (EE4_CEO)

For marketing sap products in Estonia, Nopri Mahlad draws on the established network of its mother dairy farm, which is considered an essential resource: *'The connections in the Estonian market, we all have them. The logistics to anywhere in Estonia, we had it. [...]. And the brand also, it is known in Estonia, almost everyone knows it. So it was easy for us to do the marketing'* (EE4_CEO).

5.1.3 Nett (EE6)⁵⁵

Nett was founded in 1998 and has been producing external wooden doors in Viljandi since 2002. Nett has experienced a gradual growth in both turnover and production which is mainly attributed to constant investments. At the time of the interview Nett had a capacity of approx. 10,000-12,000 doors per month. Its annual sales of about 4 million Euros were generated by some 40 members of staff and its entire production is exported, mainly to the UK, Ireland, Sweden, Germany and France.

INSTALLING A PAINTING LINE

Equipping the factory with a paint line can be seen as the next step in Nett's continuous development and growth path which is coined by a series of major investment projects. Installing a paint line constitutes a major process innovation for the company which, once installed, allows Nett to add painted/finished doors to its product portfolio and to increase its production capacity by 40% and turnover by 100% (projected) and, thus, to access higher value added product markets. These indications illustrate the overall scope of the project, which is further emphasised by outlining some of the wider changes the finishing line requires:

'The project contains a lot of additional processes. The finishing line is just one of the key parts but it also includes a lot of new equipment which we had to get into the factory in the earlier steps of the production. Handling panel material for instance, cutting the panels into required sizes, edge bending machines, glue presses. [...]. There was also the need to increase the factory size and also to improve the infrastructure in the factory, the supply and all sort of things' (EE6_GM). [...]. *'So it wasn't just a matter of buying a painting line.'* (EE6_DIR)

First discussions on the painting line date back to 2012 when existing customers *'indicated a certain need'* for finished doors. These indications were followed by intensified market research, mainly with UK based customers, to gain a better insights into the specifications of market needs as well as some trials and testing later on. During this initial stage, pre-production samples were presented at international trade fairs (France and Germany). Eventually Nett *'came to the understanding that it is a good potential for our type of factory to develop a product line which contains finished doors'* (EE6_GM).

Being primarily a manufacturer of unfinished doors, Nett was lacking knowhow regarding finished products. This lack of knowhow, coupled with the intention to install a painting line, resulted in the establishment of strategic collaborations through which relevant knowledge was sourced and thereby gradually built up within Nett:

⁵⁵ This account is based on one joint interview with the director/majority shareholder (EE6_DIR) and the general manager (EE_GM) of the company (02/2016) and one interview with the central collaboration partner (EE6_P2) representing an industrial paint distributor (04/2016).

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'We were not experienced in finished product manufacturing and didn't have the knowhow of paint materials [...] and didn't have a good knowhow about painting technologies. This was all very new to us [...] and we approached two paint producers to start discussions with them about paint materials that could suit our product and our market.' (EE6_GM)

While Nett initially consulted with two paint producers it was eventually decided to go ahead with one of them, a Tartu-based company (MV) and the distributor of a Finnish industrial paint manufacturer. Building on previous contact, the collaboration with MV developed into a fertile, ongoing and, thus, central link for the project. Based on frequent exchange with MV, Nett identified potential suppliers of paint lines and wider paint technology which were subsequently approached. Again, in the beginning three paint line manufacturer, all based in Italy, were approached, two of which were engaged by test runs and finally the one manufacturer deemed most suitable was selected to supply the finishing line. MV was an important consultant to Nett at this stage, mobilising their comprehensive knowledge on paint as well as drying technologies.

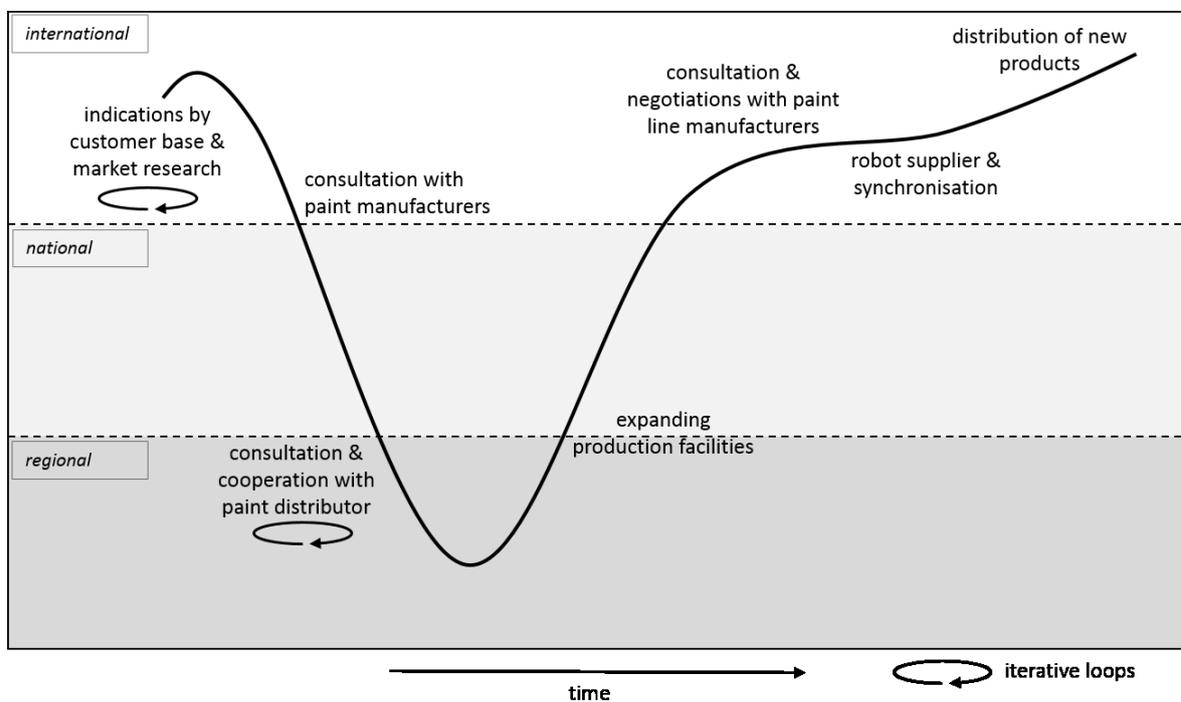


Figure 11: Project structure map of Nett's painting line project

An important element of the innovation project is Nett's decision to install a (more complex) water-based painting line rather than a conventional solvent-based line. This decision was informed by both environmental considerations (and meeting related regulations) as well as commercial considerations (being new for industrial applications, competitors mostly relying on solvents). At the same time, the decision added complexity to the project due to its deviation from industry standards (EE4_P2). However this additional complexity facilitated substantial competence building for both, Nett and MV: *'water-based has been a learning curve not only for us but also for the paint suppliers to match existing solvent-based paints in the market'* (EE4_DIR). Within this conglomerate of partners, technological requirements and strategic decisions the interview with key decision takers at Nett suggest that MV has acted as the most stable and most significant partner throughout the project. Besides technological consulting on various crucial aspects, MV has also taken on a mediating and filtering function, linking the project to a

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number of external actors. Specifically, MV coordinated contact to suppliers of critical equipment (e.g. drying equipment, spray equipment) and, importantly, also coordinated the development of a new paint generation, tailored to the requirements of Nett's water-based finishing line. Accordingly, MV describes its function as follows:

'It's like pulling the strings and bringing people together to help our customer to drive their project [...]. On my side there were some 20 people involved. Most of them were not directly engaging with Nett, but still involved in this project.' (EE6_P2)

Due to this central position of MV in the project's network and the associated need for frequent exchange and meetings, geographical proximity is considered an easing factor for the collaborations between Nett and MV. Towards the end of the project, some transaction-oriented interactions have been of importance. Nett decided to install an automatic rather than a manually operated finishing line and had to engage with an industry robot supplier. Furthermore, it was necessary to consult with software writers for synchronising robot and painting line. With both of these partners (based in the UK) Nett has collaborated in a previous robot project (the installation of a nailing robot).

FIRM-LEVEL STRATEGIES

Door production itself constitutes a rather stable industrial environment that leaves only limited scope for substantial product changes. Thus, Nett has frequently implemented process changes to maintain and increase its competitiveness. As the case of the finishing line illustrates, such process innovations can result in new products being added to the firm's portfolio. On a more general level, the Nett case provides a number of indications on how innovation projects are typically organised within the firm. On the one hand, innovation closely relates to market research and subsequent identification of specific needs and requirements. Market research, coupled with the vast and multinational industry experience of decision takers at Nett constitute crucial elements. Firm internally, Nett accounts for a comprehensive repository of knowledge and experience which is, if possible, strategically widened and expanded. On the other hand, Nett also mobilises specialist external knowledge by engaging in strategic partnerships. When previously unrelated partners whose capacities can upfront not be fully evaluated are approached, the strategy of Nett is to engage multiple partners with similar capacities.

'We will go to three for four different companies for the same item and we will listen to all of them but notice discrepancies. Therefore, we go back to the companies with a second round of questioning. [...]. And generally out of four companies there might be two that know what they are doing. [...].' (EE6_DIR). *'It develops over time. How they respond, what feedback they give, how they link into the development. Do they offer their help, do they provide samples, do they invest their time into your matters? You realise quite quickly who is responding and who is not.'* (EE6_GM)

Another important aspect links to the spatial dimension of Nett's innovation-related networking activities which have a distinct international orientation. This is portrayed as a necessity as specialised machinery and agents with practical knowledge about this specialised machinery is typically not available within Estonia (EE6_GM). Thus, consulting with international producers is required and induces high levels of (international) mobility of key personal. These indications highlight that the organisation of spatially proximate networks is not always a feasible option, even if the possibility to frequently meet and exchange personally is per se highly valued. Thus, as the description of the finishing line project suggests, finding

a regional partner through which access to further relevant and spatially dispersed actors is mediated appears a valuable strategy to balance the need to access dispersed specialist knowledge and the benefits of frequent and direct interpersonal exchange.

5.2 Cases from the Erzgebirgskreis

5.2.1 Jakob Winter (ERZ2)⁵⁶

The production site of Jakob Winther (JW) is located in the village of Satzung. Its roots date back to 1886 when the firm was founded in Schönbach (today part of Czechia) which belonged, until World War II, to an area considered a major centre of music instrument construction and production, referred to as *Musikwinkel*. Besides production of different suitcases and specialist cases, JW has retained a focus on producing cases for music instruments. The company experienced an eventful history since its first establishment, including relocation to the Rhein-Main area and integration into a large international conglomerate. Its current facilities in the Erzgebirgskreis were established in 1991. Following a management buy-out in 2005, JW operates under family ownership. Production is based in the Erzgebirgskreis while its headquarters are located near Frankfurt (Nauheim). In Satzung, JW employs some 30 people and generates a turnover of approx. 5.8 million€, much of which is generated through export activities.

DEVELOPING PATH OF A MULTI-FUNCTIONAL BAG

As stated by the interview partner, product development within the company primarily relates to customer needs: *'product developments always depend on what customers require'*. Due to comprehensive internal capacities such as technological expertise and production related know-how and experience, such requirements can be effectively met. The investigated innovation project originates from an external request by a large and previously unrelated furniture manufacturer based in Baden-Württemberg. Contact between JW and the furniture manufacturer was first established during a supplier fair for the furniture industry in Bad Salzflun, North Rhine-Westphalia. During this fair a loose exchange was established as the portfolio JW exhibited, e.g. moulded sound absorption parts, caught the furniture manufacturer's interest. About six months after this initial contact, JW was approached with a specific product development request. The furniture manufacturer sought to commission out development and production of a multi-functional bag/case as a complement to its modular furniture product range.⁵⁷ Based on this initial exchange and due to its diverse technological capacities and experiences JW was considered a suitable partner.

⁵⁶ This account is based on one interview (12/2016) with the technical director/production manager of Jakob Winter. Quotes were translated from German.

⁵⁷ The bag should primarily be developed for work-related uses, e.g. for people working in different office environments. The central idea was, that the bag should provide storage for all kinds of work-related items and utensils in a sturdy, case-like body. Specifications such as an adjustable side hollow should allow the bag to be easily attached to different kind of tables. Overall, it took about one year from first request to serial production.

5 Zooming in: Detailed Case Explorations

During this initial communication, product ideas and desired specifications were discussed *'in dialogue'* with the customer's product development department. Subsequently, a process during which the technical director of JW provided intense consulting, for instance regarding technological feasibility and materials, was initiated. During this iterative first stage, product specifications were elaborated, further substantiated and mutually negotiated:

'They had the idea of a modular solution but they did not have a precise design in mind. First, they had to get an overview on what we can offer regarding technology and material combinations. This has developed in dialogue and the customers appreciate that they don't have to approach us with fully elaborated product ideas. This is basically the consulting we provide.' (ERZ2)

This stage in the project was accompanied by an initial visit at JW's premises in Satzung. This visit facilitated exchange on the project, allowed for personal interaction as well as presentation of technological capacities, materials etc. which the interview partner considers indispensable for building a common understanding. Mutual visits were arranged as the project progressed. Besides mobility of key actors, samples were frequently distributed between partners, facilitating object-related interaction at different development stages and object-related feedback. JW provides for a high degree of internal diversification including complementary departments such as model and mould construction and a sewing unit etc. Consequently, JW could rely solely on firm-internal expertise throughout development project, only few production parts were sourced from external partners (such as a specific industrial tool).

As the development neared the end, project responsibilities at the customer-side moved from its product development to its purchasing department. Consequently, the interaction between actors became distinctively contractual towards the end, including strategic price negotiations:

'Once you are done with the developers, you have to grapple with the purchasers. Which is not easy when it comes to these large firms. Then, it is only about the price of the final product.' (ERZ2)

Consequently, a market-related routine between the firms, which succeeded joint product development, emerged. Within this routine, JW acts as an *'extended workbench'*, i.e. supplies different varieties of the final bag which is marketed and distributed by its customer. Despite this clear separation of tasks (production | marketing and distribution), JW has permission to exhibit the bag as part of their portfolio at trade fairs, which is considered an important showcase for communicating its diverse technological capabilities.

The interviewee highlights that this externally initiated project facilitated organisational learning and progress in multiple dimensions. First, the specific demands of the project induced technological advancement. Existing technologies were adapted, thereby expanding the range of technological expertise. Second, the project induced substantial changes in the organisation of production processes and routines. For instance, a fully electronic order system, until then not required, was implemented and substantially improved and modernised internal procedures. Consequently, the technical director considers the project a particular instance for comprehensive organisational progress. Overall, the project with the furniture manufacturer is portrayed as a successful collaboration – at the time of the interview a follow-up project between the partners was ongoing.

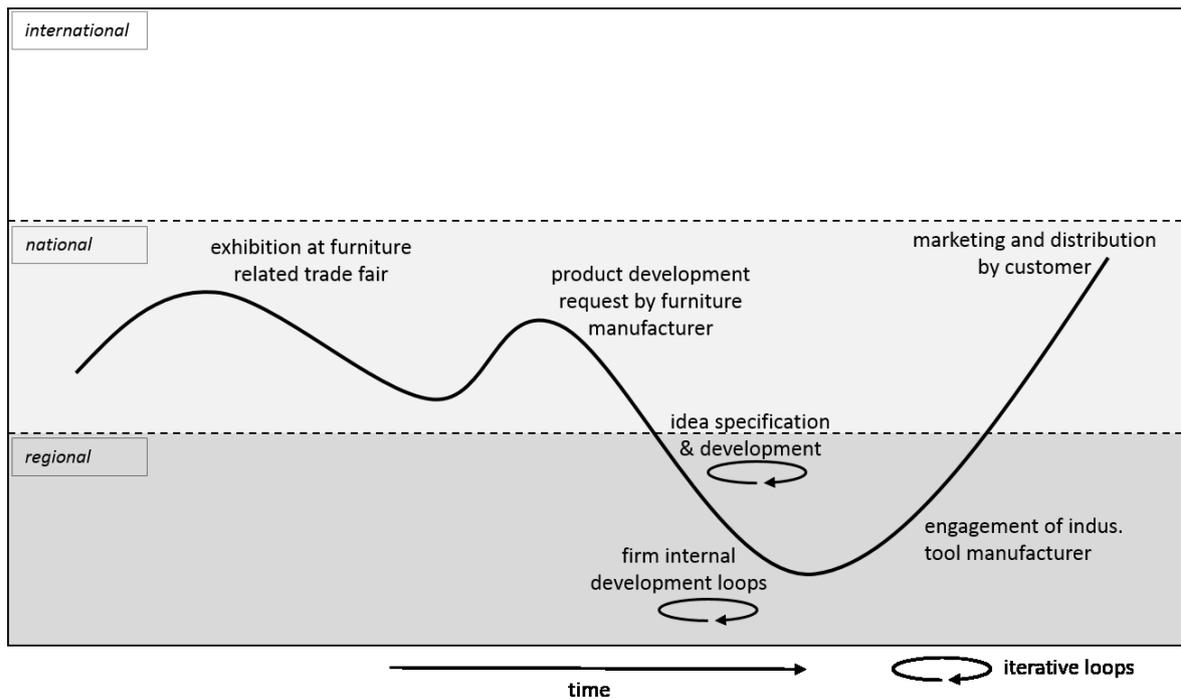


Figure 12: Project structure map of Jakob Winter's development project

FIRM-LEVEL STRATEGIES

One explicitly stated strategy articulated by JW is its focus on internal capacities, linked to its comprehensive repository of technological expertise, experiences and production routines: *'if possible, we want to have everything in our hands.'* Maintaining multiple complementary in-house departments supports this autonomy seeking approach, and reduces at the same time the need to engage in collaborations with external partners. Further, the high manufacturing depth directly relates to the capacity to respond to incoming requests. Thus, flexibility is at the core of the overall innovation approach of JW, in which creative responses to needs and requirements articulated by customers reflect the primary mode of innovation.

Besides this particular customer orientation, JW maintains ties to various research institutions such as the Technical Universities in Chemnitz or Dresden. In this respect JW frequently engages in formal research projects in which mainly application-oriented tasks are covered. A number of benefits of participation in formal research projects are mentioned by the interviewee. These projects generate additional income and facilitate in-house research activities which could otherwise not be conducted. Thereby, formal joint research projects substantially contribute to organisational learning, technological progress and overall competence development:

'We participate in such projects to get to know new matters. [...]. Such collaborations help us progress [...] and to get new ideas which we would otherwise not have. We get results from test series regarding materials that we use. In general it is always a fertile collaboration.' (ERZ2)

Another aspect that emerges from the Jakob Winter case is the role of trade fairs which the firm frequently uses as vehicles to generate visibility and to establish new, mainly market-oriented linkages. Trade fair participation supports its customer-oriented innovation mode by providing the possibility to establish ties from which new developments might originate and benefit more generally.

5.2.2 Norafin (ERZ3)⁵⁸

Norafin was established in 1998 in the municipality of Mildenaу which has a population of about 3,400. Norafin is a manufacturer of technical textiles and specialised in producing technical non-woven fabric ('Vlies') and composites which target industrial market segments such as filtration, performance apparel and further specialty applications. Norafin is listed as a 'Hidden Champion' in specialised sections of the technical non-woven fabrics market (Chamber of Commerce and Industry Chemnitz, 2015). Since establishment in 1998, the production site in Mildenaу was gradually expanded, reflecting Norafin's continuous investments and growth. Recently, a production facility was opened in the United States. At the time of the interview in 2017 Norafin had about 160 employees of which ten have R&D related responsibilities, sales of approx. 32 million Euros and an export ratio of about 75%. Norafin's internal capacities primarily centre on spunlace and needlepunch technologies, both of which were decisively developed by Norafin and research partners from Saxony.

DEVELOPMENT PATH OF 'FLAX WALLPAPER' PROJECT

The 'flax wallpaper' project has its origin in development activities that started in 2007 when Norafin was approached by a French consortium. The consortium was looking to develop flax based roofing membranes. Partners were a large textile research institute, a manufacturer of flax fibres and the potential customer of the roofing membranes. Norafin was contacted after initial and consortium-internal tests needed to be rolled out on industrial scale. Norafin's involvement relates to the initiative of the industrial partner in the consortium and can be linked to existing ties between the respective heads of the R&D departments.

At the time Norafin got involved in this project a first roofing membrane sample was existing. Besides running industrial tests, Norafin actively contributed to developing initial samples further, in collaboration with the project partners and by taking iterative commercial testing loops. Important during this phase were trouble-shooting activities by which emerging technical and production related issues (e.g. filtration, fibres, thermo fixation) were resolved, substantially due to Norafin's related manufacturing experiences. First commercial samples were available and practically tested by the consortium in 2009. However, these tests revealed severe technical and quality-related issues, especially regarding the roofing membrane's water-column. Related improvements of the water-column of the prototype were pushed forward mainly by Norafin and the flax fibre manufacturer, facilitating a close and mutually open collaborative relationship:

'There are always interpersonal aspects involved and we got along really well. It was fascinating, this company does flax since 200 years, which is not really a high end product. They were very visionary, open and solution-oriented. [...]. We continued close contact with them.' (ERZ3)

One critical result of their joint developments was that solving the quality issues would substantially drive final product price, which ultimately led to the termination of the project on cost grounds.⁵⁹ Despite the

⁵⁸ This account is based on one interview (01/2017) with the head of the R&D department, responsible for product development. Interview material was complemented with data retrieved from desk research. Quotes are translated from German.

⁵⁹ The development was not stopped altogether as iterative loops and tests were run in following years (2010-2014).

project's 'failure', Norafin as well as the flax fibre manufacturer, individually and jointly, came to the understanding to follow-up on flax-related developments as significant amounts of practical and technological knowledge, deemed have commercial value, were accumulated: *'we developed a new technology or adapted a technology so are able to process flax. So [we asked ourselves] how can we add value to this and we checked lots of options'* (ERZ3). Norafin was actively seeking for applications outside the building industry and, accordingly, realised some smaller projects, e.g. related to (and with partners from) composites, automotive, mattresses and surfing.

In 2013, and in close coordination with the French fibre manufacturer, the project of the flax wallpaper got further momentum. Essentially, flax wallpaper was an adaptation of the basic roofing membrane developed earlier on but, as the head of Norafin's R&D department clearly states, this specific product application was developed by the fibre manufacturer. However, Norafin was approached by the fibre manufacturer because it lacked the required production capacities and the wallpaper idea was, after a compensation payment, internalised by Norafin.

The innovative character of the wallpaper concerns a number of aspects. With its main component flax being a natural product, the wallpaper is marketed as a natural and sustainable product, generating a natural room atmosphere. Furthermore, the wallpaper retains the insulating properties of flax fibres and provides additional insulation on external walls as well as sound absorbing properties. Thus, in terms of product characteristics flax wallpaper is ascribed a high degree of novelty and marketed by Norafin as a first world development:⁶⁰

'The product is very innovative. Because we enter a market which has been very stable for YEARS. [...]. The market for wallpaper exists, but its functionality is very limited. Basically, it has always been the same, there are only few disruptive changes, but flax could be one.' (ERZ3)

The properties of the final wallpaper product were further substantiated by Norafin, facilitating the engagement of multiple new national and regional partners: partners for print and embroidery applications, a paper manufacturer for developing interior decoration features of the wallpaper and a partner who developed an eco-friendly glue. Importantly, the flax wallpaper project resulted in substantial changes of existing organisational routines within Norafin, especially regarding associated marketing activities.

To trigger market reactions, first prototypes of the wallpaper were presented at different international textile trade fairs in 2014. The official launch of the wallpaper in 2016 was preceded by various organisational changes at Norafin. New distribution channels had to be established as the wallpaper targets the end consumer while Norafin's remaining product portfolio targets industrial consumers. Thus, Norafin established an online shop to generate direct sales and, reacting to increasing interest of customers, a local showroom. Furthermore, Norafin also engaged in a sales cooperation with other businesses from the region in which a specialised sales person liaises with relevant customers and

⁶⁰ In August 2017 the flax wallpaper was awarded the third place in the innovation competition 'Saxon State Price for Innovation' (Sächsischer Staatspreis für Innovation).

performs *'product lobbying'* with potential key actors such as interior architects and other commercial customers. These aspects reflect that the wallpaper project not only related to a high degree of novelty in terms of product properties but further induced substantial organisational changes.

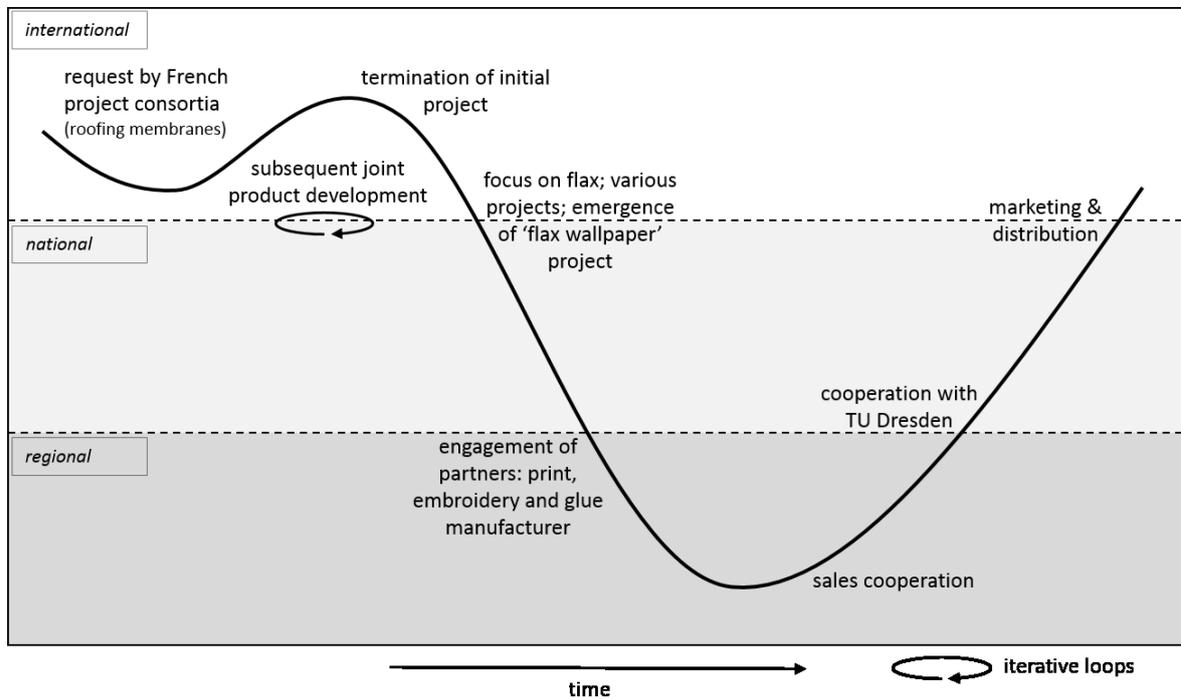


Figure 13: Project structure map of Norafin's 'flax wallpaper' project

More recently, Norafin took the strategic decision to develop a 'holistic' interior design concept including room dividers, ceiling panels etc. based around its distinct flax related competences in wallpaper and composites: *'we want to offer a complete package [...] and sell a concept. Not only wallpaper but also room dividers, ceiling panels and the like, so we create a consistent story'*. A strategic collaboration with a textile institute at Dresden University was initiated, aiming at following-up the flax theme as an emerging business segment in a more profound and structured way, involving a planned joint application for public innovation funding via the ZIM programme to initiate a formal research project.

FIRM-LEVEL STRATEGIES

In the context of innovation activities on the wider firm level the empirical material reflects a distinct strategy in the sense that Norafin maintains and seeks to expand specific *'development networks'* to relevant partners. Such innovation related networks are *'actively nursed'*, i.e. relate to substantial investments to successively build competence on future-oriented themes and projects. These relate to

'long term activities in which we want to secure the future and develop innovative products. Innovative in the sense of first-to-the-market novelties. With these projects we look into the future, want to be present on future markets.' (ERZ3)⁶¹

Because of their development orientation, these networks tend to primarily engage partners on national and international scales. Even though it is highlighted that also regional partners from Saxony play a role in these endeavours. Norafin pursues its innovation activities following a rather structured innovation

⁶¹ along these lines projects in the smart textiles field were mentioned, in particular energy related properties (generator, storage, transmission) of non-woven fabrics.

management approach, including the allocation of substantial financial and non-financial resources. These distinct ‘*development networks*’ are described in contrast to networks which Norafin maintains on a more regional/national level to facilitate (in)formal exchange on development and non-development related aspects with both commercial and non-commercial actors.

As regards the initiation of network ties, temporary formats such as trade fairs are important elements of Norafin’s practices. On the one hand Norafin explicitly utilised trade fairs as arenas to present its product portfolio and technical solutions and to generate visibility and new contacts. Additionally, trade fairs provide exchange opportunities with existing customers. On the other hand, Norafin specifically uses trade fairs to get in touch with potential research partners, to monitor and to identify technological developments that could be of commercial interest etc. Against the background its multi-dimensional organisation of networks, such formats fulfil a dual function and involve rather short-term rationales, e.g. presentation of products and technological portfolio, and long-term activities such as R&D related production and technological monitoring.

5.2.3 MÜHLE (ERZ6)⁶²

The company behind the MÜHLE brand was established in 1945 in the village of Hundshübel in the western part of today’s Erzgebirgskreis. After expropriation in 1972, the firm was re-privatised in 1990. At the time of the interview MÜHLE, initially manufacturing shaving brushes but now producing a comprehensive range of shaving accessories, had 73 employees, expected sales of approx. 12.5 million Euros and an export ratio of about 70%. Design quality, sustainability, manual production, family-ownership and a high in-house production depth are portrayed as MÜHLE’s main features and as crucial elements to maintain its leading market position. Over the past 7-8 years, MÜHLE has experienced a period of dynamic growth during which turnover trebled. These dynamics are, amongst others, linked to the strategy of gradually expanding in-house production depth and the exploitation of new marketing potentials offered by the internet. Accordingly, MÜHLE extensively uses online marketing channels and social media.

DEVELOPING PATH OF A NEW PRODUCT RANGE

The CEO and co-owner sketches innovation activities of the company as a ‘marathon’ during which various processes require coordination: e.g. monitoring and identification of market potentials and technological solutions, elaboration and implementation of design specifications etc. Typically, innovation within MÜHLE draws on extensive monitoring activities in technology and design related fields, without necessarily having a precise product idea in mind.

This case study investigates the development of a new product range. The origins of this innovation project reach back to strategic technology monitoring activities, lasting for 5-6 years. This monitoring was driven by intentions to reduce production costs and to widen sales opportunities by implementing

⁶² This account is based on one interview (02/2017) with the co-owner/co-CEO, mainly responsible for product development. Interview material was complemented with data retrieved from desk research. Quotes are translated from German. The presentation of this case was validated by the interview partner.

new technological procedures. As a consequence, metal injection moulding (MIM) replaced conventional machining methods in the manufacturing process of stainless steel parts and induced substantial cost reductions. Although MIM is a well-established method it is rarely applied for delicate design-oriented items – such as safety razors and shaving brushes. Accordingly, only a few companies master the complex technology, especially when it comes to delicate decorative applications.

As a result of extensive monitoring activities regarding the MIM technology, MÜHLE identified the leading company in the field, based in Baden-Württemberg. Subsequently, ERZ6 engaged in a loose and mutually open and rather long lasting technical consultation process, which involved repeated on-site visits in Baden-Württemberg as well as frequent coordination via telephone. At this early stage, practical technological consulting on the MIM method with a leading player, linked by MÜHLE to specific strategic interests, was crucial to become more comprehensively acquainted to this '*incredibly complex*' (ERZ6) technology and to identify its potentials for producing safety razors and shaving brushes:

'They showed me what is doable with the technology regarding decorative applications and I realised that this is indeed something future-oriented for us, potentially affecting wider parts of our product range.' (ERZ6)

Besides consultation on MIM related aspects, the partner also provides some first input on the basic construction elements a safety razor needs to have if the MIM technology is employed. These aspects illustrate the central role of technological consultation of this partner throughout early stages of the innovation project during which '*they disclosed a considerable amount of know-how*' (ERZ6).

Subsequently, it was decided to deploy MIM for the development of a new, stainless steel based product range. However, MÜHLE decided to not go ahead with the Baden-Württemberg based partner who provided initial technological consultation. Instead, MÜHLE decided to collaborate with a familiar local partner experienced in injection moulding, although rather conventional plastics-based rather than metal applications. This collaboration explicitly aimed at locally anchoring the new technology. The decision was guided by the rationale that proceeding with a local and familiar partner might ease mutual handling of upcoming issues related to the process of implementing the complex MIM method:

'We were very interested to establish the technology with a partner from the region [...]. Although they didn't know the specific method, they were very interested and we decided to go ahead together. [...] Because I see the potential for our wider product range, I thought it is good to proceed with a local partner. We are familiar with each other and we have short ways.' (ERZ6)

Collaborating with this local partner involved close and frequent coordination to find solutions for emerging technical issues. During implementing MIM and adapting the technology to the specific needs of MÜHLE's portfolio, this local technology partner consulted with external actors to source further expertise. Continuous joint efforts to tailor the MIM technology to the specific requirements, induced

successive learning which is regarded a major piece leading to the launch of the new product series in autumn 2016.

At some point in the process of adapting MIM technology, specifications of the new product series were further elaborated. At this stage an industrial designer from Meißen (Saxony), with whom MÜHLE has an established and trusted relation, joined the project. Having an established working relation to the industrial designer, based on previous joint projects, is emphasised as a facilitating attribute:

'The designer is a known partner and I appreciate that he always provides valuable input and provides lots of own ideas. [...]. And I have the feeling that he understands quite precisely what I want.' (ERZ6)

The industrial designer liaised with both MÜHLE for establishing design features and the technology partner to align these features with the new technology as using MIM necessitated newly designed components. Specifically, the designer's contribution to the project concerned the elaboration of the industrial design, thereby bringing in competences such as CAD and 3D-design applications. Coordination of these technological and design-related features between the different partners is described as a complementary 'ping-pong' game based on frequent and iterative exchange, eased by familiarity and rather short distances between the partners.

Overall, this comprehensive development project allowed MÜHLE's not only progress technologically, but at the same time to develop new products with specific usability features, new materials and a distinct, progressive design – thereby implementing a holistic approach to innovation. Besides these central partners with whom specific knowledge was mutually generated, the project further involved a number of rather market-related interactions. MÜHLE was approached by a supplier of birch bark, who provided a new material that was perceived as a distinct component for the new product range. The final partner, a manufacturer of specialised sand-blasting equipment based near Chemnitz, concerns the surface finishing stage in the production process. Instead of outsourcing the finishing process to this partner, MÜHLE, after consulting with the supplier, committed to a substantial investment and integrated the technology within the firm, thereby further expanding its specific in-house production depth. Figure 2 provides a synthesising structure map of the innovation project's development path.

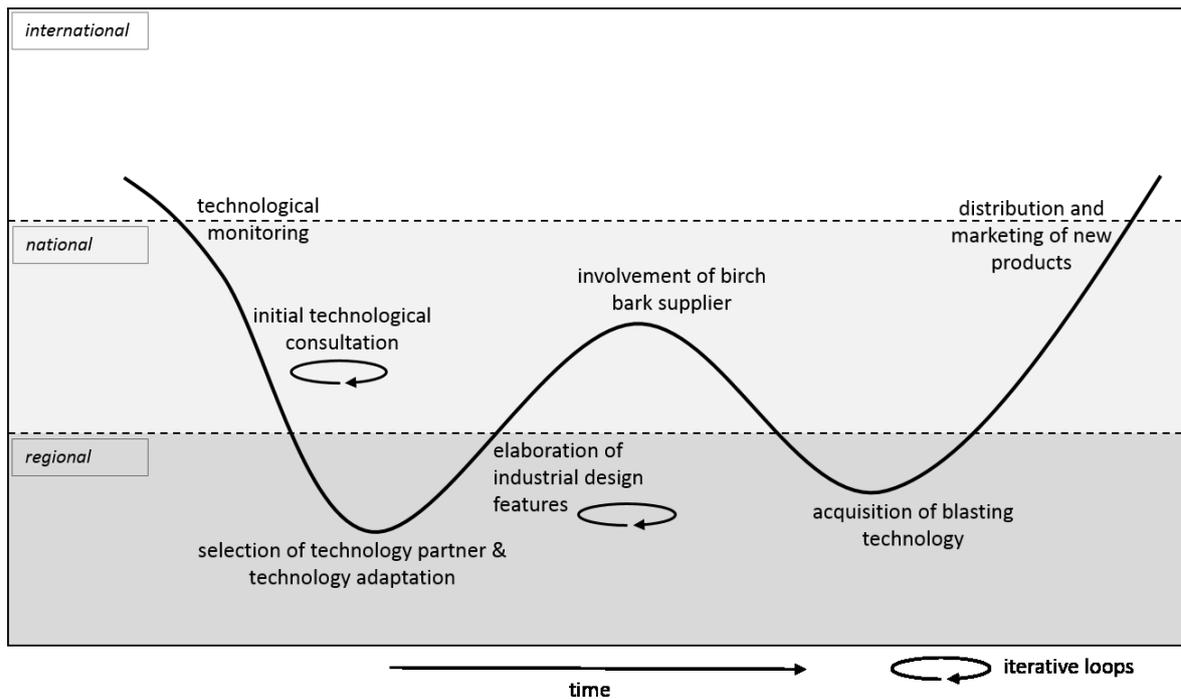


Figure 14: Project structure map of MÜHLE's product range development

FIRM-LEVEL STRATEGIES

Going beyond this specific innovation project, the case provides further insights regarding wider innovation-related firm strategies. The interviewee identifies physical distance to larger cities/main markets, considered central for marketing activities but also as sources of design-related inspiration, as latent shortcomings for firm innovation:

'If our production were in Leipzig or Berlin, a lot more would be feasible in terms of co-operations, we would have more buzz in our showroom, we could host cultural events in our production facilities. This is more difficult here.' (ERZ6)

To compensate for these specific shortcomings, MÜHLE adopted a number of strategies that relate to its firm network. First, comprehensive activities in terms of virtual and (social) media marketing were initiated, including an online-shop, presences on Facebook and Instagram and a company magazine. Second, as a major piece of its marketing strategy in 2014 MÜHLE opened a flagship-store in Berlin, constituting in itself a significant organisational innovation by which market distance is reduced: *'With the flagship store in Berlin we can reach people a lot easier and present as well as transport our brand very differently'* (ERZ6).⁶³ Additionally, high levels of mobility and membership in networks and initiatives, such as the 'Association of German Manufactories' or the 'German Design Council', ensure co-presence and exchange with relevant actors, customers and suppliers, as well as influx of inspiration and ideas from various fields. At the same time, however, MÜHLE's location in the Erzgebirge plays a

⁶³ Following Maskell's (2014) conceptualisation, this flagship store can, although being primarily a marketing tool, be understood as a *'listening post'*. Such an 'observatory', purposefully established as a local presence in one of the most relevant hotspots for ERZ6 (Berlin), offers the potential to identify relevant knowledge and informal information (e.g. specific demands, trends, perceptions etc.) directly from consumers and industry players. It thereby ensures identification of relevant developments in the market.

crucial role for brand identity and authenticity, succinctly expressed by the interviewee as follows: *‘for me, MÜHLE only works here in the Erzgebirge, separating the two is somewhat unthinkable’*.

5.3 Interim summary and case reflections

These detailed case descriptions of specific innovation activities as well as wider innovation related strategies of firms in peripheral regions indicate a number of aspects that will be discussed more thoroughly in the following cross-case and cross-context analyses (part 6).

These particular cases were selected for detailed illustration because they reflect the heterogeneity of cases investigated in this dissertation and, therefore, provide an insight into the variety of innovation processes related to actors from peripheral regions. The illustrations comprise of cases (Nopri, Jakob Winter, Norafin) in which the initial project stimulus originates from external actors and were proactively and productively acted upon by case firms. Contrary, the cases of OSKAR, Nett and MÜHLE illustrate internal dynamics as the primary mode for the emergence of innovation projects - coupled however with implicit market interactions e.g. through market research activities. Furthermore, the detailed biographies comprise of both product and process innovations, as well as distinct combinations of the two. These projects reflect different degrees of novelty and resulted in first world or first market novelties (e.g. flax wallpaper, green label products) as well as rather low degrees of novelty which have, however, induced substantial organisational changes and capacity building (e.g. painting line, multifunctional bag).

Looking at individual dyads and networks between actors that underlie these specific innovation projects highlights further variety. Most of the linkages realised as part of the projects relate to commercial actors which, nevertheless, reflect both knowledge-oriented ties based on mutual partnership and engagement as well as transaction-oriented ties such as acquisition of technology and parts. Even though ties to research partners have been identified in only two of the cases (Nopri – TFTA | Norafin – French partner, TU Dresden) it can be suggested that these have turned into pivotal links in associated projects. Regarding the spatial organisation of project networks the detailed descriptions provide certain indications that project networks of firms from South Estonia seem to have a particular international orientation. While each of the projects involved at least one international partner, only the flax wallpaper project (Norafin) in the Erzgebirgskreis engaged international partners. Accordingly, regional and national contexts appear to be of particular importance for case firms from the Erzgebirgskreis in terms of (project) networks. Furthermore, Nopri and MÜHLE reflect immediate implications of innovation projects for local environments by strategically engaging partners to promote local capacity building (MÜHLE) and local value creation/income (Nopri).

Configurations of these networks with respect to multi-dimensional types of proximity and distance indicate their multi-layered nature. Contacts to relationally proximate and distanced partners are activated and, thus, act as particular drivers of project networks. Social proximity plays an important role and drives network formation and dynamics by establishing proximity in initially distanced dyads. Likewise, institutional and cognitive distances act as productive elements in innovation projects. Such distanced relations are in a certain way mediated by geographical closeness between partners. The detailed

biographies suggest that geographical proximity to partners is typically appreciated and desired, but not always given and feasible. The accounts reflect particular instances of geographical proximity that are both permanent and temporary in nature. If co-location with partners in projects is not given, actor mobility plays a critical role in all of the six projects to facilitate interaction and exchange, tie formation, trust building, learning, observation, marketing, etc. For these purposes actors frequently reach out of the environments in/from which they operate. Two of the detailed projects (Nopri | Jakob Winter) draw upon linkages initiated during trade fairs, thereby reflecting buzz-related elements of these settings through facilitating spontaneous as well as purposeful tie formation.

These latter aspects of network related practices and temporary organisation of networks in geographical terms highlights the distinct multi-local nature of these innovation projects. Consequently, the projects cannot be tied to any single particular location and organisation but, rather bring together different locations and scales. This multi-local nature is embedded within project networks in which mobile actors exchange information and artefacts over distance and in proximity, generate fluid knowledge and, thereby, produce and reproduce distinct multi-local configurations as part of innovation activities.

Going beyond the networking logic, the cases further reflect the pivotal role firm-internal capacities seem play for the innovation activities of firms from peripheral regions. Firms such as OSKAR, JW, Norafin and MÜHLE use their comprehensive internal expertise repositories to internalise external knowledge and to act flexibly and independently. Thus, the cases reflect that internal capacities act as both, complements to networks as well as elements that reduce interaction needs.

In terms of methodological reflection it can be said that the accounts, constructed by mobilising the actor-centred innovation biographies approach, bring to the fore actor practices, strategies, decisions and associated motivations which underlie and drive innovation projects and network formation. Adopting rather structural methodologies for studying innovation, e.g. analyses on patents or R&D expenditures, these particular aspects and dynamics would largely remain invisible.

6 Zooming out: Cross Case Analyses

6.1 Emergence, types and dimensions of innovation projects

This chapter provides cross-case analyses on the 26 innovation projects investigated as part of this research. Its first section focusses on the early phases and identifies mechanisms that facilitate the emergence of innovation projects (6.1.1). Section 6.1.2 provides an aggregate picture on the types and dimensions of innovation projects and discusses related implications. The chapter illustrates that firms proactively generate innovative ideas and initiate related projects within the boundaries of their organisation. Additionally, analyses point towards the significance of mechanisms whereby firms participate in external projects. The latter mechanism requires firms to actively act upon and exploit emerging opportunities.

6.1.1 Emergence of innovation projects

This section analyses constellations that facilitated the emergence of ideas and their implementation as innovation projects. The investigated projects suggest that internal and external ideas provide stimuli for innovation. Importantly, this section illustrates that both dimensions facilitate organisational learning and capacity building.

In eleven of the investigated innovation projects (42%) the initial impetus links to firm-external actors and processes.⁶⁴ If the initial stimulus emerged from within firms, case firms were also focal firms, i.e. the central coordinating organisation of associated projects. Conversely, if projects were externally induced, firms participated as partners, covering multiple tasks/functions/activities, for instance regarding their specific capacities. These constellations emphasise the division of tasks innovation activities typically relate to and mediate by engaging multiple actors. Interestingly, in a number of externally induced projects, development activities were internalised by firms, thereby becoming central to project coordination. These observations confirm the differentiated mechanisms described as the open innovation model (Chesbrough, 2003). Approaching innovation projects from a network perspective highlights functional and spatial divisions: organisations as well as their home regions might be starting points, transit stations or preliminary and final destinations of innovation processes (Schmidt et al., 2018).

FIRM-EXTERNAL IMPETUS

External stimuli for innovation originate from private and public actors and relate to precisely formulated as well as more general requests which facilitate joint action. Innovation projects induced by requests from private companies (EE1, EE4, EE8, EE10 | ERZ2, ERZ3, ERZ5, ERZ7, ERZ9) are typically linked to commercial interests and strategies of external firms. While conducting own innovation activities, these firms purposefully search for appropriate collaboration partners to provide complementary expertise.

For instance, ERZ9, a textile manufacturer, was approached by an existing customer with a precisely formulated request to produce a technical fabric for use as chilling cabinet isolation panels. At the time of the request, specifications of the fabric were largely determined. ERZ9 was not directly involved in

⁶⁴ EE1, EE4, EE8, EE10 | ERZ1, ERZ2, ERZ3, ERZ5, ERZ7, ERZ9, ERZ11

elaborating the specifications but handled the request regarding technical feasibility, sample production etc. Rather than facilitating an intense collaborative process between ERZ9 and its customer, the request was linked to a specific task: supply of an insulation fabric with required specifications. Thereby, the existing supplier-buyer relation was reproduced. The initial stage of the birch sap project (see 5.1.2) exhibits similarities. Here, EE4 was approached by a previously unrelated international importer and responded to the request by delivering raw sap in agreed quantities.

Conversely, the sample contains multiple cases (e.g. EE1 | ERZ2, ERZ5, ERZ7) in which external requests facilitated collaborative processes. Here, firms were approached with rough ideas, open to be co-developed and thereby allowing to go beyond mere fulfilment of requests. Thus, firms participated in external developments not merely as providers of knowledge, expertise and capacities but as central consultants. Even though some of these projects eventually resulted in supplier-buyer relations, mutual collaboration has been a central factor.

Developing a multifunctional bag on request by a furniture manufacturer (see 5.2.1), ERZ2 provided extensive consulting regarding design elaboration, materials, product finishing and production routines. Likewise, ERZ7, a metal manufacturer, was approached by a partner from a previous joint project with the idea to develop a metal sheet under-construction for solar panels. Although the idea was externally initiated, it was substantially advanced by ERZ7 which eventually took over the lead in this project, resulting in securing public funding to systematically investigate the idea as part of a formal development project (ZIM project). The case of ERZ7 suggests that external ideas and stimuli can be anchored within organisations and regions. Jointly, ERZ2 and ERZ7 (along with ERZ3 and EE1) illustrate that external requests can facilitate the emergence of collaborative and reciprocal ties, going beyond mere market related arrangements.

Besides stimuli for innovation originating from commercial actors, public institutions such as research bodies and network consortia also provide for such stimuli (ERZ1, ERZ11). In these cases, initial ideas were mutually and collaboratively advanced with partners. ERZ1, a sportswear manufacturer, was contacted by TU Chemnitz, which at the time coordinated a research project on functional workwear. Involving ERZ1 was mainly due to its technological capacities (e.g. industrial knitting) and mediated by membership in a regional textile network (INNtex).⁶⁵ ERZ1 emphasises that participation in such external projects is considered a valuable opportunity to deeply engage with specialised themes and, thereby, to build new capacities. Similarly, ERZ11 became partner in a project related to the 'BioEconomy' cluster consortia.⁶⁶ The goal of the project, coordinated by TU Dresden, is to develop beech wood pipes and related applications. The role of ERZ11 relates to elaboration, optimisation and adaptation of technological processes and specifically to wood preparation and processing, bending methods etc. While covering specific tasks, ERZ11 closely collaborates with University partners, whereby the direction of

⁶⁵ The network (INNtex – Innovation Netzwerk Textil GmbH) brings together textile-affine actors such as universities, research institutions, firms and intermediaries mainly from Saxony.

⁶⁶ The BioEconomy Cluster is a Leading Edge Cluster of the German Federal Ministry of Education and Research, striving to connect industry and research for collective work on material and energetic applications of non-food biomass products (<http://en.bioeconomy.de/> (accessed: 30.10.2017)).

the project is jointly shaped. This collaboration has facilitated a follow-up project and, at the time of the interview, a third project proposal was in preparation.

external impetus originating from	
commercial actor (e.g. customer)	research partner/consortia
<p><i>'concrete'</i> request</p> <p>specifications largely determined, limited scope for joint developments; (re)producing buyer-supplier relations</p> <p>EE4, EE8, EE10 ERZ9</p>	<p>---</p>
<p><i>'open'</i> request</p> <p>initial idea formulated but specifications not determined; scope for joint developments; facilitating collaborative ties and buyer-supplier relations</p> <p>EE1 ERZ2, ERZ3, ERZ5, ERZ7</p>	<p>external project with research partner(s); initial idea formulated but specifications not determined; scope for joint developments; facilitation of collaborative ties</p> <p>ERZ1, ERZ11</p>

Table 17: Actors and dimensions of external innovation impetus

Table 17 groups projects that originate from requests by external actors and provides a stylised syntheses on their characteristics and implications. The investigated cases suggest that requests related to high degrees of openness tend to induce collaborative constellations, while rather concrete requests result, at least for the cases investigated, in buyer-supplier relations.

This analysis illustrates that external requests act as important innovation facilitators. Firms, not only but also, from peripheral regions benefit from such requests and subsequent participation in external projects – or might in fact internalise projects. Against this background, it appears critical to shed some light on the mechanisms that underlie these requests, i.e. activities and practices that allow firms and regions to benefit from and exploit such external requests. The cases illustrate that a mutual past, i.e. a certain degree of social proximity, between the partners involved plays an important role. Existing commercial and/or collaborative relations generate a certain degree of familiarity and, thereby, ease cooperation. However, external requests also originate from previously unrelated actors (EE1, EE4 | ERZ2, ERZ5, ERZ7). In this respect, visibility of firms and their specific capacities appears an important lever. Firms need to be in the position to be identified by external and unrelated actors as potentially suitable partners. In this respect company websites constitute a crucial platform to demonstrate product and competence portfolios. Likewise, formats such as trade fairs support visibility building and might generate immediate effects (ERZ1, ERZ9).

FIRM-INTERNAL IMPETUS

Firm-internal processes represent the second dimension for the emergence of initial ideas.⁶⁷ However, the internal dimension might indirectly be coupled with the external dimension, e.g. through activities such as monitoring and market research as well as feedback and demand indications by customers/suppliers. Information gathering and market observation allow firms to identify new market needs:

'There were discussions within the association on how to minimise costs. One aspect came up from there which got us thinking: if we could make similar kinds of houses and technologies with machines. [...]. This was the main catalyst. We have been active on the Norwegian market [...] and saw that there is a market for this type of different product.' (EE5)

'We had a few customers who have indicated a certain need for finishing. [Later on,] we came to the understanding that there is a good potential for us to develop a production line which contains finished doors.' (EE6)

Besides direct interaction with relevant players, extensive and long-term monitoring activities were identified as important mechanisms. For example, with the intention of new product development ERZ6 conducted extensive monitoring in technology and design related areas. The origin of the new product range (see 5.2.3) can be traced back to long-term technology monitoring that lasted for 5-6 years, driven by intentions to reduce production costs and to widen sales opportunities by adopting new technologies. Similarly, the development of a new product assortment of 'clean' meat products by EE2 (see 5.1.1) was facilitated by public debates on more healthy nutrition. EE12 (smart packaging) and ERZ13 (age appropriate furniture) are further cases in which strategic monitoring allowed to identify shifting consumer preferences resulting in the emergence of innovation projects. Efforts to improve technological and organisational processes through efficiency gains and cost reduction, were identified as further internal drivers of (primarily process) innovation (EE9 | ERZ4).

In both study areas, I have also investigated newly established firms (EE3, EE4, EE8 | ERZ8, ERZ10). For these, a set of intertwined mechanisms was identified, relating to aspects such as implementing a social enterprise (ERZ8) or entrepreneurial self-fulfilment coupled with the identification of new market segments and niches (EE4, EE3, EE7 | ERZ10). These start-up cases reflect a large degree of intrinsic motivation to start and advance own businesses. The process of establishing a company is rather long term and combines various personal motivations and considerations. The founder of an enterprise that produces crisps from locally grown vegetables summarises his motivation and the process preceding firm establishment as follows:

'First of all, I started to serve chips to the customers in our pub [...]. At this time, it was all very new and freshly made and I was producing the chips only in a small fryer. The customers liked it and the chips turned out to be popular. So I thought I could also pack and sell them – which is when the idea emerged to produce them on a bigger scale. This was in 2012 [...] and in 2014 I started the company' (EE3).

Likewise ERZ10, a company assembling metal sheet furniture, provides an insight on how the initial idea transformed into a business:

⁶⁷ identified for: EE2, EE3, EE5, EE6, EE7, EE9, EE11, EE12, EE13 | ERZ4, ERZ6, ERZ8, ERZ10, ERZ12, ERZ13.

I always had a certain design affinity and at some point we had the idea to build furniture, combining wood and metal elements. We have experimented a lot, but weren't thinking about establishing a company. It was only in 2011 when we first thought we could do this, because friends gave us really good feedback, saying they would also like to have this furniture. [...]. It was only in 2014 when we set the company up.

6.1.2 Types and dimensions of innovation projects

Tables 10 and 11 (see 3.4.3) illustrate central features of investigated cases. This section analyses and reflects upon the variety of cases regarding types and dimensions of innovation projects. The study's sectoral focus on LMT manufacturing and the heterogeneity of individual LMT industries might partly explain this variance. As the empirical base of this project does not claim representativeness, differences across study regions should not be overemphasised. Rather, this section highlights variety and complexity of innovation projects firms from peripheral regions conduct and engage in.

TYPES OF INNOVATION PROJECTS

The vast majority of projects investigated in both study areas were product innovations. 22 of 26 projects.⁶⁸ However, the process perspective adopted in this research illustrates that a clear-cut analytical separation between product and process innovation cannot always be maintained. It can instead be observed that developments through which new/improved products and processes are generated overlap.

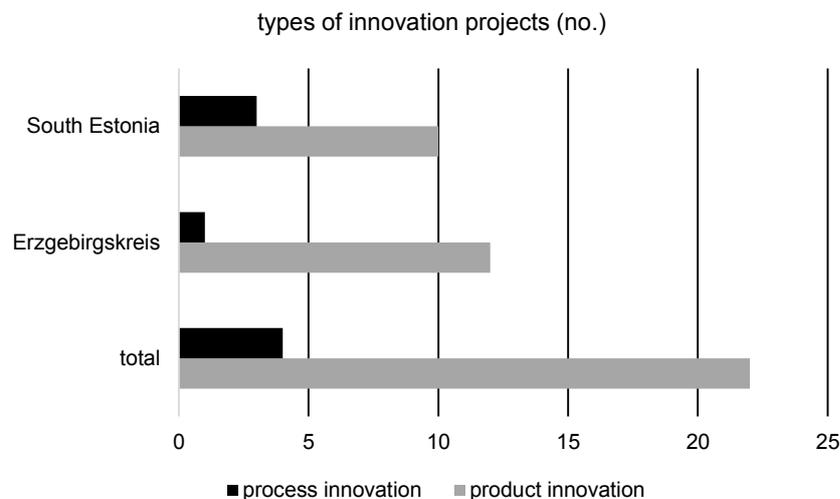


Figure 15: Types of investigated innovation projects

For instance, to be able to produce finished doors EE7 had to develop and install a painting line, which constituted a major change of technological processes within the firm. Likewise, to establish a new product range, ERZ6 had to identify, understand and implement a completely new production technology. Conversely, product developments might induce downstream process innovations – technological and

⁶⁸ This distribution might be driven by the overall approach to case selection (see 3.4.3). Cases were partly selected based on upfront identification of innovative products (processes were not identified upfront). Besides having a particular project identified prior to the interview, a strategy was also to let the interviewees decide which project to choose for the interview. In this respect, I have observed that the interviewees preferred to focus on project rather than process novelties. Additionally, start-up cases in the sample draw on a central product. Thus, this particular distribution does not suggest that product innovation is the dominant type to be encountered in peripheral regions.

organisational ones. Two firms from the Erzgebirgskreis, due to specific product developments of flax wallpaper (ERZ3) and age appropriate furniture (ERZ13), tapped into end-consumer markets and, consequently, needed to expand existing marketing and sales channels. In these cases product development triggered the emergence of new sales instruments such as web-shops, showrooms and the initiation of strategic sales co-operations. From an organisational point of view, such ancillary changes might be perceived as innovation processes in itself. Likewise, the newly established firms investigated reflect the connections between different types of innovation. The establishment of new ventures not only draws on the development of a central product, but requires at the same time the establishment of diverse organisational structures. When analysing innovation processes it is important to adopt methodological procedures that enable observance of such wider changes which contest the analytically neat but practically often imprecise dichotomy between product and process innovation. Figure 16 illustrates the connection between different types of innovation.

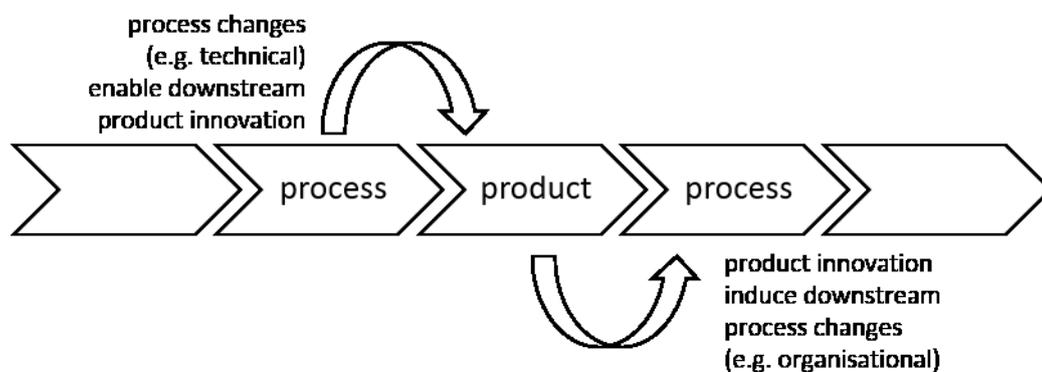


Figure 16: Sequences of innovation

DIMENSIONS OF INNOVATION PROJECTS

While the distribution of innovation types might be partially driven by the study's selection approach, the variance encountered in the dimensions of innovation projects transports an important message: firms in peripheral regions actively pursue and participate in innovation projects that range from incremental projects to first-to-the-market projects with potentially disruptive implications for organisations, industries and markets. However, positioning individual projects on the spectrum that depicts their degree of novelty can only be an approximation.⁶⁹ Independent of their novelty degree, innovation projects induce organisational learning and capacity building.

The incremental nature of some projects was overtly indicated by interviewees. For instance, changes in manufacturing routines following complaints by a key customer is described by the sales manager of a large Estonian timber processor as follows:

⁶⁹ Assessments regarding a project's degree of novelty in this research primarily ground on narrations and information provided by interviewees, coupled with verification efforts as part of triangulating, document and media analyses.

6 Zooming out: Cross Case Analyses

'We implemented these changes, [...] started the formal sawing pattern and got positive feedback on it. So now we are working without a problem. I don't know if you can call this an innovation?' (EE8)

Although pointing out the small scale of these changes, in total the project lasted for 4-6 weeks, these changes induced substantial technological improvements:

'This [the changed manufacturing routine] is a widespread standard for us now. We are able to follow up what kind of sawing pattern was used and we don't have such problems at all anymore. And we are more conscious of the problem and the reason for it.' (EE8)

Likewise, the co-owner of a newly established company describes its central product, furniture made of iron sheet, in a way that indicates only a low degree of novelty. However, highlighting at the same time the dynamic direction of the new business:

'We have not invented this kind of furniture. There are other companies in Germany producing iron sheet furniture. So we are no inventors, that needs to be said. But, of course, we have our very own style. [...]. We continue to progress and are not static in the sense that our products stay the same. We always have new ideas and try to develop one or two new models every year.' (ERZ10; similar: EE3, EE4, EE7 | ERZ8)

On the other side of the spectrum are projects that imply more radical changes. The Estonian cases provide for an example in which the introduction of meat products free of artificial additives set a new industry trend:

'The products were new for Estonia, but not new for the world. [...]. We have been pioneers for long years. Now everybody is doing these products, but we have been first let's say.' (EE2)

The introduction of a flax wallpaper by a technical textiles manufacturer is described to potentially affect (maybe even disrupt) the entire technical textile industry:

'The product is very innovative. Because we enter a market which has been very stable for years. [...]. It is hard to enter a market with a new product in the sense that it does not yet exist. The market for wallpaper exists, but its functionality is very limited. Basically, it has always been the same, there are only few disruptive changes, but flax could be one.' (ERZ3)

With respect to project duration, the empirical material provides scope for some generalisation as project duration and degree of novelty seem to correlate: the longer firms maintain projects, i.e. the more resources (financial, time, man-power etc.) they invest, the higher the degree of novelty tends to be.

6.2 Project networks: characteristics of linkages and spatial organisation

The descriptive analyses in this section provide an overview on structural elements of investigated project networks. Analyses draw on quantifying network data collected as part of the narrative interviews with firm representatives. Consequently, this chapter should be considered a complement to the qualitative analyses presented in part 5 and the following analytical chapters (6.3 – 6.6).

In line with the conceptual framing of network characteristics (see 2.1.1) this chapter categorises dyads between actors according to linkage type (inter-firm and extra-firm) and nature (trade-oriented and knowledge-oriented). Furthermore, the spatial organisation of network linkages is analysed and compared

across study contexts. In total, the analyses draw upon 102 identified external relations.⁷⁰ Despite being subject to limitations such as small sample size, non-representative sample structure and potential omissions of information during interviews etc., this numerical analysis provides important insights on the configuration of firm's project networks.

51 external relations were identified for cases investigated in the Erzgebirgskreis and 51 relevant relations for South Estonian cases.⁷¹ Thus, on average each innovation project involved about four external partners. Variation between projects from different study regions is only minor: Erzgebirgskreis: 3.9 partners per projects; South Estonia: 4.3 partners per project. Importantly, every single project involved at least one external partner. This indication affirms the widely accepted and empirically corroborated notion that innovation relies on interaction and does typically not happen in isolation (e.g. Fagerberg, 2006). However, interaction intensities, regarding the number of partners involved, vary substantially: three projects (EE8 | ERZ4, ERZ9) involved one external partner, while the maximum number of external partners involved was nine (EE4) and eight for two projects from the Erzgebirgskreis (ERZ3, ERZ8). Broadly speaking, the data suggest that projects with rather high degrees of novelty as well as the investigated start-up cases, tend to engage more external partners due to the broad range of external knowledge and expertise needed.

6.2.1 Types and nature of network linkages

Inter-firm linkages account for about 74% of total linkages. Thus, it appears that connections with other commercial partners are most important. These linkages to commercial actors involve customers and suppliers but also consultancies and engineering companies, i.e. organisations that provide access to specialised knowledge and technological capacities. Investigating the motivations that underlie the mobilisation of these linkages highlights multiple reasons, amongst which access to specific technology, e.g. machinery sourcing, specific parts and components, and expertise such as seeking specialised consultation, appear most important. Interestingly, the proportion of inter-firm and extra-firm linkages is similarly distributed across study contexts (see Figure 17). The relative importance of linkages to other commercial actors suggests that extra-firm linkages, i.e. ties to non-commercial organisations such as universities and research organisations, associations, administrations etc. are, purely on numerical analysis, less significant. Across study contexts, about one in four linkages mobilised as part of innovation projects refers to extra-firms partners. One possible explanation for this pattern might relate to the study's focus on LMT manufacturing firms, as one determining feature of these industries is a low R&D intensity (see 1.4). Consequently, LMT manufacturing firms have only rather limited needs to engage with partners from the research and development sphere.

⁷⁰ Following the main intention of the IB approach (see 3.3.1), only those relations deemed relevant and mentioned by interviewees are considered in the analysis. Hence, not *all* external actors are included. Some might not have been mentioned by interviewees or were clearly referred to non-essential to the project. The following analyses relate to 13 cases investigated in the Erzgebirgskreis and 12 cases from South Estonia (EE13 was dropped from quantitative analyses due to insufficiently available data). In the following numerical analyse, all of these identified external relations were assigned the same weight. No differentiation regarding the functional importance of individual external actors was introduced at this stage. Such differences are addressed in detailed case analyses (see part 5) as well as chapter 6.4.

⁷¹ Section AP4 in the appendix provides case specific overviews on the individual dyads of innovation projects as well as the dimensions the analyses in chapter 6.2 relate to.

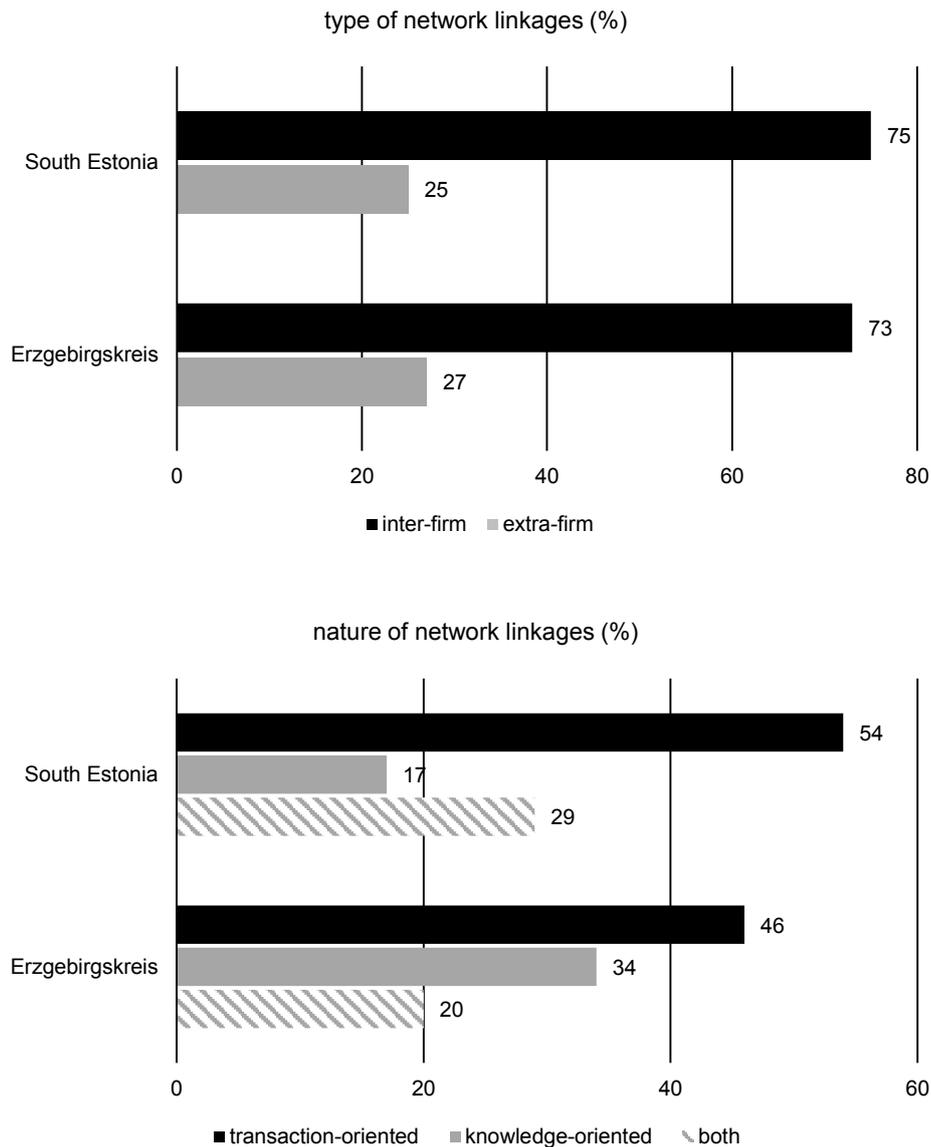


Figure 17: Type and nature of network linkages

Despite their relative insignificance in numerical terms, linkages to extra-firm partners and especially universities and research bodies were found to be of high functional significance. Collaborations with research partners have substantial impacts on the dynamics and trajectories of innovation projects. Such collaborations typically provide for access to rich, multi-layered and specialist resources, thereby facilitating comprehensive learning processes. The significant function of research partners has been identified in multiple projects (EE4, EE10 | ERZ1, ERZ3, ERZ4, ERZ13) and will be selectively illustrated in chapter 6.3. Accordingly, there might be a certain imbalance between numerical and functional importance of external partners which cannot be identified by mere quantitative analyses but requires more detailed and qualitative investigations. The functional importance of extra-firm linkage in the innovation context is corroborated by the indication that these linkages tend to be largely knowledge-oriented, consequently facilitating joint learning and capacity building processes. For instance, 12 of 14 (86%) extra-firm linkages realised by firms from the Erzgebirgskreis were found to have a clear knowledge-orientation.

Overall, the majority of external linkages have a clear transaction-orientation, i.e. were portrayed by interviewees as not being related to comprehensive processes of mutual knowledge creation and learning. 46% of linkages identified for cases from the Erzgebirgskreis and 54% of linkages from South Estonian cases fall into this category. These figures point out their relative importance as facilitators and drivers of innovation projects, highlighting at the same time that a large share of relations in innovation projects are primarily not knowledge-oriented. Clearly knowledge-oriented linkages associated with mutual knowledge creation, joint partnership and reciprocity, account for 34% of ties mobilised by firms from the Erzgebirgskreis and 17% for ties mobilised by firms from South Estonia. These indications somewhat suggest that the networks firms from South Estonia mobilise as part of their innovation endeavours tend to be more market driven, even though differences to networks observed in the Erzgebirgskreis are not too substantial. Additionally, for both study contexts it can be observed that transaction-oriented and knowledge-oriented elements are coupled: 20% of linkages realised by firms from the Erzgebirgskreis and 29% of linkages realised by firms from South Estonia exhibit both dimensions. In these linkages transaction-oriented aspects are complemented by mutual learning processes and reciprocal action, exceeding mere routine transactions.

6.2.2 Spatial organisation of network linkages

Focussing on different spatial scales, i.e. regional, national and international, pronounced differences can be identified between firms from South Estonia and the Erzgebirgskreis.⁷² In particular, two interrelated differences emerge (see Figure 18): firms from South Estonia have engaged more frequently international partners as part of their innovation projects and, correspondingly, firms from the Erzgebirgskreis collaborate more frequently with regional and in particular national partners.

Regarding the engagement of regional partners, data suggest only slight differences between the study regions: 33% of external partners involved in the innovation projects of firms from the Erzgebirgskreis are located regionally (i.e. Chemnitz NUTS-2 region), while the corresponding figure for the South Estonian cases is 29% (South Estonia NUTS-3 region). Thus, it is important to note that the share of regional linkages is considerable for both study regions. Accordingly it can be deduced that regional environments from which firms operate provide, at least to a certain extent, for partners and capacities that are relevant for their innovation activities.⁷³ These indications point towards existing matches between the requirements of LMT firms and the availability of relevant resources within both study regions. Relating individual dyads to Saxony as a whole (NUTS-1 level), reflects that 51% of linkages

⁷² Spatial scales relate to the following differentiation: (1) regional, (2) national and (3) international. These spatial categories imply inevitable issues and inconsistencies linked to different spatial categories regarding the overall units of Estonia and Saxony. Specifically, Estonia as a country is categorised as one NUTS-2 region and sub-national divisions relate to three NUTS-3 units. Thus, the regional/national differentiation adopted in this study implies a certain 'scale jumping'. In Estonia the regional reference unit is the 'Lõuna-Eesti' NUTS-3 region, comprising of the four counties of the study area plus the counties of Tartumaa and Jõgevamaa (size: 14,529 km²; population: 323,000; population density: 22/km²). For Saxony, the Chemnitz NUTS-2 region constitutes the regional reference unit, comprising of the city of Chemnitz and, besides the Erzgebirgskreis, the counties of Mittelsachsen, Voigtlandkreis und Zwickau (size: 6,522km²; population: 1,526,000; density: 230/km²). Additionally, it emerges from the interview material that actors from the Erzgebirgskreis consider the cities of Chemnitz and Zwickau as part of *their* region (e.g. ERZ_CON1, ERZ5). The NUTS-2 level is frequently used to spatially delineate the regional scale in collaboration/network analyses (e.g. Hansen 2014).

⁷³ 6 of 17 (35%) of regional contacts identified for cases from the Erzgebirgskreis engaged partners from within the study area (local partners); 7 of 15 (47%) contacts were realised within the South Estonian study region.

realised by firms from the Erzgebirgskreis engage Saxon partners, highlighting their orientation towards the wider regional scale.

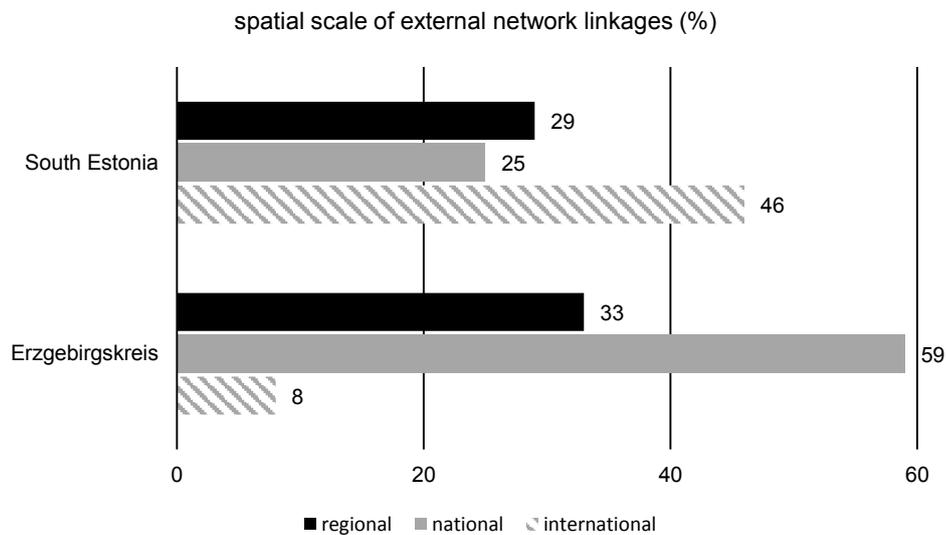


Figure 18: Spatial organisation of network linkages

In addition to regional collaborations, firms from the Erzgebirgskreis mobilised another 59% of linkages on the national scale. Hence, 92% of external partners in innovation projects are located within Germany and only 8% (four linkages distributed across two projects) reveal international dimensions. Thus, for firms from the Erzgebirgskreis, the data highlight the importance of, and might reveal certain preferences towards, regional and national partners when it comes to innovation-related collaboration.⁷⁴

A substantially higher proportion of international linkages is identified for projects of South Estonian firms. 45% of linkages relate to international partners and, importantly, each of the 12 cases included in the analysis reveals at least one international linkage, emphasising their importance across cases. In total 55% of linkages engage Estonian partners, of which 30% can be assigned to the regional and 25% the non-regional scale. Consequently, and in line with the higher importance of international partners, the aggregate national scale is, compared to cases investigated in the Erzgebirgskreis, less important. Nevertheless, the majority of innovation related linkages engage partners from within Estonia.

As stated previously, the quantification of network linkages is subject certain limitations and needs to be cautiously reflected upon. However, distinct differences observed regarding the spatial organisation of project networks, in particular the distinct (in)significance of international collaborations for (Saxon)Estonian firms, is not only striking, but raises questions on the drivers of this diverging spatiality. The following paragraphs offer a number of potential explanatory avenues by linking numerical indications and qualitative interview material.

⁷⁴ However, firms from the Erzgebirgskreis have indicated that they actively engage(d) in collaborations with international partners throughout projects other than the ones explored as part of this study (e.g. EE4 currently pursuing a project with Indian partners; EE6 previously collaborating with a partner from Japan). Thus, these results are influenced by the approach to focus on one specific project.

It can be suggested that the detected differences regarding the spatial organisation of project networks might indeed reflect more systematic rather than random effects driven by a small and non-representative sample. It can be suggested that the relatively high international orientation of Estonian firms is driven by multiple factors. The involvement of international partners is recurrently reported a particular necessity through which firms access specialised services, knowledge and competences relevant for their innovation activities but at the same time scarce or not at all available within Estonia. Multiple interviewees explicitly link the lack of practically relevant knowledge to their practice of sourcing this expertise from abroad. The rationale for involving a Finnish research partner for specialised analytical procedures in the development of fermented neutral fruit wines is summarised as follows: *'We chose the research lab in Finland because it was the nearest lab for our field. There were no similar labs in Estonia'* (EE10). More widely, EE10 identifies the lack of practical and professional experience within the Estonian research sector as a particular bottleneck, especially since the firm is active in a particular niche of the beverage industry. Estonia is considered *'too small'* to provide for all technological and analytical resources needed. Thus, engagement of international partners is common practice. Similar arguments emerge from EE4, a dairy processing firm, regarding the development of new cheese varieties: *'In Estonia there is simply not a good cheese master from which we could learn. [...] So we have to do it ourselves or get consultants from Holland, which is really expensive.'* Analogous indications were also identified regarding the availability specialised technology, machinery/equipment and related specialist services (e.g. EE1, EE2, EE3, EE6, EE12):

'The machines that do the main work [in the factory] generally come from Germany and Italy. The machine building competence [...] is not available in Estonia' (EE6).

'If there would be some problem with the machine, it broke down for some reason, in Estonia there is one single certified maintenance company. Obviously, they usually have queues for three weeks. What can I do in three weeks? I have deadlines' (EE5).

'We always have to order the wearing parts through a Finnish company. Finland is still the old paper maker country' (EE10).

A frequent statement across interviews that synthesises related issues and partly explains the orientation towards international partners is that *'Estonia is a small country'*. As the previous discussion suggests, this smallness produces limitations regarding the availability of specific resources pointing towards a certain 'thinness' on the national scale. At the same time, this smallness induces a distinct proximity between actors from within/related industries. As the case of EE10 highlights, this closeness might implicitly and explicitly affect firm's networking behaviour. EE10 strategically minimises partnerships with Estonian research organisations that collaborate with direct competitors to reduce the risk of unintended knowledge spillovers. Consequently, EE10 seeks strategic collaborations with partners from outside Estonia.

A complementary explanation for the higher proportion of international linkages observed in the innovation projects of South Estonian firms might relate to their overall high export ratios.⁷⁵ High export ratios condition frequent direct contact to international customers. As commercial inter-firm partners were

⁷⁵ The average export ratio of the Estonian firm sample is 50%, compared to 31% for firms from the Erzgebirgskreis (see Table 9).

identified as important actors within the innovation context (see 1.2.3) high export ratios of Estonian firms might, to a certain extent, reflect in the distinct international orientation. Interestingly, Estonian cases reveal a certain orientation towards partners for the Nordic countries, in particular Finland: 7 of 23 identified international linkages (30%) relate to Finnish partners, 10 of 23 (43%) to partners from the Nordic countries, including Sweden and Norway. It appears that this noticeable orientation towards Finland is at least partly driven by perceived similarities in language and cultural understanding that, coupled with a certain degree of geographical closeness, adhere to the notion of institutional proximity (see 2.2.2): *'of course, it was much easier than doing the project with somebody who is culturally and also geographically much further from us'* (EE9; similar: EE10, EE11, EE12).

Reversing the logic of potential explanations for the distinct international organisation observed for Estonian cases suggests that the overall national German context does seemingly not induce shortages of specific expertise. Firms from the Erzgebirgskreis draw to a larger extent on regional and national partners and resources from regional and national scales. This availability of capacities reduces the need to establish linkages to international partners which, accordingly, appear to be more of a strategic choice rather than a required necessity. The following quotes from interviews with both firms as well as regional development actors support the proposition that firms from the Erzgebirgskreis are, unlike their Estonian counterparts, able to benefit from rather thick and dense regional and national environments:

'Especially in terms of paper technology there are only few options [for collaboration]. Universities in Dresden, Darmstadt and Munich and the paper centre in Gernsbach [town in Baden-Württemberg].' (ERZ4)

'[Regarding application oriented research institutions Saxony provides for an] absolute density. Many of the companies here have direct contacts to these institutions. Metal construction and coating etc. to Freiberg University. Concerning electronics and IT TU Chemnitz is important and Mittweida regarding marketing. But also TU Dresden and Zwickau University.' (ERZ_CON1; similar ERZ_CON3)

Additionally, it can be suggested that actors from the regional development arena actively encourage collaborations between regional organisations. Accordingly, the economic promotion agency of the Erzgebirgskreis (WFE) actively supports businesses in finding regional as well as extra-regional partners and maintains numerous instruments in this regard: *'Supporting such formats is important for us and we do think that is it highly relevant for local and regional firms, which we also get as feedback'* (ERZ_CON3).⁷⁶ Thus, while firms from the Erzgebirgskreis seem to be able to draw upon 'thicker' environments, the specific networking formats offered by regional development actors might also be

⁷⁶ As part of on-going desk research a number of related instruments were identified. For instance, in collaboration the regional chamber of industry and commerce the WFE organises, on an annual basis, a cooperation fair which specifically targets firms from the supply industries ('Kooperationsbörse Zulieferindustrie'). In 2017 more than 120 regional companies participated in the fair which, following the concept 'inform-contact-cooperate', seeks to foster collaboration across regional firms. Another example is a joint exhibition area for firms from the Erzgebirgskreis at the 'InTec' fair (a trade fair for machine tools, manufacturing and automation taking place bi-annually in Leipzig) organised by the WFE. Furthermore, the project 'CSRnetERZ', coordinated by WFE provided a platform for more than 50 SMEs from the region to exchange and collaborate on issues related to 'Corporate Social Responsibility'. Another example is the innovation fair initiated and hosted by a regional networking initiative (August Stark, ERZ_CON2). Some of the firms interviewed as part of this research participate(d) in these and other activities (ERZ1, ERZ3, ERZ4, ERZ5, ERZ6, ERZ7, ERZ9, ERZ13). (http://www.wfe-erzgebirge.de/de/Wirtschaftsservice/Unternehmen_Investoren/Kooperationsboerse_1355.html; accessed: 14.11.2017); (<http://www.csr.erzgebirge.eu/>; accessed: 14.11.2017).

considered one aspects that implicitly drives the high proportion of collaborations realised within the Chemnitz region and more widely within Saxony.

6.3 Multi-layered dimensions of proximity and distance

This chapter analyses constellations of different dimensions of relational proximity and distance. The goal is to understand how network linkages are configured along social, institutional, cognitive and organisational dimensions and to what extent these configurations drive or prevent the formation of project networks.

Following the critical realist position adopted throughout this research (see part 3), analyses primarily draw on open exploration of the empirical material. Rather than seeking to quantitatively *measure* configurations of proximity and distance, the intention is to relate configurations to articulations and motivations of actors. Thus, I seek to *understand* the relational configurations encountered in project networks and, ideally, to identify patterns across cases and study regions.⁷⁷ Furthermore, this explorative approach allows to devote attention to dynamics of relational configurations, particularly identified as being underexplored (e.g. Balland et al., 2015). Nevertheless, some of the previously quantified features of individual linkages in innovation projects (see 6.2.1) will be mobilised to approximate social and institutional proximity/distance. Instances of different degrees of proximity, distance and associated dynamics are illustrated for each of the relational dimensions. Besides analytical purposes, these illustrations add transparency to the process through which interview quotes (first-order categories) were aggregated to wider cross-case and cross-context themes/dimensions.

6.3.1 Social proximity and distance

Following for instance Hansen (2014), mutual acquaintance between partners is used as an approximation to assess existing degrees of social proximity (e.g. repeated partnership, friendship and family ties) and distance (e.g. new partnerships). Data on individual linkages reveal that about 50% of linkages relate to partners that have previously collaborated and have joint experiences (Erzgebirgskreis 43%; South Estonia 56%). Interestingly, the majority of projects (22 of 25) mobilised at least one link to a previously related partner, while only three did not (EE12 | ERZ5, ERZ7). Consequently, it can be argued that social proximity appears as an important driver of innovation projects and associated networks. Reproduction of existing linkages constitutes a central mechanism of project related network formation. Considering only those linkages that have a distinct knowledge-orientation, substantial differences between the two study regions emerge: 64% of the knowledge-oriented ties mobilised by South Estonian firms base on shared experiences. This applies only to 44% of linkages mobilised by firms from the Erzgebirgskreis. Thus, firms from South Estonia have reproduced existing ties more frequently in knowledge generating collaborations. A possible explanation might relate to indicated needs of Estonian firms to frequently collaborate with geographically dispersed partners and the coordination costs that adhere to such distanced collaborations (see 6.2.2 and 6.4). Once effective relations to international partners were

⁷⁷ In this regard, this research deviates from previous studies in economic geography which primarily adopt quantitative methodologies to analyse proximity dimensions: e.g. Ponds et al., 2007; Broekel, 2015; Fitjar and Huber, 2015; Hansen, 2015; Fontes and Sousa, 2016; Hansen (2014) combines qualitative and quantitative analyses.

established, these partnerships might be preferably re-activated to avoid investments related to finding alternative partners.

Connecting these indications with interview material allows shedding light on the specific configurations that underlie socially proximate and distanced relations. Repeated partnership in innovation projects relates to shared professional experiences such as previous joint projects, established trade relations, as well as personal experiences such as family or friendship ties. Trust bases and high levels of familiarity associated with joint experiences emerge as central drivers of tie formation:

'He is an existing partner and I appreciate that he always provides very good input and brings in many own ideas. Moreover, I have the feeling that he knows fairly accurately what I want.' (ERZ6)

'It certainly is important to have more projects with the partner, because a certain business relation emerges, [...] trust emerges. There needs to be a certain mutual reliability.' (ERZ9)

'Our central policy is that we try to get new components through suppliers that we have already. If our suppliers cannot do this, then we start to look outside our existing network. It is always really hard to find firms that are loyal and reliable [...].' (EE1)

These quotes underscore the importance and effects of shared experiences and how these set ground for trustful relations and provide reference points for mutual expectations. Partnerships that proved fruitful in past are likely to be reproduced in future projects and, thus, stabilise firm networks.

While these illustrations refer to repeated professional relations between partners, which this research identifies as a key element of social proximity, there are also instances that relate to family and friendship ties. The expansion of family and friendship ties into the business sphere can be primarily, but not exclusively, observed in the establishment of new businesses ventures (EE3, EE4, EE7, EE13 | ERZ8, ERZ10). Personal relations are transformed into structures that provide for help, support and partnership regarding the various resources required throughout business establishment. Family members and friends become co-owners of newly established ventures, illustrating the pivotal role of individual relations for start-up processes. While in some cases (EE4, EE7 | ERZ8, ERZ10) new ventures were initially set-up as joint projects, other cases (EE3, EE13) reflect that family members or friends joined at later stages. Besides constellations of co-ownership, these ties were found to provide for diverse resources such as critical feedback (EE3, EE7, EE13 | ERZ8, ERZ10), help in negotiating contracts and mediating market access (EE3, EE4, EE7), provision of financial support and investment (EE3, EE4, EE7 | ERZ8, ERZ10) or assistance to create a firm logo (EE3). Interestingly, all but one of these contacts relate to the local environment, suggesting that critical elements of the overall support structures of newly established firms from peripheral regions largely overlap with geographical proximity. Transformation of personal ties into business ties can also be identified as drivers of some established firms investigated in Estonia. For instance, the technical manager of EE1, a bed manufacturer, intensively consults with *'a good friend'* and local welding specialist for tasks to facilitate sample production and to reduce innovation time span. Similarly, to respond to increasing demands for birch sap and to reduce the risk of opportunistic behaviour, i.e. delivery of diluted sap, EE4 involved *'people we trust'* from the local community as sap collectors.

While these indications highlight the importance of social proximity in innovation-related collaboration for both transaction and knowledge-oriented linkages, 50% of linkages occurred between partners without joint experience. Taking mutual acquaintance as a first indication for a certain degree of social proximity, it can be supposed that the social configuration in these linkages was initially rather distanced. Initiating such distanced partnerships underscores the role of processes that support trust building and, thereby, generate a fertile ground for effective partnership. The empirical material indicates that these processes take time, a scarce resource in innovation projects. Nonetheless, building certain degrees of acquaintance and trust between previously unrelated partners is considered indispensable.

'That [a trustful relation] has to come with time. [...]. Personal contacts are important in general. There certainly are things when it's down to the person.' (ERZ1)

'Then I went up [to Berlin] to see them, we have sniffed at each other a little and identified what we really want.' (ERZ5)

'Of course, when you contact a partner for the first time you cannot identify whether they are a good or bad partner. But it develops over time, [...] how they respond, what feedback they give [...] do they invest their time into your matters. You realise quite quickly who is responding and who is not.' (EE6)

These quotes address at least three important theoretical aspects related to social proximity and distance and potentially further dimensions. First, innovation-related collaboration between organisations is largely tied to the interpersonal level: *'you build trust with the persons you work with, not so much with the companies'* (EE11). In this sense transaction and knowledge-oriented collaboration is very much negotiated at and driven by inter-personal rather than inter-organisational aspects. Second, processes of trust building, which especially new linkages necessitate to become functional, require instances of geographical proximity. If co-location between partners involved is not given, formats that allow for temporary co-presence such as kick-off meetings and mutual company visits or recurrent meetings throughout the project duration play a crucial role (see 6.4.2). Thus, processes of building social proximity necessitate geographical proximity while familiarity and trust levels in established partnerships might substitute for co-location – which is in line with findings by Hansen (2014). Third, trust building processes point to the fluid nature of social proximity/distance. Their degree in collaborative arrangements changes over time and must not be perceived static.

While the previous paragraphs focussed on (increasing) social proximity, the empirical material also contains instances of (increasing) distance. The case of EE5 highlights that a collaboration with an international technology partner was not realised because of lacking trust, i.e. too much social distance:

'We started at first with the goal to build the entire production line as sub-contracting in Taiwan. [...]. [The owner] visited the factory in Taiwan, but it was not too trustworthy. There was the danger that they might start selling this machine afterwards and will give away our competitive advantage.'

Similar reasons, although explicitly addressing the inter-personal level, prompted ERZ10, a newly established venture constructing metal sheet furniture, to terminate a collaboration with a local carpenter. Even though this collaborations was initially considered beneficial:

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[The collaboration with] *the carpenter's shop did not function very well. [...] That [having fundamentally different ideas and approaches] was also the reason why it didn't work. [...] I don't need a carpenter who always says: 'this looks crappy.'*

While these examples of lacking trust generated frictions within projects, the case of EE8 illustrates that sudden disruptions in long-established social configurations might work productively once associated frictions are settled. Frictions induced by the new management that took over the operations of a Finnish key customer ultimately triggered the emergence of an incremental innovation project. The client's new management raised certain quality issues, exercising pressure on EE8 to solve these:

'It was a fairly big customer and at the moment we were a little anxious. What is going on? How can we improve it? [...] Since the change of the management the atmosphere was rather cold. [...] After we succeeded to clear these issues out, everything was good again.'

Mediating this disruption in social configurations required mutual visits as well as increased communication levels through which trust and a functioning working relation between decision taking individuals in both companies was (re)established. In spite of instances of increasing social distance, a common theme running through the cases is that mutually satisfying partnership and processes of trust building, i.e. increases in the degree of social proximity, facilitate the potential of repeated collaboration, observed in numerous cases (e.g. EE4, EE6, EE9, EE12 | ERZ1, ERZ5, ERZ6, ERZ9, ERZ11, ERZ13).

OVERALL DIMENSIONS	Social	
	illustrations from interviews	aggregate themes
proximity	<p><i>'On a personal level we got along well, he is a very accostable person. [...] It is always also an interpersonal question. We got along really well with the people [from the fibre supplier].'</i> (ERZ3)</p> <p><i>'[...] thereupon [the existing partner] approached me, because we had already a good relation, if I could image to continue the project.'</i> (ERZ11)</p> <p><i>'These ideas are presented to customer we have been working together with for a few years, customers we trust, not the customers that have bought just ones from us.'</i> (EE11)</p>	<p>familiarity, personal basis</p> <p>functioning professional relation</p> <p>trustworthy existing customers</p>
distance	<p><i>'[the collaboration with] the carpenter's shop did not function very well. [...] I don't need a carpenter who always says: 'this looks crappy'.'</i> (ERZ10)</p> <p><i>'We started at first with the goal to build the entire production line as sub-contracting in Taiwan. [...] [The owner] visited the factory in Taiwan, but it was not too trustworthy.'</i> (EE5)</p> <p><i>'Since the change of the management the air was a little cold, let's say.'</i> (EE8)</p>	<p>personal and professional frictions</p> <p>lack of trust</p> <p>tensions</p>
changes and dynamics	<p><i>'When you are done with the product developers you have to struggle with the purchasers.'</i> (ERZ2)</p> <p><i>'As I said, this [the collaboration with university partners] was a very very interesting experience and I would do it again anytime.'</i> (ERZ13)</p> <p><i>'Because after this grant, [representative of EE4] sent a letter to my boss that the collaboration was very well, they were very satisfied, etc. That they want to continue the collaboration in the future.'</i> (EE4_P1)</p> <p><i>'Since the management changed they started to put more focus on the newly implemented KPI's and therefore it came out that our product had to be improved.'</i> (EE8)</p>	<p>change in personal constellations</p> <p>positive résumé of collaboration</p> <p>professional basis, planning new projects</p> <p>change in personal constellations</p>

Table 18: Illustrating instances of social proximity and distance in innovation projects (own table)

6.3.2 Institutional proximity and distance

Institutional dimensions of proximity and distance relate to arrangements between actors on the macro level. Institutional proximity/distance link to formal institutions (laws, regulatory regimes) and informal institutions (cultural norms, beliefs, values or language) and describe the degree to which actors share or not share institutional frameworks. Following this conception, indications from the descriptive-statistical

analyses of project dyads (see 6.2) can be mobilised to approximate configurations along the institutional dimension. In particular regarding two aspects: institutional contexts regarding linkage types (inter-firm/extra-firm) and references regarding the spatial orientation of linkages (regional/national/international). A certain degree of institutional distance (proximity) can be assumed if relations bring together actors operating from different (similar) institutional contexts.

In this understanding, inter-firm collaboration suggests as well a certain degree of institutional proximity while extra-firm collaborations, and in particular links between firms and research organisations, indicate rather distanced configurations. Given that 74% of identified dyads refer to inter-firm linkages and the limited number of industry-research collaborations, the data seem to suggest certain preferences for collaborations that imply institutional proximity. As these indications are similarly observed across study regions, they might reflect a more general feature of the networking behaviour of firms located in peripheral regions and/or operating in LMT manufacturing. The following quotes reflect configurations in which partners in inter-firm linkages operate from institutionally rather close positions, based on similar reference systems and shared understandings:

'It was totally fascinating to work with a company that does flax, not really a high end product, since 200 years. They were very visionary, open and solution oriented' (ERZ3).

'I involved a partner with whom we have previously worked together. [...]. This partner, in turn, also has projects with Dresden University and therefore knows the routines and how it works. So we were directly on the same wavelength' (ERZ11).

'After we succeeded to clear these issues out everything was good again. They are simply people doing their own things, they have their own targets and work on them – which is quite natural within companies' (EE8).

Institutional distance in innovation projects between firms and research partners, surfaces for instance as distinctively different organisational practices and reference frameworks. For instance, the owner of a furniture manufacturer (ERZ13), collaborating for the first time with university partners, summarises differences in underlying frameworks as follows:

,'First of all we think of costs and marketing, we actually don't think about customers to be honest. And the TU [partners from Dresden University] in principle don't care about costs to start with, for them it is about the topic.' (ERZ13)

Despite operating at distance, the owner of ERZ13 highlights that such diverging approaches work as productive differences that potentially give rise to relevant outcomes and successful joint projects (similar: EE4 | ERZ1, ERZ3, ERZ4, ERZ10). However, transforming these differences into productive linkages requires openness towards the partners involved. This openness to partially operate outside own reference systems in industry-research collaborations reflects convergence of related institutional frameworks and, thus, highlights associated dynamics. Reflecting upon a particular industry-research collaboration, the representative of the research organisation in this partnership states:

'I would say that one thing is that we as a scientific partner have to understand that they [firm partner] don't want a specific scientific text. They want real-life solutions. And usually that [understanding] is lacking.' (EE4_P1)

In case such mutual understanding is absent, institutional differences might produce ineffective and unsatisfying outcomes as the example of a drink manufacturer from South Estonia (EE10) collaborating

with a Finnish research partner illustrates. As *'the [Finnish research] lab did not give enough explanations'* EE10 needed to further consult with an established contact from Tartu University who *'helped us understand the results from the Finnish lab'*. Such divergent and dynamic configurations of institutional proximity and distance have direct implications for partnering decisions in future projects. Relations deemed productive despite, or exactly because of, institutional differences are likely to be repeated (e.g. explicitly stated by EE4 | ERZ4, ERZ13) and thereby converge over time.

Although at times particularly visible, differences in routines, approaches and reference frameworks can not only be identified as features in industry-research collaborations. They also constitute decisive elements in the relations between commercial organisations, driving and constraining associated network formation. Instances of institutional distance between firms relate for instance to elements such as culture, size or associated power asymmetries. Differences in firm culture surface in collaborations between large/established firms and small firms/start-up ventures. Being approached with a request to develop a tank system for an aquaponics start-up ERZ5, a plant construction company, highlights some of these cultural differences: *'They [the start-up] are floating in very different spheres and we are with the reality. [...]. They are theorists and we are practitioners'* (similar: ERZ7, ERZ12). Likewise, but from the perspective of a start-up entrepreneur approached by a cardboard manufacturer (EE10) to join its smart packaging project, cultural differences are described as follows:

'My perspective is that I can give some freshness to this idea, new marketing ideas and so on. [...]. Some of them [board members of EE10] are really old-school people.'
(EE12_P1)

Interestingly, EE10's CEO deliberately aimed to integrate *'freshness'*, i.e. a certain distance, into the project. While visiting a start-up convention in Tartu, different entrepreneurs were approached to discuss potential collaborations. These efforts ultimately resulted in engaging a new partner. These instances reflect the productive properties of distanced relations as potentially opening new collaborative avenues and business opportunities. However, flexibility and openness, along with proximity in other dimensions (e.g. cognitive), appear as requirements to bridge such institutional distances.

While institutional distance can drive tie formation, it might also impede and even prevented the formation of (desired) linkages, thereby facilitating additional search processes for alternative actors. In search for external actors to bring in specific capabilities, such as technology partners and part suppliers, firm size was identified as a limiting factor: *'the larger firms have no inclination to be approached by a small mini company [like us]'* (ERZ10). Search processes needed to be prolonged until suitable and interested suppliers were identified: *'I found a firm in the North [of Germany] which now produces single table plates for me'* (ERZ10). Similar issues were identified primarily for newly-established firms (EE3, EE7 | ERZ8, ERZ10). However, firm size also affects innovation-related networking activities of established firms. Seeking to increase production speed of its paper machine EE9, Estonia's most traditional paper manufacturer, experienced serious problems to find specialists *'small enough to be interested in the project'*. Leading industry players were not interested:

'The machine is so small [in world scale] and let's say the project for most of the paper machinery suppliers was so small that there was no interest.' (EE9)

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Following intense search and consulting processes, EE9 engaged a partner not deterred by the project's small size and at the same time *'happy to co-operate with a company that is so old and at the same time doing quite well'*. In a similar vein, the case of EE1, a bed manufacturer, provides an insightful account on how differently configured institutional arrangements are balanced, whereby issues of firm size and divergent operational modes were mediated. EE1 mobilises different ties for different purposes at different stages in its innovation activities. For component and sample production it turns towards small and flexible local craft firms that provide, based on mutual acquaintance, tailored, effective and quick support. Standard suppliers cannot offer such support through elaboration stages:

'Usually the development time takes too long with the big producers, they need too much documentation and [...] we are not really sure what exactly we need. So we don't waste our time to provide drawings and all the documentation.' (EE1)

Later on, after specifications of components are elaborated with local partners, EE1 switches to its established (inter)national supplier network, benefiting from established interactions and routines.

Another approach to approximate the institutional dimension from numeric analyses of project linkages relates to the spatial dimension of networks. Certain degrees of institutional distance can be assumed for international collaborations as partners operate within different jurisdictions and from different frameworks regarding culture, norms and language. Likewise, it can be assumed that these differences diminish (partially) in national and (more fully) in regional and local collaborations which provide higher levels of proximity associated with shared reference systems, beliefs, cultural traditions and identities.

In this regard the high proportion of regional (54%) and national linkages (38%) identified in the projects of firms from the Erzgebirgskreis is striking. To a certain extent these figures might relate to matches between competencies required by LMT manufacturing firms and those available regionally and nationally. With respect to the research sector, a regional development actor from the Erzgebirgskreis suggests that

'Regarding materials they [firms from the Erzgebirgskreis] are looking towards Freiberg. [...]. Regarding processes and production planning the competence is in Chemnitz. In my opinion there is no need to necessarily look beyond.' (ERZ_CON3; similar: ERZ_CON1)

This impression is echoed by firms:

'I think we have quite some competent universities and institutes. And if we develop projects we first look what they can offer thematically. [...]. For our topic such as metal sheet [expertise] can be found here in my opinion.' (ERZ7; similar e.g. ERZ4, ERZ5, ERZ9)

Thus, firms are not necessarily urged to engage in collaborations with international partners which imply higher transaction costs due to differences in formal and informal institutions. In this respect indications which suggest that collaborations with partners from acquainted contexts are preferred choices can be identified, while international collaborations are considered to induce additional complexities and costs:

'We thought of it [collaboration with Czech partners]. I was over there to visit firms but it didn't work out yet. I am not reluctant [...] but I don't have the absolute urge.' (ERZ11)

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'The distrust towards Czech partners is quite big. They also have a different economic and working culture. We have too few collaborations with Czechia especially when it comes to innovation.' (ERZ_CON1)

'Especially in terms of paper technology there are only few options [for collaboration]. Universities in Dresden, Darmstadt and Munich and the paper centre in Gernsbach [town in Baden-Württemberg].' (ERZ4)

While the first two quotes indicate uncertainties related to international collaborations the latter, in which the manager of ERZ4 maps out the company's links to research partners, reflects a clear regional and national orientation. Thus, institutional proximity can be considered an implicit driver of the distinct regional and national focus of project networks of firms in the Erzgebirgskreis. Thus, institutional proximity and distance act as latent factors that drive (non)mobilisation of specific linkages. Likewise, shared cultural backgrounds between partners might explain why firms chose to collaborate with certain partners and not with others, as the case of EE4, a newly established vegetable crisps manufacturer, exemplifies. Its owner actively mobilises 'Mulgi-Identity' as part of building and marketing the venture and, consequently, seeks to build a supply chain comprising of firms from the Estonian Mulgimaa area.⁷⁸

OVERALL DIMENSIONS	Institutional	
	illustrations from interviews	aggregate themes
proximity	<p><i>'Mutual respect and trust are values which we also nurse with our customers. We play relatively transparent which is important for a good development, we want to be faithful and sustainable.'</i> (ERZ3)</p> <p><i>'It is not only about the idea itself [...] but you need combatants and you need to convince people to interrupt their routines and production process.'</i> (ERZ10)</p> <p><i>'Finland is a very easy market, the language is a little bit the same, and church and the culture is the same.'</i> (EE12)</p>	<p>common values</p> <p>common motivation, goals</p> <p>similar culture and language</p>
distance	<p><i>'They [the start-up] are again floating in very different spheres and we are with the reality. [...]. They are theorists and we are practitioners.'</i> (ERZ5)</p> <p><i>'First of all we think of costs and marketing we actually don't think about the customer to be honest. And the TU [Dresden University] in principle don't care about costs etc. to start with, for them it is about the topic. [...]. We think as serial producers and our thinking has become very narrow. If we hear wardrobe, we think 2m high, 60cm wide, shelf and clothes rail. They are the categories we think in.'</i> (ERZ13)</p> <p><i>'They [the big producers] are not really interested in thinking about the problem. They only want quantities and money.'</i> (EE1)</p> <p><i>In our discussions I have the feeling that I am the dynamic side in providing ideas. [...].some of them [board members of cooperation partner] are really old-school people.'</i> (EE12_P1)</p>	<p>organisational culture and frameworks</p> <p>approaches and frameworks</p> <p>firm size, routines and approaches</p> <p>approaches and ways of thinking</p>
changes and dynamics	<p><i>'If everything works fine we would like to continue [the collaboration with Dresden University]. We could apply for a new project to further optimise the process.'</i> (ERZ11)</p> <p><i>'I would say that one thing is also that we as a scientific partner have to understand that they don't want a specific scientific text. They want real-life solutions. And usually that is something that is lacking very often, I would say.'</i> (EE4_P1)</p> <p><i>'We cannot do any sales there [in Finland]. Today I think it is mainly because we have such a non-traditional sauna for them and they are afraid to buy it.'</i> (EE7)</p>	<p>institutionalisation of partnership</p> <p>convergence of frameworks</p> <p>understanding culture and tradition</p>

Table 19: Instances of institutional proximity and distance in innovation projects

⁷⁸ Until the end of the 19th century Mulgimaa was a distinguishable ethnographic and linguistic area within southern Estonia. Five historical parishes (Halliste, Paistu, Karksi, Helme and Tarvastu) constituted the cultural Mulgi area. Its population used to speak, and a small part of it still speaks, Mulgi dialect and shares a number of distinct cultural aspects (source: <http://www.mulgimaa.ee/en> accessed: 26.11.2017).

Contrary to cases from the Erzgebirgskreis, a rather high proportion of linkages to international partners is identified for cases in South Estonia (45% of identified dyads). Linking these numerical indications to actor perceptions, in the preceding section of this chapter I related this distinctively different spatiality of innovation networks to a certain lack of resources/competencies available within Estonia. Firms are urged to source competencies more frequently from international partners. The high(er) costs of these collaborations (highlighted e.g. by EE4, EE7, EE10) corroborate the view that international orientation might indeed be more necessity than choice driven. However, exploring such rather structurally induced needs to engage international partners in more detail reflects a clear preference towards partners from the Nordic countries and especially Finland: 43% of international linkages relate to partners from Nordic countries. Institutional similarities are frequently articulated as moderating elements in international collaborations. Actors seek to integrate degrees of institutional proximity despite underlying geographical distance.

'Of course, it [collaborating with a Finnish partner] was much easier than doing it with somebody who is culturally and geographically much further from us.' (EE9; similar EE7, EE10, EE11)

'Finland is a very easy market, the language is a little bit the same, and church and the culture is the same.' (EE12)

Additionally, institutional configurations surface as critical elements in firm's (intended) export activities. In the process of accessing foreign markets EE7, a newly established manufacturer specially designed saunas, faced substantial institutional issues both formal and informal ones. On the one hand legal issues due to nationally divergent regulatory frameworks ultimately affecting its manufacturing routines (similar: EE2, EE4). On the other hand EE7 had to 'learn' that its unconventional sauna design faced reservations in *'traditional sauna countries like Finland'*. As a consequence, EE7 deliberately built contacts to Finnish partners such as retailers and architects etc. in order to balance legal and sales related uncertainties: *'this was pretty hard learning and I will never ever make the same mistakes again when getting to other markets'* (EE7).

6.3.3 Cognitive proximity and distance

Cognitive proximity relates to capacities of organisations and individuals, such as particular knowledge bases and professional experiences. In the innovation context, the cognitive dimension is considered pivotal and a certain degree of proximity in cognitive terms is deemed a prerequisite for collaborative knowledge creation (Boschma, 2005). The cognitive dimension is approached and (re)constructed based on actor articulations referring to cognitive arrangements between actors in innovation projects.

On the macro-level, the cases investigated as part of this research confirm Boschma's proposition that interactive knowledge creation and innovation require a certain degree of cognitive proximity. However, the cases further highlight the central function of cognitive distance in processes of tie formation and firm's innovation-oriented networking behaviour. Thus, cognitive distance emerges as a central category that underlies tie formation. Actors get involved exactly because differences in capacities and knowledge bases exist. Thereby, internal capacities are completed with those of external partners.

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Innovation activities are characterised by growing complexities and tend to bring together partners with increasingly diverse technological backgrounds and reference systems. As the mobilisation of technology and expertise not available firm-internally constitutes a central motive to involve external actors, collaboration intrinsically implies cognitive distance and might even become a desired condition (Hansen, 2014). Engaging partners that operate from similar cognitive frameworks only provides for limited learning opportunities. Illustrating the configurations of cognitive (dis)similarities, I will primarily focus on those linkages that reflect a distinct knowledge-orientation. This is because cognitive configurations seem especially relevant if partners engage in mutually active, knowledge-creating partnerships. It does not suggest that the cognitive dimension is unimportant in transaction-oriented linkages. Another rationale for focussing on these knowledge-oriented linkages emerges from the empirical material itself: it is primarily such knowledge-oriented linkages that provide for rich articulations on the cognitive dimension.

Motivations that underlie decisions to initiate contact and engage with specific partners and not with others, reflect that difference can be seen as an essential driving force of partnering decisions. For instance, the purposefully established link by a cardboard manufacturer (EE12) to start-up as part of a smart packaging project illustrates that the need to acquire specific knowledge was the essential driver:

'I told to him [the potential partner] that I have this idea and asked 'what do you think about it? You are a specialist in the field of near field communication, but I'm not.'
(EE12)

This direct reference to cognitive distance further addresses the institutional level as the partners operate from diverging organisational backgrounds: an established LMT firm and an entrepreneur with ICT focus. Despite such distance on the macro-level, the partnership is characterised by cognitive proximity on the individual micro-level. This micro-level relates to the individual's professional backgrounds:

'[The] underlying pipeline in our communication is that [we] both have a technical background, so a common ground. But we are not totally similar, so that is a good thing. We have a common ground and aspects in which we are different.' (EE12_P1)

In this particular case, differences and similarities in cognitive terms are considered an essential factor for effective communication and, ultimately, successful collaboration and mutual learning:

'For me it's interesting to also see his [the CEO of EE12] perspective, because he has so much experience in the industry. [...]. It has also been a learning process for [the CEO of EE12], via me then.' (EE12_P1)

This example reflects the potentially diverse and multi-layered configuration of cognitive proximity and distance in innovation projects. Likewise, it highlights that the specific capacities actors contribute to innovation projects ideally act as cross-fertilisers. This different, yet complementary character regarding cognitive configurations has been identified in numerous cases across study regions (EE4, EE6 | ERZ1, ERZ3, ERZ5, ERZ6, ERZ8, ERZ10). Complementary cognitive capacities surface in projects that connect practical, theoretical and analytical capacities, or actors that operate within rather different industrial contexts (e.g. ERZ12 | ERZ13).

Additionally, such complementary arrangements of firm capacities and individual backgrounds were identified as particular facilitating elements throughout early stages of firm establishment (EE3, EE4, EE7

| ERZ8, ERZ10). In these cases complementary arrangements were desired features and strategically realised to cover the broad range of expertise needed to start and maintain a businesses:

'I am basically a marketing person and a sales man. [...]. My partner runs the production [...] and [his] idea was pretty much that he wanted a sauna for outside that looks something different.' (EE7) (similar: ERZ8)

'My partner studied mechanical engineering and does not have much to do with design. He has got technical understanding but not necessarily the aesthetic sense. [...]. And it is completely opposite with me, I have no clue about these [technical] things.' (ERZ10) (similar: EE3)

Working on a long term project to develop a product range based on new technology ERZ6 (see 5.2.3) seeks strategic consultation with the leader in this particular technology field, based near Stuttgart:

'They showed me what is doable with the technology regarding decorative applications. I got an impression regarding the surfaces that can be realised, so what can be theoretically achieved. [...] but over the past two years I realise that they developed all the knowhow behind the technology over many years. It looks of course nice if you don't have a clue, but the technology is tremendously complex.' (ERZ6)

This indication reflects the vast cognitive differences between ERZ6 and its technological consultant as well as the technology itself. ERZ6 decided not to further collaborate with this technologically leading partner. Although merely on technological grounds ERZ6 portrays this partner as an ideal one. Instead it was decided to *'establish the technology with a partner from the region'*. This particular partnering decision, resulting in anchoring the technology locally, is attributed to an established relation between ERZ6 and this partner as well as existing geographical proximity: *'[...] I thought it is good to proceed with a local partner. We are familiar with each other and we have short ways'* (ERZ6). Thus, at this particular stage the project reveals a situation in which cognitive, social and geographical dimensions are traded off against each other. This account suggests that due to the high degree of cognitive distance involved in the project's early stage, which continues to exist with the local partner, social and geographical proximity are deemed pivotal. Jointly appropriating highly complex technology requires periods of intense exchange and frequent meetings. Thus, ERZ6's owner ascribes a high value to social and geographical proximity exactly because of distances in cognitive terms. Similar configurations can be observed for further partners involved in the project where geographical and social proximity seemingly compensate for cognitive differences, e.g. in the collaboration with an industrial designer.

On a more general and theoretical level, these instances suggest that joint innovation projects tolerate, and even require distances in cognitive terms, providing that these distances can be compensated by proximity in other dimensions such as geographical and social. These result confirm recent findings by Hansen (2014, 2015). Similar configurations in which cognitive distance is mediated/bridged by proximity and other dimensions can be observed in further cases across study regions.⁷⁹ Emphasising the same argument by mobilising contrary observations, cases also provide for various instances in which

⁷⁹ e.g. ERZ3 and ERZ13 initiating a new collaboration with partners from Dresden University; ERZ11 engaging in repeated collaboration with partners from Dresden University; EE6 closely collaborating with a previously known paint distributor based in Tartu; EE10 using an established link to Tartu University for ad-hoc consultations.

relatively high cognitive proximity between partners allows for geographical distance.⁸⁰ Cognitive configurations change over time and typically converge as projects mature and mutual learning processes occur (Balland et al., 2015). The empirical material indicated that learning occurs in both, distanced as well as related cognitive arrangements.

OVERALL DIMENSIONS	cognitive	
	illustrations from interviews	aggregate themes
proximity	<p>'[name of person] who is responsible on their side, he has very good knowledge about microflora and fermentation, so communicating with him is easy.' (EE4_P1)</p> <p>'[the] underlying pipeline in the communication is that [we] both have a technical background, so a common ground. But we are not totally similar, so that is a good thing. We have a common ground and aspects in which we are different.' (EE12_P1)</p> <p>'We sat together and saw that it [the initial collaboration] functions well and that we have the same perspective.' (ERZ3)</p> <p>'There were certain rough edges and difficulties. But a certain understanding of textiles was existing.' (ERZ9)</p>	<p>knowledge complements, communication</p> <p>individually similar professional backgrounds</p> <p>similar perspectives</p> <p>linked knowledge bases</p>
distance	<p>'[...] we were not experienced in finished product manufacturing. We didn't have the knowhow of paint materials and finishing materials and we didn't have a good knowhow about the painting technologies.' (EE6)</p> <p>'We thought this was interesting but have no experienced in sound absorption. For us it is very valuable to learn about an entirely new field through such a project. It also fits with what we want to offer and the expertise one needs.' (ERZ3)</p> <p>'We have the advantage, my partner studied mechanical engineering and does not have much to do with design. He has got technical understanding but not necessarily the aesthetic sense. [...]. And it is completely opposite with me, I have no clue about these [technical] things.' (ERZ10)</p>	<p>lacking experiences and knowhow</p> <p>lacking experiences, new fields</p> <p>individually different professional backgrounds</p>
changes and dynamics	<p>'Water based has been a learning curve not only for us but also the paint suppliers to match the existing solvents based paints in the market place. [...]. Because they haven't had experience working in the door industry with water based paint, only within other industries.' (EE6)</p> <p>'For me it's interesting to also see EE10s perspective, because he has so much experience in the industry. [...]. It has also been a learning process for Vahur, via me then.' (EE12_P1)</p> <p>'We learned a lot on the production process [...]. Especially regarding the cuts of the shirts and how it can be produced in a way that it feels sophisticated in the end.' (ERZ8)</p>	<p>mutual learning on technology and processes</p> <p>learning through different experiences and approaches</p> <p>learning about practices and processes</p>

Table 20: Instances of cognitive proximity and distance in innovation projects

6.3.4 Organisational proximity and distance

The organisational dimension refers to sets of relations that coordinate processes of knowledge creation, either within organisations (e.g. subsidiaries) or between organisations (e.g. associations, networks). It follows the logic of membership and refers to ties between actors that belong to same group. Following this understanding of organisational proximity and distance only few projects exhibit associated references. However, going beyond the particular contexts of concrete innovation projects and focussing on practices at the wider firm level, it can be suggested that participation in networks, which generate proximity, is generally positively perceived.

Membership in networks and associations, which provides a degree of organisational proximity to fellow members, has been identified as a driver of project networks. ERZ1 reflects a case in which the initial

⁸⁰ e.g. ERZ2 collaborating with a furniture manufacturer from the South of Germany; ERZ9 collaborating with textile-affine and distantly located partner; EE2 acquiring food technology from a German company; EE8 and EE11 consulting with their established international customer base.

project stimulus is directly linked to membership in a specialised textile network. Thus, network membership provided organisational proximity and visibility and, given its industrial focus, also a certain degree of cognitive proximity. In this particular case, all actors involved in the innovation project were affiliated to the textile network. While this case illustrates an immediate membership effect regarding the emergence of innovation projects further cases exhibit, although more implicitly, how membership in organisational bodies affect tie formation and network dynamics. Throughout project duration some innovating firms sought exchange and consultation with partners from associations, networks or chambers (EE2, EE3, EE13 | ERZ8, ERZ11). Typically, such consultations in the project context were rather loose, yet mostly strategic. Linkages to organisational bodies were mobilised to generate visibility and to drive marketing activities (EE2, EE3, EE13 | ERZ8). EE2, developing meat products free of artificial additives (see 5.1.1), presented its newly developed products during a gathering of the Estonian meat industry. Because these products deviated from established manufacturing practices, EE2 generated a certain distance to other members of the network and the industry. Also, new organisational networks exceeding project activities were formed by the investigated firms for marketing and market access purposes. An interesting example in this regard is the establishment of a sales co-operation between ERZ3 (flax-wallpaper) and ERZ13 (age appropriate furniture) as well as further companies, jointly seeking to access interior design markets through coordinated action:

'We have now also joined a sales cooperation [...]. A sales cooperation that involves a number of companies, we jointly finance a sales representative who advocates our themes with architects, public administrations etc.' (ERZ13).

As part of efforts to prominently place birch sap on international markets, EE4 (see 5.1.2) established the 'Estonian Birch Sap Association', seeking to unite Estonian sap collectors and to generate more profound international impact by joint rather than isolated action.

Going beyond specific innovation projects it can be stated membership in associations, networks and further organisations is actively practiced by numerous case firms and considered valuable in terms of facilitating informal exchange, information gathering, inspiration and partner identification. The following quotes illustrate some intentions and effects related to membership in organisational structures:

'[within the network] we provide knowledge which helps project partners, and we hope to receive such knowledge from others.' (ERZ1)

'We are also a member in the enamel association, because we do enamel ourselves. Recently, a project started on repairing enamel which brings together firms that are interested in the topic and which then allows to build a network.' (ERZ7)

'We are also member of the [Estonian wooden house] association. And in the communication with the other producers [...] were had some discussions within the association on how to minimise costs. I think one aspect came up from there which got us thinking. If we could make similar kinds of houses and technologies with machines. [...]. So there is actually quite a bid of exchange going on, we exchange ideas and experiences visit each other's factories and share technological nuances. [...]. So we learn quite a lot from each other. [...]. You have the official association but there is also a more efficient cluster of firms inside the bigger one.' (EE5)

Because of their specific technological, content-related as well as stable features such organisational networks facilitate proximity along multiple dimensions (socially, cognitively and institutionally).

6 Zooming out: Cross Case Analyses

Contacts maintained and built in these networks can be activated in future projects. More generally and in particular following-up upon aspects raised in chapter 6.1, data suggest that membership and coordination of contacts in networks and associations provide for opportunities to participate in external projects (illustrated by ERZ1 in this section; similar: EE5 | ERZ4, ERZ6).

OVERALL DIMENSIONS	Organisational	
	illustrations from interviews	aggregate themes
proximity	<p><i>'We are also member of the [Estonian wooden house] association. [...]. So there is actually quite a bid of exchange going on, we exchange ideas and experiences visit each other's factories and share technological nuances.'</i> (EE5)</p> <p><i>'[within the INNtex network] we provide knowledge which helps project partners, and we hope to receive such knowledge from others [other members] that might be of value for our future activities.'</i> (ERZ1)</p> <p><i>'Within the paper industry there is an academic paper engineering association at TU Dresden. [...]. We meet once or twice per year and this is how contacts facilitate.'</i> (ERZ4)</p>	<p>exchange of expertise and practices</p> <p>collaboration by membership in industry network</p> <p>membership in alumni associations</p>
distance	<p><i>'We were representing [the newly developed products] at the meat forum in Estonia, gave this speech and everybody thought we are crazy.'</i> (EE2)</p> <p><i>'[...] such activities like meetings once a month [in business-related groups] I'm not keen on this. Because I'm not the right person for this. I want to do my thing and not go and participate in events.'</i> (ERZ10)</p>	<p>introducing deviation</p> <p>not seeking membership</p>
changes and dynamics	<p><i>'[the purpose of the Estonian Birch Sap Association] is to share knowledge and to bring together the different producers. Because Estonian amounts are quite small and we want to get [...] one big piece which is easier than 1000 small pieces.'</i> (EE4)</p> <p><i>'We have now also joined a sales cooperation [...]. A sales cooperation that involves a number of companies, we jointly finance a sales representative who advocates our themes with architects, public administrations etc.'</i> (ERZ13)</p>	<p>organising coordinated actions; integrations</p> <p>establishing organisational structures for joint action</p>

Table 21: Instances of cognitive proximity and distance in innovation projects

6.3.5 Interim summary

Before discussing in detail actor perceptions on the role of geographical proximity as well as related formats, this section summarises main indications on the function of relational proximity and distance in the innovation activities of firms from peripheral regions. The analyses highlight that the individual relational dimensions tend to be highly interwoven. Throughout collaborative practices, actors implicitly *juggle* (Hansen, 2015) with different types of proximity and distance to establish configurations that work most productively. Consequently, different dimensions might be traded off against each other. Further extending these interrelations, previous analyses point towards the specific function of distance as a central driver of innovation-related collaboration, contesting the common conceptual focus on proximity (Grabher and Ibert, 2014). It has been shown that joint innovation projects tolerate, and even require, distances in some dimensions. Providing, however, that these distances can be adequately compensated by proximity in other dimensions. Additionally, analyses illustrated that it is not necessarily the organisational firm level at which proximity configurations are negotiated and emerge as constituting elements. Instead, the importance of the interpersonal level could be illustrated. Likewise, dynamics of relational proximity and distance also frequently appear to be individually grounded. These indications call for more frequent adoption of methodologies capable of reflecting interpersonal elements in the analysis of collaborative arrangements.

Delving into individual dimensions, this research identifies along the social dimension that previous joint professional experiences as well as friendship and family ties provide for acquaintance and trust and,

therefore, constitute important drivers of collaboration networks. Activation of family and friendship ties is a particular aspect of firms from peripheral regions (e.g. Young, 2010). Dense social networks can provide distinct qualities and mediate an overarching state of actor thinness. While established trust to partners facilitates repeated collaboration, it also induces a potential danger of becoming locked into familiar relations (Boschma, 2005; Balland et al., 2015). Additionally, it has been shown that social and geographical proximity overlap: building trust requires interpersonal exchange and co-presence, but might also substitute it once trust and familiarity are/were established. The analyses illustrate that certain levels of institutional difference, such as diverging informal reference frameworks, work productively if collaborative arrangements provide for proximities in other dimensions and are coined by openness and flexibility of the partners involved. Relations deemed productive despite, or precisely because of, institutional differences are likely to be repeated. Likewise, cognitive distance can be ascribed a central function in processes of tie formation and firm's innovation-oriented networking behaviour. However, these distances require compensation and bridging by proximity in other dimensions.

These multi-layered functions of relational dimensions of proximity and distance compose central elements of firm's (project) networks. They allow firms to construct particular spaces in which geographical dimensions do not necessarily reflect the most essential ones. Rather, activity spaces are (co)constituted by actor practices, communication and relational configurations. Firms link up to dispersed actors via proximity and distance in social, cognitive, institutional and organisational terms and actively mobilise relational configurations as part of their innovation endeavours.

6.4 Spatial proximity and distance: perceptions and organisation

The notion of spatial proximity continues to have a central position in the discourse on innovation and space (see 1.3). It is co-location, i.e. geographical proximity, which serves as a main argument for the widely maintained view of actor dense, metropolitan areas being the quintessential hotspots of innovation. This is because proximity between diverse actors is considered to mediate interaction, facilitate knowledge exchange, to induce spillovers and, thereby, to generate agglomeration externalities.

However, peripheral settings are rather characterised by thinness and firms located in these regions operate at distance to potential cooperation partners, main markets etc. Nevertheless, descriptive analyses regarding the spatial organisation of innovation projects (see section 6.2.1) suggest that a certain degree of spatial proximity is given in the investigated projects. 35% of linkages in the projects of firms from the Erzgebirgskreis and 30% of linkages in the projects of South Estonian firms reflect a distinct regional component. Although it needs to be mentioned that the respective regional reference units, Chemnitz NUTS-2 and South Estonia' NUTS-3 region, cover rather large areas (see footnote 72). Absolute distance between partners in these administrative reference units might still exist and, hence, not necessarily allow for ad-hoc and frequent face-to-face communication. Introducing, for the sake of this explicitly geography-oriented analytical chapter, a local, i.e. sub-regional⁸¹ dimension corroborates this aspect.

⁸¹ This local dimension refers to linkages within the boundaries of the two study areas (see Maps 1 and 2). Thus regional agglomerations like Tartu and Chemnitz are excluded.

Looking at project specific collaborations realised within the boundaries of study regions, seven of such linkages can be identified for South Estonian cases (14% of all identified linkages) and six for cases from the Erzgebirgskreis (12% of all identified linkages). Interestingly, a large fraction of non-local but regional linkages relate to the regional centres of Chemnitz and Tartu.

In the following sections I will further expand on the role geographical proximity and distance in firm's innovation projects. Adopting a time-sensitive perspective allows to take into consideration temporality and, thereby, to identify specific modes whereby geographical distance in innovation projects is managed and mediated. Table 22 illustrates instances of geographical proximity, distance and changes in these dimensions.

OVERALL DIMENSIONS	Geographical	
	illustrations from interviews	aggregate themes
proximity	<p><i>'We have a local welding guy at hand [...]. Then we tested here how [the constructed samples] work. The first thing we try is to do everything locally here.'</i> (EE1)</p> <p><i>'[...] but we are also involving local people [for sap collection] that we know and trust.'</i> (EE4)</p> <p><i>'Because I see the potential for our wider product range, I thought it is good to proceed with a local partner. We are familiar with each other and we have short ways.'</i> (ERZ6)</p>	<p>flexibility, sample construction</p> <p>trustworthy local partners</p> <p>short ways, effective coordination</p>
distance	<p><i>'it [the location of the partner] is like 300km, so I can't just go there, it takes too much time.'</i> (EE4)</p> <p><i>'To be honest, [the place where partner is located] is pretty far and it is also very remote. I don't have a car, I've been there once which was quite a journey.'</i> (EE12_P1)</p> <p><i>'[...] these 1.5 hours that it takes to get there are a real problem. Because you simply cannot briefly coordinate and make quick decisions, it is always quite time-consuming.'</i> (ERZ8)</p>	<p>resources, time</p> <p>remoteness, transport</p> <p>limitations for coordination and routines</p>
changes and dynamics	<p><i>'First time we showed [the newly developed bed] was on the Cologne-Exhibition. [...]. There we showed our first sample which at this stage was really still a raw product.'</i> (EE1)</p> <p><i>'I was there [Berlin] a few times. Just for one day, getting there in the morning and leaving again in the afternoon. But there is also the internet and telephone.'</i> (ERZ5)</p> <p><i>'They really showed a lot of effort, we had many telephone conversations, we went to see them and they also came here.'</i> (ERZ13)</p>	<p>trade fair participation, sample presentation, mobility</p> <p>visits, communication</p> <p>project meetings, mobility</p>

Table 22: Instances of geographical proximity and distance in innovation projects

6.4.1 Actor perceptions on geographical proximity and distance

To evaluate the role of spatial proximity and the extent to which it acts as a driver of the innovation processes of firms from peripheral regions, a first step is to investigate actor perceptions regarding specific qualities ascribed to geographical proximity. As a general bottom line, this research finds that geographical proximity is generally perceived as an element that provides interactive relations with specific qualities and, thereby, confirms previous findings (see 1.3.1). One recurring aspect is that spatial proximity to relevant actors is seen to provide for flexibility and reduced transaction costs regarding both, transaction-oriented and knowledge-oriented linkages (EE4, EE6, EE12, EE13 | ERZ6, ERZ3, ERZ8, ERZ9, ERZ12, ERZ13):

'There are advantages to have local and nearby partners and it is important to have them.' (EE6)

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'[Geographical proximity to partners] does play an important role and we try to have partners as close by as possible, not only partners for development purposes but also production partners.' (ERZ7)

'It is always helpful to have partners locally, to have short ways. It is good to coordinate or if partners need to be on site. It also minimises the costs of projects.' (ERZ4)

The strategy of ERZ6 (see 5.2.3) to anchor a relevant technology locally rather than collaborating with the leading industry partner over distance illustrates the moderating effects of geographical proximity. It is primarily seen as a streamlining element as *'issues can be solved quickly and the flow of information is facilitated'* (EE12_P1). Conversely, actor relations that build upon distance are portrayed as implying limitations and complexities: *'because you simply cannot briefly coordinate and make quick decisions, it is always quite time-consuming'* (ERZ8; similar: EE4 | ERZ7).

From these indications, confirmed in the majority of cases, it can be concluded that on a macro-level actors generally ascribe a mediating function to geographical proximity. Thus, proximity can be considered a desired condition for actors to operate, but which is not necessarily feasible. However, it does not suggest that distance is perceived as a substantial disadvantage that restricts routines and operations. It can indeed be observed that the very fact of being located in distance to markets and potential/existing collaboration partners shapes routines:

'[...] I don't consider this a disadvantage because we are always on the move. There is hardly a week in which we are not in Berlin or abroad, in the UK or elsewhere. [...]. So it's less a matter of where we are located, but more a matter of how much time we can devote [to these activities] besides our day-to-day business.' (ERZ6)

This statement can be seen as an exemplary indication reflecting that actor mobility constitutes a particular element of how firms manage distance as part of their general operations and in particular their innovation efforts. Consequently, a lack of geographical proximity to relevant partners should not be considered a condition imposing insurmountable limitations on firms' operations. Accordingly, multiple actors explicitly suggest that *'it doesn't really matter where partners are located'* (EE11; similar: EE4, EE12_P1 | ERZ9, ERZ11).

Face-to-face contact can to a certain extent be effectively compensated for by technologically mediated communication tools. Actors use different communication modes as accelerators in their collaborative ties to distanced partners. These modes comprise for instance of telephone and e-mail communication, telephone conferences, extended skype meetings and comprehensive virtual session for joint product development. Throughout project duration there are episodes in which exchange between partners is a daily necessity as well as periods in which exchange can be reduced. While different technologies allow dispersed actors to effectively communicate, mere transition from physical to virtual contact is not considered a viable option:

'My opinion is that you can only discuss certain things on the telephone or via web-conferences. Real interpersonal contact is still not possible. Current technology is still not good enough to replace it.' (ERZ3; similar: EE7, EE8 | ERZ2, ERZ5, ERZ7, ERZ12)

'Spending half a day in a factory which makes the machine you will find out whether the machine is the right one for you or not. Trying to do that from quotations and the internet or phone conversations is very difficult.' (EE6; similar: EE5 | ERZ6)

Consequently, communication technologies cannot fully substitute interpersonal as well as object-related interaction. Thus, there is still the need for actors to organise interaction in geographical proximity.

6.4.2 Managing distance: mobility, temporary and virtual settings

The understanding that firms from peripheral regions operate at distance brings to the fore the question on how they organise the seemingly indispensable need for localised interaction with external partners. In this respect, mobility of actors (individuals) and artefacts (e.g. samples, prototypes, final products) can be identified as a common practice to manage and (temporarily) bridge distance.

'[...] the world becomes smaller and smaller [...] and it is not a miracle for us to go to EU countries and even China or Taiwan if needed.' (EE6)

'Of course we were having several meetings. Our team visited the customer's factory and they also came over here for discussions.' (EE8)

'That [increased levels of mobility] is important. As I said, [...] one has to spend quite some hours in the car.' (ERZ9)

All projects investigated reflect, to varying degrees, mobility aspects. This indication highlights its pivotal function and emphasises the multi-local nature of innovation. The central function of mobility is not confined to the project-level, but reflects a common practice on the broader firm-level. However, it needs mentioning that the degree of mobility is subject to available resources such as finance and, importantly, time. Firms that operate at distance have to devote substantial resources to generate temporary proximity. Consequently, some firms (e.g. EE4, EE12, EE13 | ERZ5, ERZ6, ERZ7, ERZ11) explicitly frame this circumstance as a distinct limitation and reduce periods of co-present interaction to a minimum: *'maybe we should meet [more frequently] but it's like 300km, so I can't just go there, it takes too much time'* (EE4).

Conceptually, indications on different types and formats of mobility relate to the notion of temporary proximity (see 1.3.2 and 2.2.2). It can be clearly retrieved from the data that firms frequently and rather naturally use settings that allow for co-presence with partners to drive both, their innovation efforts and overall firm operations. Firms actively organise temporary proximity while permanently operating at distance. Two main modes of organising geographical proximity in innovation projects emerge as being of particular importance: initiation visits/project meetings and trade fairs or related formats such as consumer markets etc.

INITIATION VISITS AND PROJECT MEETINGS

The function of initiation visits and project meetings has been implicitly addressed while analysing relational dimensions of proximity and distance. This research identifies that mutual visits and meetings play a particularly important role. Especially, but not only, in the context of projects that involve previously unrelated partners, mutual visits provide a platform for effective partnership to take shape through face-to-face interaction. Such initiating visits take place at different collaboration stages: preceding (potential) collaborations (EE4, EE5, EE9 | ERZ2, ERZ3, ERZ5, ERZ6, ERZ9, ERZ10), as kick-off to projects (EE4, EE6, EE12 | ERZ1, ERZ2, ERZ11) and at later project stages (EE4, EE7 | ERZ3). Such bi and multi-lateral meetings play a substantial role in processes of trust building, but also provide means to harmonise institutional as well as cognitive arrangements. In this sense, it can be

suggested that dynamics of relational dimensions of proximity and distance are somewhat coupled with (temporary) geographical proximity (see 2.2.2).

Independent of their timing, such visits help to reduce existing distances between partners, for instance in terms of interdependent social, cognitive and institutional dimensions. They allow to moderate uncertainties, bring together diverging expectations in partnerships and, thereby, facilitate the emergence of common understandings. In the context of initiating collaboration with new partners ERZ5 highlights that the very first step was '[to go to Berlin] *to see them, we have sniffed at each other a little and identified what we really want*'. Thereby, personal relations between the individuals involved were build and mutual expectations determined. Building its network of international distributors EE7 highlights the need to meet with partners to build trusted relations: '*I believe in one more thing: with all partners, and especially foreign partners, what you have to do is to get to know each other*'. Consequently, EE7's CEO arranged personal meetings with the most important international partners, either abroad or in Estonia (similar: EE4). Within the specific context of (re)establishing trust, visits were arranged to mitigate tensions between partners through direct face-to-face interaction (e.g. EE7, EE8).

Besides providing platforms for interpersonal interaction and exchange, such visits provide means to interact with technology and artefacts. Co-presence helps to become acquainted with distinct (technological) capacities and knowledge bases of partners. In the consultation process with a potential technology partner ERZ6 stresses that '*for me, the on-site visit was very important: to be at [the factory] and to see how capable this technology is*'. Related aspects are highlighted by EE6 in the consultation process with different paint line manufacturers:

'Spending half a day in the factory which makes the machine, you will find out whether the machine is the right one for you or not. Trying to do that from quotations and the internet or phone conversations is very difficult. [...] We went to Italy [and] were hesitating between two machines. We knew the specifications we needed and on paper they seemed fairly identical. We spent half a day in the factory and found that this machine was not for us, so it helped us to make the decision.'

Similarly, although being visited by a collaboration partner ERZ2 highlights that:

'It doesn't make sense to initiate [a project] without a visit. People need to have a look because for many, our products are new and they don't really have precise ideas'.

These examples illustrate that geographical proximity not only proves beneficial in the context of interpersonal interactions but expands to human-artefact interaction. Furthermore, meetings during joint projects provide opportunities for intense exchange, content related updates, further elaboration and adaptation of projects (e.g. ERZ1, ERZ4, ERZ13).

These illustrations suggest that mobility holds a central position in the innovation activities and routine operations of firms from peripheral regions. It can be argued that certain modes of temporary proximity play a substantial role in establishing and operating project networks. Ultimately, the explicit need to manage, and in a certain way overcome, distance through mobility might even suggest that firms operating at distance exhibit higher mobility levels compared to firms that have the opportunity to organise relations

in geographical proximity. However, given the overall comparative approach of this research, which does not involve direct comparison to centrally located firms, this hypothesis requires caution.

TRADE FAIRS AND RELATED SETTINGS

Beside such bi-lateral formats this research finds that trade fairs, as well as related formats, drive the innovation efforts of firms from peripheral regions. Unlike the limited reach of specifically organised visits and meetings with selected partners, the specific ecology of trade fairs allows firms to temporarily engage with wider functional audiences such as potential and existing partners, customers, research organisations, public actors, etc. In the context of investigated projects, the multi-dimensional function of trade fairs and associated formats can be linked to three interrelated aspects: (i) establishing new and maintaining existing contacts, (ii) the presentation of product/process novelties and (iii) sales/marketing.

In a number of cases the very emergence of projects can be traced back to trade fairs. Subsequent to the actual event, newly established contacts resulted in collaborations and partnerships (EE4, EE7, EE10 | ERZ1, ERZ2, ERZ3, ERZ9, ERZ10) and transformed into joint innovation projects (EE4 | ERZ2, ERZ9). As ERZ2 explains:

'we were approached while exhibited at a supplier fair for the furniture industry. We were exhibiting moulded parts, they saw this and in combination with the felt covering, they got the idea that it could also make a bag'.

Similarly, while exhibiting at Tallinn Food Fair EE4 initiated contact to a partner that became central in the development of birch sap soft drinks. Going beyond these instances which facilitated entire projects, the empirical material further provides numerous instances which reflect that trade fair participation expanded networks on the firm level more generally (e.g. EE4, EE7 | ERZ1, ERZ3). Furthermore, actors consider trade fairs as arenas to meet and exchange with existing partners and customers. In providing this dual function, firms perceive co-present settings as productive platforms to reach out, access and generate buzzing environments:

'I mainly use [fairs] to get in touch with research institutions and universities. Fraunhofer institutes are around, often also TU Dresden and other German universities. You can easily observe what they do and if there is interest. You can feel free and simply contact them.' (ERZ3)

'To find partners we increasingly visit trade fairs [...] and present ourselves as a powerful partner in the textile field. We have found a number of partners during trade fairs with whom joint developments were started.' (ERZ9)

Due to their orientation towards specific industries or themes, trade fairs and associated events can be considered to provide technological as well as institutional frameworks which are, at least partially, shared by participating actors. These settings act as arenas that allow to observe developments of competitors, customers and wider markets. Such monitoring potentials have been frequently mentioned as underlying motivations for participation (e.g. EE1, EE4, EE10, EE11 | ERZ2, ERZ3, ERZ4, ERZ11, ERZ12).

Another critical dimension of trade fair participation is the opportunity to present newly developed products, processes and prototypes. Accordingly, trade fair participation, either as exhibitor or visitor,

might play a crucial role in the path of innovation projects.⁸² In particular, firms link their participation in trade fairs, markets, festivals and degustations to the rationale of receiving feedback and to potentially incorporate changes based on direct market interaction:

'We have exhibited in France and Germany where we also exhibited with a primed door, a pre-production sample made at this time, just to test the market.' (EE6; similar: EE1, EE5, EE7, EE12, EE13 | ERZ3, ERZ7, ERZ10, ERZ12).

In some cases (e.g. EE5, EE7 | ERZ12) exhibitions at trade fairs were also used to officially launch product marketing. A related aspect, explicitly and implicitly articulated, is that such formats not only provide arenas for interpersonal exchange, but also allow for artefact-related interactions. Which is considered a critical dimension, especially in the context of newly developed projects:

'The thing is that our product [a sauna based on and unconventional Igloo design] [...] looks really cool, it looks nice on the pictures and different [to what people know] [...]. People need to step inside and then they get the feeling and will say it is really nice. [...] but you cannot do this only by pictures. Therefore it is really important [for us] to go to the fairs.' (EE7⁸³; similar: ERZ10)

Similarly, EE2 arranged degustations in supermarkets as part of market launch of its e-free meat products. Thereby, seeking to convince customers of their products and to reduce reservations towards its product range which was new to the Estonian market. To present new developments, firms typically participate in trade fairs as exhibitors. However, the empirical material also comprises for cases in which firms visit fairs without own exhibition areas. Doing so, product samples are distributed and potential audiences strategically approached:

'So I was just a visitor [at a big fair in Holland] [...]. I had my luggage [samples] with me and I told everybody about birch sap and I shared my business card.' (EE4; similar: EE12 | ERZ5, ERZ11)

Marketing and sales related aspects partly overlap with efforts to utilise the dense environments of trade fairs as arenas for product presentation and the generation of visibility. This sales function can be observed across cases. However, some firms clearly indicate a certain shift in the sense that the sales function of fairs has been more and more moved to the background, suggesting that their motives for participation primarily relate to interaction opportunities:

'Generally I would say that trade fairs now play a less important role for marketing. We consider trade fairs more as opportunities to directly talk to customers.' (ERZ6; similar: ERZ5, ERZ7, ERZ11)

⁸² Trade fairs and related formats were visited, either as exhibitor or visitor, in the context of 19 cases (i.e. 73% of investigated cases): EE1, EE2, EE3, EE4, EE5, EE6, EE7, EE11, EE12, EE13 | ERZ2, ERZ3, ERZ5, ERZ7, ERZ8, ERZ9, ERZ10, ERZ11, ERZ12. In case firms have not participated in trade fairs as part of investigated projects, it has been stated that firms frequently visit fairs as part of overall business operation.

⁸³ As part of the research process on EE7, comprehensive data were collected on its trade/summer fair and festival participation (from sources such as company website, Facebook etc.). This is to complement interview statements on the importance of such formats for the overall business development. Some of these diverse events were: Kalafest 2014 (Viljandi 02/2014), Türi Lillelaat 2014 (Viljandi 05/2014), international trade fair (Helsinki, 03/2015), Maamess 2015 (Estonian Agricultural fair, Tartu, 04/2015 and 04/2016), Interjõör Trade fair (Tallinn, 04/2015), Marketing event at Estonian National Theatre (Tallinn, 05/2015), Tartu Hanseatic Days (Tartu, 07/2015), FOR ARCH fair (Prague, 09/2015), Building and interior fair (Tartu, 10/2015), Marketing event at Rotermann Square (Tallinn, 12/2015), Otepää Sauna Marathon (Otepää, 02/2016), international trade fair participation in Stockholm, Helsinki, Göteborg and Munich throughout 2016.

Nevertheless, firms from both study regions perceive and use trade fairs, smaller markets and regional festivals as sales opportunities:

'From 2014 onwards we have realised that exhibiting a trade fairs is absolutely essential for us. [...]. Even though you must not always consider direct sales on the sport. We visited also fairs without selling anything but sales really increased after-wards, so in the end it was very effective.' (ERZ10)

Along a similar vein, fairs are used as immediate sales opportunities in particular by newly established companies and those targeting end consumers (EE3, EE4, EE7, EE13 | ERZ8).

This research finds that trade fairs and related formats take on multiple functions within the context innovation processes of peripherally located firms. Their importance can be directly linked to the temporal generation of co-presence between diverse actors and the facilitation of interpersonal and object related interaction. On a more general level, firms from both study regions seek to use these formats as particular platforms to generate visibility. Thus, formats which allow for temporary co-presence provide essential mechanisms for firms to reach out, building networks, generate visibility and, thereby, to bridge and bypass distances.

VIRTUAL SETTINGS AND MARKETING ACTIVITIES

Virtual settings and online activities emerge as an additional mechanism by which firms moderate distance and generate visibility. A substantial number of firms actively use the internet as an advertising opportunity to strategically position themselves and their products. ERZ6, a manufacturer of shaving equipment (see 5.2.3), surfaces as one of the most active/strategic companies in this regard. It considers online activities effective means to compensate for lacking proximity to particular locations deemed relevant for the company. As the CEO of ERZ6 explains:

'Nowadays people google so we try to generate as many intersections as possible, i.e. to generate visibility for our brand and company we try to feature our brand wherever it is possible.'

Consequently, over the past years ERZ6 adopted a broad range of associated virtual and social media activities and maintains an online-shop, Facebook and Instagram sites and a YouTube channel – all used for product presentation and marketing.⁸⁴ Accordingly, it is pointed out that: *'without the internet the firm could not have taken such a dynamic development'* (ERZ6). In addition to these virtual activities ERZ6 publishes its own print-magazine through which *'stories from the company cosmos'* are communicated to existing customers and the wider public. Furthermore, ERZ6 seeks to continuously generate media attention which serves as an indirect mechanism to the build visibility and to overcome distance to markets.

Similar activities can be identified for further firms targeting end consumers, although typically being more selective and not necessarily covering comprehensive sets of measures. Webshops and Facebook sites are considered important elements and actively maintained or have been recently established to

⁸⁴ ERZ6 utilises this YouTube channel to feature its collaboration with a well-known London-based individual from within the booming barber scene (*'he is some kind of YouTube star'*). Thereby, ERZ6 strategically positions its brand internationally.

feature products and generate visibility (EE1, EE2, EE3, EE4, EE7, EE11, EE13 | ERZ1, ERZ3, ERZ8, ERZ10).⁸⁵ Virtual settings provide rather cost-effective marketing channels. Thus, their broad adoption amongst case firms can also be seen as a response to generally limited resources available for marketing and advertising. In this regard ERZ6 and EE7 can be seen as exceptions that have strategically decided to devote significant resources into marketing. Despite a certain consensus amongst firms on the generally conducive role of virtual settings it has also been argued that *'the internet is not a healer. [...]. The internet is so big, our company gets lost, it's like the needle in a haystack'* (ERZ10).

6.5 Complementing network linkages: firm internal capacities

The previous chapters analysed innovation projects primarily from network perspectives and corroborate that the diverse resources acquired through external linkages play a crucial role in the innovation activities of firm from peripheral regions. However, the function of internal resources must not be downplayed, as it is widely accepted that these not only constitute the base of firm competitiveness, but also shape networking capacities, i.e. the capacity to recognise, appropriate and integrate external resources (Cohen and Levinthal, 1990; Cantwell, 2006). This research confirms the complementary function of internal and external resources. The role of internal capacities is approached regarding both, specific innovation projects and the wider firm level. The analysis reveals that firms from peripheral regions operate from comprehensive internal capacity bases and that these bases are strategically expanded. Consequently, internal capacities are considered key mechanisms to create self-sufficiency by reducing interaction requirements and, thereby, compensate for a lack of regional knowledge sources.

6.5.1 Internal capacities as innovation drivers

Resources that determine the competitiveness and drive the innovativeness of firms relate to technological capabilities and production routines as well as accumulated experiences of individuals. Following the resource based view (Foss, 1997) these resources determine firm's core competencies. Across study regions it can be observed that firms operate from diversified sets of internal capacities which immediately affect innovation activities. ERZ6 synthesises this observation in an illustrative fashion:

'I think that our production depth is somewhat part of our DNA and very important for the company. [...]. We try to keep as much in-house as possible.'

ERZ2, a case manufacturer (see 5.2.1), maintains, besides its technological and experience-related core activities of case construction (*'this is our expertise'*) a wide array of departments, such as units for model and mould construction or sewing. Collectively, these ensure that a broad range of production activities can be handled internally:

'We can sew bags and we can produce cases, we can integrate a zip, we can rivet, glue and screw items, produce a belt strap – anything that is needed.'

This comprehensive capacity base and its effective operation is coupled with and dependent upon the *'traditional knowhow and experience of employees'*. This constellation of technological and experience-based internal capacities ensures a high level of readiness to flexibly handle external requests. Overall,

⁸⁵ More specific activities were identified in this regard, e.g. blogging (EE4), comprehensive advertising (EE7), seeking media attention (EE2, EE3, EE4, EE5, EE7, EE11, EE12, EE13 | ERZ3, ERZ8, ERZ10).

this flexibility is portrayed as a main source of competitive advantage and has, furthermore, substantially contributed to successfully handle the external request for producing a multifunctional bag: *'it was very appreciated by the customer [that we could produce the entire bag], they thought we could only produce the case'*. Consequently, when developing the multifunctional bag ERZ2 could almost exclusively draw on internal resources: *'there was no substantial external expertise involved'*.

Similarly, ERZ9, a home textile manufacturer, has continuously upgraded and expanded its technology base allowing the firm to tap into technical textiles markets which, consequently, became an increasingly important market segment. Based on these technological capacities, associated production experiences and routines of its technologists, ERZ9 pushed the development and production of isolation fabrics for applications in chilling cabinets forward:

'[the production of isolation fabrics] needs to be technologically implemented. And we didn't have much experience with these materials. So we had to adapt the machine settings to process the different materials.'

Again, the combination of technological capacities and experience-based expertise provided an effective base to pursue the development without engaging partners. The case of EE5, a manufacturer of wooden houses, further highlights the significance of diversified internal capacities and their immediate effects on innovation projects. While being a wooden house manufacturer, the origins of EE5 go back to machine building activities, the company still maintains a large machine building department. Its CEO considers this combination of competencies a major source for competitive advantage:

'there are certain things we do differently because we have developed the machines ourselves and we have the unique possibility to get feedback from all different stages of the supply chain [...]. From our own production, from our builders and from the customers.'

Consequently, when producing a novel technology solution to automate the production of a specific wooden corner type ('Norwegian Corner'), previously requiring manual crafting, EE5 primarily relied on internal technological capacities, coupled with diverse practical experiences of both machine building and construction staff.

The case of EE2 (see 5.1.1) illustrates similar indications. Developing 'green label' products, EE2 acquired specific technological components. These components were assimilated and adapted to the company's specific conditions and requirements. This adaptation process rested upon internal capacities, in particular practical experiences of its food technologists:

'We had to accommodate components and recipes to our conditions, and sometimes we got different results. So we had to find ways to get good results. [...]. We had to combine their knowledge and our knowledge. [...]. We were testing every day to find out which compounds work.'

Similar indications that highlight the importance of practice-based internal capacities for effective appropriation of externally acquired technological solutions come up in cases EE1, EE7, EE9 | ERZ5, ERZ12. Furthermore, EE2's technicians construct specific manufacturing equipment, reflecting a further dimension of its comprehensive in-house manufacturing depth:

6 Zooming out: Cross Case Analyses

'We even build our equipment. We have excellent guys in-house who produce equipment for new technologies. Thereby we can test in smaller charges and make larger equipment for producing larger quantities later on.'

Internal expertise and practical experiences across different departments allowed EE8 to effectively and quickly respond to production related quality issues raised by one of its key customers:

'We have certain specialists in each and every, let's say, important part of our activities. They are responsible for certain segments of the production in the company. [...]. So we usually can handle those things internally.'

Although exhibiting higher interaction levels to external partners case firms EE1 | ERZ1, ERZ3, ERZ6 reveal similarities regarding maintenance of comprehensive internal manufacturing depths. The owner of ERZ6 pinpoints their function in the following way:

'This comprehensive production depth is paradoxically exactly the opposite of what is being taught at university. The mantra there is to make to production lean. [...]. Back in the days we have only produced shaving brushes, just like our competitors. [...]. We have simply picked from the toolkit of our suppliers who have focussed on producing handles, mounts and the like. Consequently our products were quite similar to those of our competitors. [...]. The moment we decided increase our production depth, the company grew really dynamically. [...]. Externalising parts of the production, and be it only to a company in the neighbour village, is always a limiting factor. [...]. Now, I think that our comprehensive production depth is actually part of the brand DNA, it is very important for the company. It is not possible in every single area, but we try to keep as much of our production in-house.' (ERZ6)

This view highlights a key motivation of firms to operate from diversified internal manufacturing bases: flexibility. It allows companies to act independently without substantially relying on external input but also to effectively and quickly respond to requests. With regards to Estonian firms (e.g. EE4, EE5, EE6, EE9), internal capacities further serve as a mechanism to bypass limitations of technological resources, specialist knowledge and services available within Estonia. Thus, diversified sets of internal capacities act as responses to the previously identified aspects of resource thinness (see 6.2).

By maintaining high degrees of internal capacities, firms potentially, although not necessarily, reduce their interaction requirements, i.e. adapt interaction and innovation behaviours. Due to diversified internal capacities linkages to external actors might render obsolete and firms actively build substantial levels of self-sufficiency. This aspect can be vividly illustrated in the context of accessing public innovation funds:

'For funded projects we always have a person in charge of content and one in charge of administrative handling. We have a colleague with a background in chemistry. The writes things of which 80% make already up a project proposal. He knows exactly how things have to be written and what needs to be considered. He is really knowledgeable on funding schemes, SAB, BMBF etc. [...]. which is really helpful.' (ERZ3)

In this regard ERZ3 differs from other cases which typically outsource grant application/administration processes to either external consultants (EE2, EE9 | ERZ1, ERZ5, ERZ7, ERZ12) or research institutions involved in projects (EE4 | ERZ4, ERZ11, ERZ13). High levels of internal capacities complement strategic mobilisation of network linkages through which required expertise is externally acquired. Consequently, maintaining high degrees of internal resources can be interpreted as specific mechanism to (i) avoid costs and uncertainties related to the initiation and operation of external, and especially new linkages, and (ii) to respond to potential lacks of resources available regionally.

However, EE10, a firm from the beverage industry, provides a counter-example to these indications. Being a small company with 11 employees, it operates from a rather low degree of internal capacities. Its CEO explicitly states that innovation activities follow an open approach. Consequently, EE10 typically grounds innovation activities on strategic collaborations with external partners to compensate for limited internal capacities. Thus, EE10 has high interaction needs and maintains a range of ongoing collaborations with industry and university partners and, according to project requirements, frequently establishes linkages to new partners. In this regard the empirical material points towards a certain relation between the level of internal capacities and firm size. Accordingly, larger firms provide for more diversified internal capacities and for higher degrees of self-sufficiency. While smaller firms face a certain dilemma: lower degrees of internal capacities induce higher needs for external knowledge acquisition which is, however, confined by limited resources to initiate linkages and to effectively internalise expertise.

6.5.2 Capacity building through innovation projects

The previous discussion analysed the role of existing internal capacities as drivers of innovation projects and wider firm competitiveness. Furthermore, innovation activities induce further capacity building, through organisational learning and strategic decision taking, e.g. access to new markets, adoption of new technologies etc. Consequently, this gradual building of internal capacities further drives diversification of knowledge and competence bases and might affect firm's interaction behaviour.

Capacity building through innovation projects relates to diversification of technological profiles by nuancing existing solutions and production practices (e.g. EE2, EE8, EE9 | ERZ2, ERZ3, ERZ4, ERZ5, ERZ11), or by adopting new technological solutions (e.g. EE6 | ERZ6). Regarding the latter aspect ERZ6 (see 5.2.3) provides an illustrative case. As part of product development based on a new technology, ERZ6 expanded its technological base in multiple directions. First, by implementing MIM-technology with a local partner. Second by further expanding its manufacturing depth. Instead of outsourcing the finishing stage of new products, the technology was, by committing to substantial investments, incorporated into the firm. These strategic decisions follow the logic of increasing flexibility by decreasing dependence on external actors. Thereby, as suggested in the previous section, self-sufficiency is actively build. Striving to locally anchor technological solutions further reflects specific learning processes, which expand from an inter-organisational to a local dimension – facilitating profound regional capacity building. Going beyond such mere technological aspects certain cases illustrate instances of organisational learning because firms engaged with new and fundamentally different, i.e. non-routine topics (e.g. EE6: implementing a water-based painting line; ERZ3: interior design applications; ERZ5: fish breeding and its implications towards tank construction and process engineering). Doing so, firms align and adapt existing solutions and routines with/to emerging opportunities and build new expertise.

Another important source of organisational learning and capacity building refers to specific overlaps between product and process innovation (see 6.1.2). New market opportunities were generated as part of technical projects and, subsequently, firms mobilised new sales and marketing channels. Multiple firms (e.g. EE1, EE4 | ERZ3, ERZ12, ERZ13) have, following product development, established new

distribution channels such as online shops and showrooms or engaged in export activities. Such activities reflect distinct organisational innovation processes.

A further nuance of building internal expertise through innovation can be identified when looking at expertise originating from previous projects (EE6) as well as projects that have (initially) failed, i.e. have not yielded desired outcomes (EE1 | ERZ4). The case of EE6 indicates that the installation of a painting line benefited from collaborations with diverse external partners and gained from internal expertise built up in preceding projects. Specifically, when integrating an automation robot, EE6 could substantially draw on experience from a previous robot installation project. Certain tasks regarding robot installation were now covered internally, lowering the extent to which external expertise was needed:

'We gave the first [robot project] to an Italian company, the whole project. And then they went through it with us, explaining what they did. This robot now is the second robot and we decided that we would bring all the pieces together now, 5-6 different things have to be pulled together [...]. So we took that 5-6 things [...] and worked on each step to bring this second robot together for half the budget of the first robot.' (EE6)

In the early stages of developing an adjustable firmness bed related to design features set by a Norwegian retailer, technical issues resulted in project termination. However, insights from the terminated project triggered the launch of a follow-up project. While retaining the adjustable firmness concept, technical design features were substantially adapted: *'from the initial project we got the input that we can produce adjustable firmness beds, but the bed design was totally different'* (EE1). Similarly, ERZ4, a paper manufacturer, ran a project aiming to increase the speed of its paper machine in the production of glassine, however, without compromising on transparency. Although the overall goal could not be realised, this 'failed' project generated important indications and expertise regarding future activities:

'we now know that [the paper characteristics change] and operate accordingly. [...] we know that the transparency level cannot keep our expectations. So we don't have to promise to our customers [...]. Is very important to know what is doable and what is not.' (ERZ4)

6.6 Towards a typology of innovation-related action strategies

Exploration and analysis of innovation projects allows to derive some basic patterns of firm's innovation-oriented practices and strategies. Following on previous analyses (part 5, chapters 6.1 to 6.5), this chapter synthesises the empirical material and develops a typology of innovation-related action strategies of firms from peripheral regions. The goal of constructing such a typology is to aggregate observations by reducing information on individual cases and to achieve a certain degree of theoretical generalisation. Therefore, the typology of innovation-related action strategies reduces the role of contextual elements and develops aggregate dimensions. As such, it has been mentioned that empirically grounded typologies are particularly relevant for intervention strategies, i.e. policy related action (Schmidt-Hertha and Tippelt, 2011). Thus, a further intention is to generate a basis for deriving recommendations whereby innovation-related practices and strategies might be effectively supported by policy measures, related for instance to regional, innovation and industrial policy. Consequently, this chapter constructs and characterises different types of innovation-related action strategies (6.6.2) and discusses potential avenues for effective

policy support (6.6.3). In addition, the methodological approach mobilised for typology construction is briefly outlined (6.6.1).

In theoretical terms, the construction of a typology on innovation-related action strategies follows the understanding of innovation as interactive and knowledge grounded organisational transformation processes (see part 1). Accordingly, central dimensions of the typology refer to practices and strategies whereby firms mobilise knowledge and expertise required to pursue innovation processes. Consequently, the main dimensions of the typology refer to (i) the degree to which firms rely on internal capacities and (ii) firm's interaction intensities (see Figure 19).

Both dimensions can be considered decisive and intertwined mechanisms that facilitate firm's innovation endeavours. Firms mobilise a twin strategy to maintain innovation capacity and competitiveness, composed of mobilising and expanding internal capacities as well as sourcing and appropriating resources from spatially dispersed actors through established and newly built network ties. Practices that underlie these strategies, implicitly and explicitly, allow firms to bypass potential structural shortcomings of regional environments (actor thinness, distance etc.). However, the way in which these mechanisms are coupled varies between individual cases and is contingent upon contexts. Consequently, constructing a typology on innovation-related action strategies can be considered an exercise towards theory development, by reducing information as well as the impact of contextual and contingent factors.

6.6.1 Excursion: methodological aspects of typology construction

From a methodological viewpoint, any typology is the result of a grouping process. Individual groups constitute the types of a typology and differ according to the specific arrangement of features that determine study objects. Hence, typologies structure empirical data to proceed from single case observations to more aggregate dimensions that reflect broader elements of empirical phenomena (Kluge, 2000; Schmidt-Hertha and Tippelt, 2011). Each type within a typology, in this dissertation innovation-related practices and strategies, is determined by internal homogeneity, i.e. shared characteristics across study objects, cases, observations etc., and external heterogeneity which delimits different types (Kluge, 2000). However, typology construction in qualitative social science research must not be perceived as yielding absolute types that impose structural and strict boundaries. Rather, typologies provide a synthesis of combinations of empirical regularities and meaningful relationships between them (Abicht, Schönfeld, Reupold and Tippelt, 2009; Schmidt-Hertha and Tippelt, 2011). As such, regularities can not necessarily be separated from study objects and individual types in typologies are, inevitably, overlapping and coupled.

The construction of a typology of innovation-related practices and strategies of firms from peripheral regions was guided by the multistage process explicated by Kluge (2000). As a first step, relevant dimensions of the typology were identified and retrieved from the empirical material. Following the dissertation's theoretical framing of innovation as knowledge grounded and interactive processes, the two central dimensions to differentiate innovation-related action strategies refer to the degree by which firms rely on internal capacity and their interaction intensities. Accordingly, the differentiation into five types

of innovation-related action strategies (see 6.6.2 for characterisation) can be ascribed to both, theoretical considerations and empirical analyses.

empirically grounded catalogue of innovation-related practices and strategies	case attributes	
	high level of internal capacities	high interaction intensity
...	EEX ERZX	...
...
...
...
...
...
...	...	EEX ERZX

Table 23: Stylised attribute space

The coding system which was deductively and inductively developed as part of QCA (see 3.3.3) served as a starting point for typology construction. Guided by the two determining dimensions of internal capacities and interaction intensity, innovation-related practices and strategies were identified. These constitute central elements of the particular *attribute space* ('Merkmalsraum') that forms the basis for typology construction. This catalogue of identified action strategies was cross-tabulated with the above mentioned determining dimensions, yielding a matrix on the typology's overall attribute space. In a second step, individual cases were assigned to practices and strategies mobilised as part of innovation projects and then grouped. This matrix (Table 23 depicts a stylised attribute space) was further synthesised considering meaningful relationships and possible contradictions between individual strategies. An iterative process finally resulted in the construction of aggregate types. These types and the attributes that provide a structure along internal homogeneity and external heterogeneity are described in the following section.

6.6.2 Types of innovation-related action strategies

Both dimensions that form the typology's basis, interaction degree and level of internal capacities, refer to a continuous spectrum that ranges from low to high relevance. Thus, investigated cases can be located on this spectrum. Developing a typology of innovation-related action strategies yielded five different types. Each bundling specific sets of innovation-related strategies. These types are referred to as *self-sufficiency building* (type 1), *resource mobilising* (type 2), *complexity managing* (type 3), *flexibly (re)acting* (type 4) and *non-innovating* (type 5). The following sections characterise each of these types, highlighting determining features as well as certain overlaps. Concerning its determining dimensions, the typology of innovation-related action strategies constitutes *ideal types* which, by definition, are not precise depictions of empirical reality (Abicht et al., 2009).

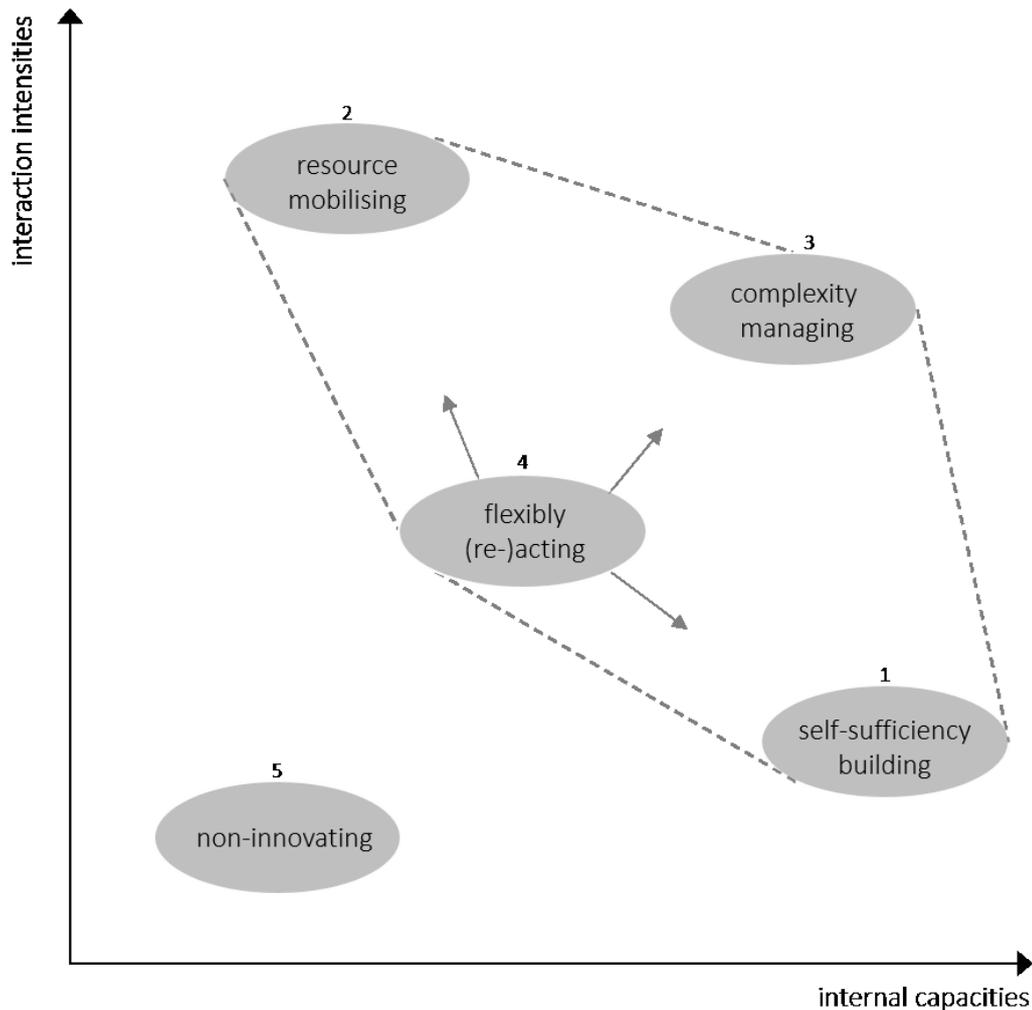


Figure 19: typology of innovation-related action strategies of firms from peripheral regions

The dashed line in Figure 19 delimits the space of action strategies observed throughout this dissertation. Consequently, by investigating and reconstructing successfully implemented innovation projects, non-innovating action strategies (type 5) were not encountered empirically and remain outside the particular attribute space. As more than one mode of innovation-related action strategy can be found within single firms – and might, in fact, work as complements – the typology of innovation-related action strategies does not, it should be stressed, represent a specific typology of firms. Additionally, it needs to be highlighted that these strategies might also not be unique to firms from peripheral regions, but may as well be mobilised by firms located in more central and actor dense environments. Nevertheless, these action strategies can be considered specific elements of innovation behaviour of peripherally located firms as they operate, as discussed in previous chapters, as implicit and explicit mechanisms that help firms to bypass structural deficiencies.

TYPE 1: SELF-SUFFICIENCY BUILDING ACTION STRATEGIES

To maintain innovation capacity and long-term competitiveness, self-sufficiency building action strategies primarily build upon a broad range of diversified firm-internal capacities. These comprise for instance of specific technological and human resources, extensive production experiences and practical

knowledge. Furthermore, it can be observed that firm-internal capacities, especially those of long-term relevance, are actively expanded beyond what would typically be considered firm's core competencies. Maintenance and gradual expansion of internal capacities generates flexibility and reduces dependency on external partners. Thereby, firms lower their interaction requirements and establish, to varying degrees, levels of self-sufficiency. Public funding schemes are frequently accessed, facilitated by internal capacities and established routines to manage and administer grants. Typically, rather large and long-established firms adopt self-sufficiency building strategies. Companies taking self-sufficiency building strategies tend to operate in rather stable segments of LMT manufacturing (e.g. wood, textiles) in which they have consolidated market positions. Accordingly, and besides product development, process innovation is an integral part of this action strategy and supports firms to maintain market positions by efficiency increases and cost reduction.

The importance of firm-internal capacities results in limited and purposefully organised networking activities. Nevertheless, it can be observed that internal capacities require coupling with externally acquired knowledge and expertise. Thus, networking plays a reduced, yet decisive role. The intensity of networking activities in the context of specific innovation projects is relatively low, precisely because firms can build on comprehensive internal capacities. Innovation projects can effectively be pursued and implemented by mobilising technological and human resources, diminishing the need for external knowledge acquisition. However, there are instances when specialised knowledge from external, and often regionally dispersed sources need integration. By mobilising internal production and practice-based expertise, external knowledge is adapted to organisational contexts and project requirements. Due to high degrees of absorptive capacity (Cohen and Leventhal, 1990), intense and long-term technological consultation with external partners is typically not required. On the contrary, due to comprehensive internal capacities, technological consulting is frequently provided to external partners. Accordingly, exchange with existing customers and suppliers, which might involve, but is not limited to technological consulting, plays a pivotal role and constitutes a major innovation stimulus. Networking activities usually rely on (re)activating contacts to existing commercial and research partners, draw on established routines and can therefore be effectively organised over distance. New linkages are only infrequently created and, if so, usually selectively and purposefully chosen, based on specific requirements such as technological needs.

Because of their size and long tradition, firms adopting type 1 action strategies tend to be well embedded into regional structures and active participants in related networks and initiatives with commercial actors, (semi)public bodies, associations, chambers etc. Ideas, expertise and contacts within these established networks constitute potential sources for innovation. Based on extensive internal capacities, external innovation stimuli and project requests can be flexibly and competently acted upon. Routine participation in trade fairs and industry gatherings is part of self-sufficiency building strategies. Firms typically exhibit at leading (inter)national fairs and industry events which are traditionally and frequently visited. Besides being opportunities for product presentation, trade fairs function as platforms to meet/exchange with customers and suppliers and to refresh existing contacts.

Type 1 action strategies that help firms from peripheral regions to bypass structural deficits. Maintaining and further expanding firm-internal capacities compensates for lacking knowledge resources available regionally and reduces interaction requirements. Various cases illustrate that the particular, yet not pre-defined, set of self-sufficiency building action strategies work as a viable mechanism to maintain innovative capacity and competitiveness. However, type 1 strategies also imply certain risks. Reliance on internal capacities is associated with increased demands for qualified labour, which might become a particular bottleneck of this strategy. Especially when considering the challenging demographic developments (ageing, continued out-migration etc.) peripheral regions currently are and will be confronted with in the future (see 7.1). Additionally, by mainly drawing on routine interactions with established external partners, type 1 strategies imply a latent danger for firms to get locked-in routines, practices and networks. While established networks and routine interactions can be effectively managed, they might, in the long run, only provide for insufficient influx of novelty and learning opportunities.

TYPE 2: RESOURCE MOBILISING ACTION STRATEGIES

The second type of innovation-related action strategies implies strategies whereby firms primarily mobilise external resources. Accordingly, related strategies build on accessing and integrating resources through network linkages. At the same time, internal capacities are only of reduced significance and do typically not exceed core competencies. Consequently, the basic features of type 2 action strategies are somewhat in contrast to type 1 (see Figure 19). Mainly rather small and newly established firms, i.e. firms that account for only limited internal capacities, adopt resource integrating action strategies.

Successfully innovating with limited internal capacities requires coupling with external resources. Accordingly, the mobilisation of existing network linkages and, importantly, active establishment of new network ties constitutes a central feature of type 2 strategies. Strategic mobilisation and expansion of networks encompasses both, knowledge oriented-linkages as well as transaction-oriented linkages to find suppliers and, crucially, to establish sales channels. Interestingly, and especially within the context of newly established businesses, it can be observed that social ties (e.g. friendship, family) are mobilised for business purposes, illustrating their specific function as support structures, e.g. when it comes to financial matters. Such support networks further involve seeking mentorship to compensate for lacking internal resources and experiences (e.g. strategy building). Market-oriented linkages are of particular importance as firms have to access and build markets for newly developed products. Firms adopting resource mobilising strategies activate and build knowledge and transaction-oriented linkages on multiple scales. Depending on firm's export endeavours, building international sales ties constitutes an important element.

Setting up new networks for internalising external resources and realising market access typically requires face-to-face meetings to build trust with new partners. Accordingly, type 2 action strategies relate to rather high degrees of actor mobility. Besides business meetings, formal participation in and informal visits of (inter)national trade fairs, local markets etc. constitute central features of these mobility aspects. Trade fairs function as formats to generate visibility and attract attention for products and firms, to receive direct market feedback and to build new and refresh existing contacts.

Creating visibility can be identified as a particularly important aspect of this action strategy, especially as it is mostly adopted by smaller firms. Accordingly, virtual resources such as social media and more generally online marketing tools are actively used for product placement and visibility generation. Additionally, regionally distinct and *peripheral and rural resources* such as natural resources, regional traditions and heritage etc. are commercially exploited and mobilised for marketing purposes – reflecting certain degrees of regional attachment. In conjunction with small firm sizes, such ‘soft’ resources can be authentically mobilised for marketing and brand building.

As resource mobilising action strategies primarily draw on diverse resources (technology, knowledge, finance, imaginations etc.) accessed and mobilised through multi-scalar arrangements, related practices help firms from peripheral regions to overcome limitations of regional environments. At the same time, it can be observed that firms adopting type 2 action strategies tend to be only loosely integrated into regional networks with commercial and (semi)public actors. Which might relate for instance to small firm sizes, limited resources and their rather low age. Furthermore, and despite its resource mobilising nature, it can be suggested that access to public innovation funding is typically not part of this strategy. This is mostly due to lacking capacities and experiences required to access and administer funding schemes but also related to insufficient knowledge about suitable funding programmes.

TYPE 3: COMPLEXITY MANAGING ACTION STRATEGIES

The previously discussed action strategies might be considered ideal types driven by the dominance of certain mechanisms; type 1: internal capacities; type 2: networking practices. Even though these types can be linked to empirical observations, pure forms of these types are not necessarily commonly observed. Instead, it can be expected that type 1 and type 2 action strategies work as complements, collectively driving the innovation activities of firms from peripheral regions.

Accordingly, complexity managing action strategies can be considered a particular model that integrates the two. Complexity managing action strategies draw on both, comprehensive sets and strategic expansion of internal capacities as well as extensive networking activities to access complementary resources not available internally. To generate innovation, this strategic coupling allows to mobilise and to locally anchor expertise from spatially dispersed sources. Such comprehensive action strategies are required if innovation projects involve substantial complexities. Consequently, type 3 action strategies relate to impactful, i.e. high degree of novelty, and long-term projects that evolve over multiple years.

To pursue highly complex innovation activities, firm-internal capacities such as technology, human resources, production experiences, practical expertise etc. form a pivotal base. Management of complex innovation endeavours requires organisational routines whereby related projects and responsibilities are structured. Accordingly, activities related to complex projects are typically distributed across departments – coordinated by dedicated and experienced R&D staff/departments and frequently guided by formal and organisationally implemented innovation management. Projects pursued as part of complexity managing strategies require substantial financial resources and, consequently, frequently involve the mobilisation of public innovation funds managed and administered either internally, or by specialised consultants. Technological solutions and dedicated human resources considered to be of strategic value are, if not yet

available internally, frequently internalised. Thereby, internal capacities and production depth are continuously expanded.

Besides diverse firm-internal capacities, pursuing highly complex innovation projects further necessitates frequent interaction with external partners. Accordingly, network activities play a substantial role in type 3 action strategies. Networking refers to both, purposeful mobilisation of existing linkages and, in contrast to type 1, frequent mobilisation of new and multi-scalar linkages to access specialised resources not available within established circles. Consequently, trade fairs and industry gatherings play an essential role to monitor markets and technological developments, but also to purposefully build new contacts. Innovation projects pursued as part of complexity managing strategies tend to open new (niche) markets, i.e. urge firms to establish new sales channels and to seek new marketing opportunities. Thus, networking activities targeted at finding new customers or suppliers play a crucial role. Likewise, and similar to type 2 strategies, marketing activities are essential elements and may result in establishing new marketing tools that provide access to final customers, e.g. sales co-operations, showrooms, flagship stores etc.. In accordance to type 1, firms tend to be well embedded into regional structures and actively involved in networks with commercial and (semi)public actors.

Complexity managing action strategies combine type 1 and type 2 strategies that have been identified as particular mechanisms that allow firms from peripheral regions to bypass structural deficits of regional environments. As type 3 action strategies rely on both, comprehensive internal capacities and extensive networking activities this type might be less prone to the lock-in issue identified for type 1. Existing linkages are complemented by frequently activating new ties that ensure influx of fresh ideas, expertise and practices. Yet, firms adopting type 2 strategies have and continue to have increased needs for qualified labour.

TYPE 4: FLEXIBLY (RE)ACTING ACTION STRATEGIES

The final type of innovation-related action strategies is referred to as a flexibly (re)acting approach. This type is, similarly to type 3, characterised by combining firm internal capacities and networking activities. However, type 4 does not necessarily relate to a specific dominant set of action strategies. Rather, the approach is based on practices and strategies whereby firms flexibly act upon and respond to specific requirements of innovation projects. In contrast to type 3, flexibly (re)acting action strategies ground on moderate degrees of internal capacities and interaction intensities – allowing firms to flexibly (re)act upon own activities and externally induced opportunities.

Related practices are more attuned to individual projects, rather than being manifested in strategic orientations on the firm level. For instance, in case (external) innovation opportunities emerge, internal capacities might be temporarily expanded by hiring specialised staff, working on projects for a limited period. While in other projects, mobilising existing or building new network linkages to access external resources to complement internal capacities may be deemed more suitable. Consequently, as part of type 4 strategies, firm networks are flexibly organised, existing links mobilised when needed and new linkages purposefully built. Purposeful selection of external partners also links to rationales for these partners to provide for access to multiple and diversified resources as well as their specific networks (gatekeepers),

as type 4 strategies result in outcomes whereby new markets can be accessed. Consequently, marketing activities, trade fair participation etc. constitute important elements – although typically not as intensively followed up as in types 2 and 3. Suitable innovation funding schemes are accessed, typically administered externally by consultants. Similar to type 3, and although changing according to needs, flexibly (re)acting action strategies balance internal capacities and interaction intensities which, collectively, work as a mechanism to overcome and bypass regional limitations.

TYPE 5: NON-INNOVATING ACTION STRATEGIES

Type 5 constitutes an action strategy which, given the overall framework of the typology, does not yield innovative outcomes. Firms cannot draw on either, sufficiently developed internal capacities and effective interaction arrangements which would allow them to generate innovation. Thus, and in line with the theoretical framing of innovation as knowledge-grounded and innovation-oriented processes, this particular type lies outside the typology of innovation-related action strategies (see Figure 19) and has, consequently, not been empirically investigated as part of this research. However, against the background of a certain pro-innovation bias, it is highlighted that this particular type is, although being of high analytical and policy value, substantially under-researched (Godin and Vinck, 2017).

6.6.3 Policy implications

The potential to derive practically relevant policy recommendations has been highlighted that as one of the benefits of empirically grounded typologies (Schmidt-Hertha und Tippelt, 2011). Consequently, a central question to reflect upon with regards to the typology and previous analyses is, how public policy, implemented on different scales ranging from regional to EU levels, can and should be designed to further and more broadly encourage innovation of firms from peripheral regions.

The findings of this dissertation suggest that policy instruments, to effectively facilitate innovation, need to consider the relevance of internal capacities and interactive networks linkages. To varying degrees, the investigated innovation projects were found to (re)combine socially, organisationally and spatially dispersed resources and, thus, are highly contingent processes. Consequently, it has been highlighted that policy makers cannot precisely and immediately plan, control and influence innovation (Schmidt et al., 2018). Yet, policy makers at different levels have indirect opportunities to encourage and influence innovation. A central element of innovation policy should be, besides traditional approaches towards infrastructural investments, to reflect relational elements (Faulconbridge, 2017). To create and exploit innovation opportunities, relational policy approaches have to be oriented towards facilitating social interactions between firms and regional and extra-regional actors (Faulconbridge, 2017; Schmidt et al., 2018).

Within the context of relational innovation policy seeding, enabling and facilitating interaction opportunities beyond established networks appears as a crucial strategy. Such measures might be of particular relevance for self-sufficiency building action strategies (type 1) who might potentially get locked into established structures and exchange relations. Ensuring that firms, decision takers in firms, individual employees etc. jointly learn and build competence with other organisations (firms, suppliers, customers, research organisations, intermediaries etc.) within and beyond regions/industries is pivotal. As

firms mobilising type 1 strategies tend to be well connected regionally and within their specific industries, measures that encourage extra-regional and inter-industrial interaction are particularly beneficial. Accordingly, public policy needs to find ways whereby firms and decision takers embrace more fully the value of engaging in new collaborations that operate, to certain degrees, at relational distance. In this regard, instruments fostering actor mobility have a potentially important role to play and might manifest as funding schemes that encourage firms to participate in and exhibit at (inter)national trade fairs and conferences. Mobility, especially when coupled with participation in temporary events, might facilitate chance encounters and interactions, thereby helps to expand and diversify firm networks and increases the chance of exploiting (external) innovation opportunities. At the same time, visibility of firms, products and wider capacities is fostered. Some of these instruments, e.g. co-financing of trade fair or conference participation, are actively pursued by policy makers in both study contexts, in Estonia by Enterprise Estonia, in Saxony e.g. by SAB, but might need more active promotion to become more widely recognised amongst potential beneficiaries.

Mobility schemes also relate to fostering firm membership in industrial as well as interdisciplinary working groups/communities that provide opportunities to access relevant knowledge and more generally find inspiration. Such specialist groups are increasingly organised virtually by internet-mediated interaction and collaborations ('online communities'), i.e. do not necessarily require face-to-face contact and might, therefore, mitigate distance and isolation which actors in peripheral regions are confronted with. Against the backdrop of the growing relevance of digitalisation processes/solutions for the organisation of production processes ('industry 4.0'), innovation policy has to ensure that firms from peripheral regions are equipped with suitable digital infrastructures to narrow down the broadly asserted digital divide in technological landscapes (Townsend, Wallace, Smart and Norman, 2016; Brink et al., 2018; see part 7).

However, measures that involve, and induce additional actor mobility might face a particular dilemma: actors have only limited time resources and those operating from peripheral regions are already highly mobile, e.g. to manage day-to-day business operations. Thus, additional mobility might be perceived as a burden. Furthermore, Schmidt et al. (2018:195) discuss instruments which help to 'unlock' regional organisations. These seem particularly useful in the context of firms primarily employing type 1 actions strategies. Following the rationale of inducing external exchange and inspiration, it is highlighted that rather closed organisations could, by provision with suitable funding schemes, be encouraged to open up for untypical actors and users such as external employees and administrators, students and pupils (internship programmes), artists and scientists and benefit from related influx of expertise. While strengthening firm's interaction opportunities especially supports firms adopting type 1 action strategies (low interaction intensity), it also provides benefits for firms that draw upon higher interaction intensities (type 2, 3 and 4) but might face limited resources (type 2).

The typology of innovation related action strategies suggests that especially firms drawing upon type 2 strategies benefit from more profound integration into regional structures such as associations, business roundtables, regional development initiatives and the like. However, because of limited resources, related

measures must not impose additional burdens. Furthermore, the organisation of regional events is another set of measures aligned to the innovation strategies of firms from peripheral regions. Events such as regional trade fairs, regional markets, competitions and awarding ceremonies function as particular marketing channels and interaction formats that allow to establish and increase (intra)regional visibility. Furthermore, companies adopting type 2 strategies, found to typically be rather newly established and actively maturing and adding robustness to their ideas, products and businesses might be effectively supported by regional mentorship programmes. Institutionalised and ongoing exchange with and guidance by mentors, considered regional actors occupying central positions in organisations and/or wider institutional contexts (Schmidt et al., 2018:196), complements and compensates for lacking internal resources and experiences (e.g. regarding business operation, strategy development, marketing etc.) and facilitates integration into regional networks and support structures.

Events with a particular focus on labour markets and vocational training further address a major challenge that commonly emerges, to varying degrees, from all identified types of action strategies: continuously high demands for qualified and specialist labour. In this sense, demographic trends (ageing, population decline, out-migration etc.) that can be observed in many peripheral regions beyond the specific study regions of this dissertation impose particular constraints on firm's innovation activities (Brink et al., 2018). Therefore, human capital related aspects need to be on top of policy makers' agendas. Efforts to maintain and strengthen educational institutions, for instance by establishing innovative collaboration models, need to be fostered – potentially even against demographic trends of peripheral regions. Funds need to be efficiently channelled for firms to make use of existing and new offers for professional and vocational training. In a similar vein, it is most important for firms to build attractiveness, regarding both soft aspects such as employability as well as hard, monetary incentives. This process can be actively supported by regional policy makers, e.g. through the establishment of ambassador schemes that help firms to build internal and external visibility. Likewise, returnee and welcome programmes can work as effective mechanisms to attract qualified labour and to coordinate demand and supply sides of labour markets.

Building visibility and attractiveness requires coordinated strategies of firms and intermediaries such as economic promotion agencies, chambers, associations and educational institutions. Consequently, it is crucial that regional policy makers seek to integrate these actors into cooperative structures in which wider issues, such as regional labour markets, are collectively addressed and resources bundled. With regards to activities encountered during fieldwork in the study regions, examples from the Erzgebirgskreis illustrate that multiple of the previously outlined measures are adopted by regional actors, coordinated by

its economic promotion and regional marketing agency: events and fairs are frequently organised⁸⁶, an ambassador scheme is in place⁸⁷ and a returnee/welcome programme has recently been launched.⁸⁸

However, such soft measures need to be complemented by suitable investments in hard physical/digital infrastructures, R&D and technology transfer structures etc. Although such instruments constitute rather conventional innovation policy approaches (Faulconbridge, 2017), it has been suggested that these are typically biased towards metropolitan regions (Townsend et al., 2016; see part 7). Another essential aspect emerging from the typology of innovation related action strategies is that public innovation funding schemes are more frequently and more directly accessed by established and high-capacity firms (type 1 and type 3 strategies). Consequently, access hurdles with regards to grant application and administration should be lowered to increase their reach also amongst firms that have only limited resources as additional financial resources might have substantial positive implications for their innovation endeavours (Brink et al., 2018). One particular solution in this regard can be scouting schemes, i.e. consultations with individuals knowledgeable of funding opportunities and experienced with grant administering procedures. Such scouts could actively target smaller companies, thereby raising awareness and lowering hurdles for these firms to access available funding schemes.

The discussion of policy implications was guided by the overarching relational perspective adopted throughout this research. Consequently, the importance of policy measures that encourage and generate opportunities for interaction within and across regional contexts was particularly highlighted. While also conventional innovation policy approaches such as cluster strategies aim at facilitating interaction, their conceptual grounding on distinct territorial dimensions, has resulted in a particular privileging of regional configurations. Thus, such existing policy approaches take not sufficiently into consideration the mobile and multi-local nature of innovation processes, which, as they increasingly operate at the local-global nexus (Crevoisier and Jeannerat, 2009), require relational policy approaches (Faulconbridge 2017; Schmidt et al., 2018) that effectively support firms to construct specific *activity spaces* (Bathelt and Glückler, 2018).

⁸⁶ e.g. a cooperation forum for actors from suppliers industries is organised on an annual basis; each time attracting more than 100, mostly regional, exhibitors; (http://www.wfe-erzgebirge.de/de/Wirtschaftsservice/Unternehmen_Investoren/Kooperationsboerse_1355.html; accessed: 30.03.2018)

⁸⁷ An ambassador campaign was established in 2010 and by now more than 100 individuals from economic, societal and political spheres were awarded the title 'Botschafter des Erzgebirges' whereby these become official regional representatives. Related activities involve regular awarding ceremonies, (extra)regional marketing campaigns and the establishment of institutionalised networks amongst awardees.

⁸⁸ The 'Welcome Center Erzgebirge' was established in 2016. It is marketed as the central contact point for both, regional companies seeking staff and (inter)national migrants and returnees. To provide effective interface services, the Welcome Center collaborates, besides regional companies, with multiple actors such as job centres, chambers, local administrations, educational and cultural institutions, churches and housing companies (<https://www.welcome-erzgebirge.de/service/ueberuns.html>; accessed: 30.03.2018)

7 Revisiting Cases from the Periphery Label Perspective

In section 1.3.2 I detailed determining elements of the *periphery label* which is explicitly and implicitly, yet frequently, ascribed to peripheral regions and actors. In this part I want to reflect upon how actors from peripheral regions themselves perceive and refer to the locations and environments in which they are located and from which they operate. These actor narrations are linked to aspects such as distance, low density, scarcity of innovation-relevant resources, lacking entrepreneurial spirit and innovation attitudes etc. – i.e. the previously discussed constituents of the periphery label. Doing so, highlights instances that confirm as well as contest certain elements and dimensions of the peripheral label. Part one of this dissertation illustrated that structural and quantitative research approaches prevail in innovation-oriented economic geography. Against this background, it appears appropriate and somewhat required to mobilise regionally and contextually grounded narrations and perceptions of actors from peripheral regions, i.e. in the present study firm representatives and regional development actors. Such contextually grounded narrations on perceptions as well as day-to-day experiences of actors tend to move to the background, if not become neglected in structurally driven analyses and research circles. However, these perspectives are in capacity to extend, i.e. contest, corroborate, negotiate, moderate etc., the primarily deficit-centred narration on the state of innovation capacities of peripheral regions and their actors.

Although firms in peripheral settings are exposed to structural deficiencies (see 7.1), the particular problem-centred narrative does not necessarily match actor perceptions and practices. The following discussion highlights the need for more differentiated rather than overly generalising debates on the state of peripheral regions. In fact, these settings provide for heterogeneous and locally/regionally distinct resources which, if proactively exploited, not only support overall business operation but also provide sources for innovation and change. As I said, I argue for a more differentiated perception of peripheral regions and their actors in overarching discourses. This involves not to retain largely dichotomous representations – neither solely deficit nor solely quality oriented ones. It is crucial to identify and to take into consideration the specific structural deficits of peripheral regions to be able to design effective support measures. Consequently, I do not argue for quality-centred perspectives for the sake of blanking out structural limitations actors in peripheral regions have to cope with on a daily basis. Instead, I argue for an understanding that takes into consideration existing deficits, which need to be addressed by regional policy, without overseeing qualities and strengths of these regions and their actors. Thus, with reference to the discourse on the ‘geographies of innovation’ (see 1.3), I propose not to stop with characterising regions once differences to metropolitan regions (‘hotspots of innovation’) were detailed. But to go beyond and also depict specific and diverse qualities and potentials. Such nuanced and balanced understandings avoid oversimplification in both directions, problematisation in spite of existing qualities and romanticisation in spite of existing limitations and dependencies.

7.1 Structural deficits: infrastructures and labour markets

INFRASTRUCTURES

Distance constitutes a central element of the periphery label. It has been illustrated that actors adopt diverse sets of mobility-related practices by which distance is managed (see 6.3). However, this research finds that distance remains a central feature in the narrations of actors from peripheral regions. In terms of logistics, distance induces additional transaction costs, a circumstance that emerges as a particular issue across cases in both study regions. For instance, EE4 synthesises that:

'there are lots of minuses connected to our location, but there is nothing to do about it. But it would be a lot easier to be close to Tallinn.'

These problematic perception of distance suggest that actors feel somewhat peripheralised along the particular dimension of physical infrastructure(s). In this context, actors from the regional development arena in the Erzgebirgskreis conclude that infrastructural priorities within the Federal State of Saxony essentially focus on further connecting its main centres, Leipzig and Dresden (ERZ_CON1, ERZ_CON3) while other regions, such as the Erzgebirgskreis, do not experience substantial improvements in connectivity. These perceptions are widely echoed by businesses from the Erzgebirgskreis, some of which refer to the state of regional infrastructures as the central locational disadvantage (e.g. ERZ6, ERZ9, ERZ11). Even though, the data also clearly suggest that individual perceptions regarding infrastructural accessibility largely depend on firm's micro-location.⁸⁹ Nevertheless, a certain infrastructural decoupling that adds additional complexities to firm operations emerges as a collective theme. Not exclusively, but more frequently, articulated by firms from the Erzgebirgskreis:

'In an economic sense there are only disadvantages [to our location]. We have to bring all our raw material to a corner [in Estonia] where transport doesn't usually go. We are off the main lines.' (EE9)

'Generally we still have a good location, being close to Chemnitz. 20km further away it is much worse. [...]. We miss a motorway through the Erzgebirge, [having this] would make the region interesting. But it's not if it takes one hour to go to Olbernhau.' (ERZ5)

'A constraint is that we are not well connected to Chemnitz. It takes one hour to Chemnitz, one hour to Freiberg. Which is time-consuming. [...]. It sounds banal, but the first thing is the physical condition of streets, it's really bad.' (ERZ11)

'We simply don't have a good infrastructural connection. If you need to get here, coming from the motorway - a real catastrophe.' (ERZ12)

Besides transport infrastructure, a number of firms from the Erzgebirgskreis mention in particular substantial limitations regarding digital infrastructure. The state of the ICT landscape is perceived as a distinct '*anachronism*' (ERZ6) and inhibiting factor for overall competitiveness and business development, especially as it might exclude firms from major developments such as processes of digitalising industrial production. This issue is vividly summarised by the owner of a metal manufacturing company:

⁸⁹ There is a certain tendency that firms closer to Chemnitz evaluate their own infrastructural accessibility less problematic (e.g. ERZ1, ERZ4, ERZ5; see Map 2). Likewise, for Viljandi county it is stated that '*Viljandi county itself is quite well situated in the meaning that [...] road connections [to Tartu and Pärnu] are very good, and also we are like a crossroad*' (EECON1). This perception of Viljandi county being rather well connected is widely echoed by firms (EE1, EE2, EE3, EE6, EE7; see Map 1).

7 Revisiting Cases from the Periphery Label Perspective

'The internet connection continues to be a real locational disadvantage. [...]. When I came here in 2008, our entire internet connection was based on ISDN. Of course it was really difficult, especially with large customers who operate with direct online sales. Which means that we receive orders electronically, handle and process them electronically. [...]. Thanks god, we now have a private provider who established a stable grid here. But still, we couldn't realise industry 4.0 projects, not even 2.0. This is a real disadvantage.' (ERZ9)

Collectively, these articulations highlight that the state of different types of infrastructures is perceived as a major issue by actors located in peripheral regions, facilitating and reproducing at the same time a certain sense of being on the edge and located outside of main systems. Access to high-quality ITCs has frequently been identified as an important factor that allows firms located in peripheral regions to access wider resources, enlarge networks, expand their reach and mitigate isolation and distance (North and Smallbone 2006; Townsend et al. 2016). These indications are echoed in this research as the wide use of diverse sets digital tools suggests (see 6.4.2). Yet, actors articulate a certain sense of ongoing division in terms of digital landscapes which matches a diagnosis North and Smallbone emphasised already more than ten years ago: '[peripheral regions are] *discriminated against by investments in the telecommunication infrastructure because of the relatively low and dispersed nature of demand*' (North and Smallbone 2006:52). Interestingly, issues regarding digital infrastructures have not been raised by Estonian firms.

AVAILABILITY OF WORKFORCE

Another shortcoming that actors from peripheral regions articulate across cases and study regions is their exposition to and affectedness by shortages of skilled labour. However, shortages of certain occupations and specialised staff is not necessarily a condition firms from peripheral regions face exclusively. Indeed, associated dynamics pose problems to firms and industries in metropolitan and peripheral regions alike. However, as previously discussed (see 4.1 and 4.2) the study regions of this research have, over the past decades, suffered from significant population decline, partly driven by (waves of) out-migration. Due to these population dynamics, shortages of skilled labour and replacement of employees is an issue of amplified relevance in peripheral regions, especially as further population declines are projected. Hence, skills and labour shortages pose particularly pressing and future issues, especially when coinciding with structural issues in infrastructural terms. The dynamics collectively produced by the particular coupling of these individual processes reinforce difficulties of firms to attract ('convince') qualified individuals and specialists (e.g. EE5, EE8, EE12, EE10, EE11, EE12 | ERZ4, ERZ5, ERZ6, ERZ9, ERZ11), perceived by actors as a certain core-periphery divide:

'We are currently seeking two good people [for marketing and engineering]. I am fairly pessimistic that I can find these people here locally, this is a problem for us.' (EE5)

'For most of the young people it's not very attractive to work in the countryside.' (EE10)

'For many people the region is simply not attractive. The infrastructure is not good and the population dynamics are also negative, so we have to see what happens.' (ERZ6)

It is interesting to note that the availability of workforce somewhat depends on firm's micro-location. For the Erzgebirgskreis it has been mentioned that being located in proximity (i.e. commuting distance) to Chemnitz reinforces workforce related issues. Due to Chemnitz hosting for instance large players from

the automotive industry (e.g. VW) as well as related supply industries that offer attractive wages. This regional constellation enforces difficulties of firms located near Chemnitz to attract as well as keep specialists and apprentices (ERZ4, ERZ5, ERZ9):

'We do not work with the minimum wage because Chemnitz is so close, [...] and VW is located there. They [VW] go into the villages and suck away all skilled employees. [...] and you have educated excellent people and VW comes and gets them. This is also an issue for us.' (ERZ5)

This issue is mirrored by ERZ7 which perceives its rather remote location (see Map 2) as a certain advantage as it allows the company to position itself as an attractive employer – independent of Chemnitz catchment area. Consequently ERZ7 summarises that *'finding skilled people and specialists is not a problem for us. [...]. We were able to find replacements for all relevant positions.'*

Development agents from both study regions consider current and future skill shortages as *'central issues'* and *'major challenges'* for effective firm operation and future competitiveness (EE_CON1, EE_CON4 | ERZ_CON1, ERZ_CON3). As illustrated in chapter 6.4, firms from peripheral regions operate from extensive internal capacity bases that are also actively expanded. Consequently, it can be suggested that firms continue to have high demands for qualified staff to ensure competitiveness and innovative capacity. Hence, skill shortages might pose substantial limitations for future firm development, especially for firms that build their innovativeness on internal capacities – of which human capacities constitutes a major part. However, it has also been suggested that the actual extent to which firms are exposed to skills shortages differs. Representatives of support organisations relate this heterogeneity to diverging efforts to build visibility and employer attractiveness in general and in particular within regions: *'active firms are certainly more successful in this respect'* (ERZ_CON3; similar: ERZ_CON1). Although indicating difficulties in finding specialists ERZ3 confirms the crucial role of building internal visibility to moderate related issues:

'When we started here it was really difficult to find staff. Nowadays we have 160 employees and are really visible, we have a reputation and people come to us. We also advertise a lot, in all directions and especially for the development department, looking for academics. Today it is a lot easier for us than it was 10 years ago. But still, skilled employees continue to be an issue.' (ERZ3)

Accordingly, building regional visibility and employability can be identified as a particular strategy adopted by multiple firms in both study regions to address workforce related shortages (e.g. EE1, EE5, EE8 | ERZ1, ERZ3, ERZ4, ERZ5, ERZ6, ERZ7, ERZ9, ERZ12, ERZ13). These efforts relate to a number of activities such as regional sponsoring and advertising, collaborations with schools, participation in regional education fairs, image videos etc. Such activities are actively supported by organisations from the regional development area such as CDCs in Estonia, the WFE in the Erzgebirgskreis as well as chambers.

Further practices and strategies to address issues related to thin local labour markets, in particular for firms from the Erzgebirgskreis, is the provision of apprenticeships. Formal apprenticeships are offered by all firms interviewed in the Erzgebirgskreis, except newly established firms ERZ8 and ERZ10. However, available spots for certain occupations cannot always be filled (ERZ6, ERZ11, ERZ13). Consequently,

apprenticeships are widely considered crucial vehicles for internal capacity building: *'we have to educate employees and young professional ourselves'* (ERZ9: similar: ERZ1, ERZ5). As part of efforts the hire specialised engineers, EE5 established a satellite office in Tartu in 2015 which makes daily commutes for some technical key staff obsolete. As the CEO of the company notes, the satellite office has substantially raised the attractiveness of the firm as an employer: *'you will immediately have twice as many applications if you provide the possibility to also work from Tartu'*. Along a similar vein, EE12 bought a number of flats to offer local housing for some employees during the week. Collectively, these illustrations reflect particular practices and strategies in response to skill shortages suggest that firms, although not all interviewed firms, (re)act upon arising issues and, thereby, align their practices and strategies to the challenges induced by various environments in which they are embedded.

7.2 Distinct qualities: historical legacy, traditions, cultural and physical landscapes

The empirical material collected in both study areas relates, in different ways and to varying degrees, to their specific historic legacies. Current economic activities and industrial foci of regions are shaped by past cycles of economic activity. Although the significance of activities once important has declined (see 4.1 and 4.2), past economic legacies left regional imprints. Firms (can) build upon and mobilise these traditions and practices, wider internal as well as external images as regionally distinct assets, e.g. for marketing purposes. Consequently, past economic trajectories and the embedded traditions and knowledge bases are not to be seen as mere liabilities that confine firm's room for manoeuvre, but also as enabling elements.

For instance, the county capital of Viljandi has once been *'Estonia's capital of bed producers'* (EE1). In this particular function a number of bed producers, suppliers as well as firms producing complementary products as such pillows, linen and so on were once located in Viljandi (EE_CON1). Although size and importance of this cluster substantially diminished over time, some firms are still active within the industry and the wider furniture sector continues to be of economic relevance. The technical manager of EE1, a bed manufacturer, refers to this local focus of (past) economic activity as a particular resource from which the company benefits, explicitly in terms of labour force and experiences of local firms:

'they [local firms] have the know-how already. I go to some wood supplier nearby and say that I need a specific frame for a motor bed, they know what you talk about and have an idea of what is needed. This is not something that is totally new for them. [...]. When it comes to employing new staff [many] workers joining us have specific experiences with producing beds, which is really a benefit for us.'

Likewise, metal manufacturing has traditionally been and still is of economic importance in the Viljandi area. Accordingly, related capacities and experiences of regional firms allows EE1 to easily and flexibly access these resources. As a representative of the RDC of Viljandi county summarises:

'the old structures are used to lift up the new knowhow within the metal industry and wood-working. [...]. These traditions are actually coming from the Soviet time. Because we had a very strong industrial structure here. It is some kind of historical heritage, and somehow the people have been able to keep that.' (EE_CON1)

Connected to these aspects, the activating personal networks that have a distinct regional dimension appears as a particular practice through which actors access resources such as practical expertise or, in the case of newly established businesses, finance (EE2, EE4, EE7, ERZ10).

ERZ13, also a furniture manufacturer, draws upon existing knowledge and experiences as well as diverse networks of small and specialised suppliers, linked to the Olbernhau/Seiffen area hosting a large furniture and wood related conglomerate during GDR. Accordingly, ERZ13's owner states that the area features vast wood-related manufacturing competencies, both on the firm and staff level.⁹⁰ Firms in both study regions draw upon such regionally distinct knowledge inheritances. On another dimension, ERZ13 relates to the specific reputation of its location Seiffen as a well-known 'toy-village' and popular tourist destination – both of which are considered potential resources if effectively exploited. In this regard, ERZ13 plans to establish a show-room, exhibiting its wood-competence and targeting tourists as potential customers.

Furthermore, it can be highlighted for both study regions that firms make pro-active use of existing regional traditions and wider regional images as part of their marketing activities. For instance, ERZ6, a manufacturer of shaving brushes and accessories, suggests that it (indirectly) benefits from Saxony's general and in particular the Erzgebirge's reputation for craftsmanship, artisan production and high quality of products. Consequently, the owner of ERZ6 states that his company has a certain '*exotic-status*' that relates to a combination of its location and the production of rather unconventional products – which links to the long-standing history of the company and the historical legacy of the brush industry within the area. This particular coupling provides an authentic base for constructing a particular image of the company which is '*of course a nice story for marketing purposes*' (ERZ6) and which has been strategically mobilised to generate visibility, resulting for instance in a number of firm portraits in different media. Similarly, a newly established producer of sheet metal furniture (ERZ10) seeks to integrate specific traditions and competences of the Erzgebirge in sheet metal processing into its brand communication: '*metal sheet manufacturing has a long tradition in the Erzgebirge [...]. This is of course one aspect that we like to communicate*' (ERZ10). Such rather 'exotic', yet traditionally grounded specifications can work as intangible and unique resources for firms as they provide the opportunity to be strategically mobilised, e.g. for marketing activities that aim to underscore aspects such as quality, reliability and authenticity.

While the previous examples suggest a rather implicit mobilisation of regional particularities and traditions as part of firm's marketing activities, there are firms which overtly mobilise features that have a distinct *peripheral* dimension as part of their marketing campaign. The CEO of EE7 states for instance that its location in the Estonian countryside adds authenticity to its saunas, marketed with reference to a distinct natural design. Consequently, EE7 integrates its particular non-urban location into its marketing strategy: '*The marketing story behind us is that we are from under the Nordic Sky, making saunas [by using] old traditions*' (EE7). Likewise, in establishing and internationally expanding its birch sap

⁹⁰ similar e.g. ERZ3 uses traditional patterns of Plauener lace ('Plauener Spitze') to create a variety of its decorative flax wallpaper that has a distinct regional connection; ERZ7 in terms of metal and metal sheet manufacturing and experiences; ERZ8 in textile manufacturing which seeks to '*connect to old values in a contemporary manner. [To allow for an] interplay of traditional craftsmanship and young ideas*'.

business, EE4 strategically produces an image which foregrounds birch sap as a natural and traditional Estonian/Nordic beverage. In doing so EE4 further relates to the traditions of birch sap regarding folk and medicinal uses. EE4 also benefits from the established image of Võrumaa as a site of intact nature and high quality food production:

'For the marketing side it is an advantage. You are so far away from towns and you are a real country company. You are based in the nature, the products you use are clean. [...] This is important for marketing and it is a real bonus.' (EE4: similar: EE_CON5)

Furthermore, EE4 involved a number of local forest owners as sap collectors to respond to increasing international demands. Thus, this specific traditional and local context of birch sap also draws on the particular knowledge and associated collection practices of partners, mobilising locally anchored knowledge and experiences. In this sense, EE4 provides an illustrative example in which a regionally distinct natural, traditional and cultural resource (birch sap), combined with associated and anchored expertise and practices is mobilised and creatively adapted in a contemporary manner to respond to emerging demands.

In a similar vein, EE3 explicitly links its production of different vegetable crisps to the historical and culturally distinct Mulgimaa area (see footnote 78) and created a brand that overtly mobilises aspects of Mulgi heritage – relating for instance to a specific icon and colour combinations of its packaging etc. These examples from the empirical material suggest that non-metropolitan locations might provide firms with unique physical, historical and cultural assets. By mobilising these assets, which are part of unique physical and cultural landscapes, firms purposefully commodify their locations and, consequently, products become specific articulations of place.⁹¹ Thus, regional features provide for distinct resources exactly because they differ from other regions and places such as metropolitan areas. The strategic mobilisation of such regionally specific opportunities for branding and marketing purposes are also considered unique assets by regional development agents (e.g. EE_CON1, EE_CON5, EE_CON6) who, at the same time, actively encourage related marketing activities of firms. In terms of marketing and wider activities that aim at generating visibility it can also be suggested that the 'smallness' of Estonia, which has previously been identified as a certain bottleneck for firm's operations (see 6.2.2; 6.3), constitutes an advantage. In the sense that firms can build visibility for and attract interest in their companies and products on a national level relatively easily and without necessarily heavily investing into marketing campaigns (e.g. EE2, EE3, EE4, EE5, EE7, EE13). It can also be noted that this process is actively supported by relevant institutions on the national level. For instance, the Estonian Chamber of Agriculture and Commerce (ECAC) awards specific quality labels to food producers which allows them to differentiate themselves in the market and accordingly to increase visibility (EE_CON5). For instance, the label was awarded to EE3's range of vegetable crisps and considered by the company as a '*very big step*' and facilitator of its marketing efforts. Thus, it can be noted that for consumer-oriented firms and products a rather 'small' context not only induces limitations but also accounts for specific opportunities.

⁹¹ Such aspects have been frequently identified as central strategies of peripherally located firms, in particular firms active in the food industry (e.g. Korsgaard et al., 2015).

On another dimension, a resource that explicitly comes up in a number of cases from South Estonia is that firms benefit from effective relations to local government. Interestingly, this aspect has been mentioned by firms that differ substantially in terms of size:⁹²

'I even feel that if you are in really small place [like we are], the local government treats you differently. It is much easier to negotiate things [...] because you are important. In Tallinn, a company like us, we are nobody because we are so small.' (EE7)

'One very important benefit of course is that the local government is very fast. If I need something, some licence or building things, it's not like in Tallinn that you wait for six months. I make the application and get positive feedback within a week or so.' (EE9)

7.3 Entrepreneurial action

Furthermore, the cases investigated as part of this research suggest that the often implicit expansion of the periphery label from socio-spatial attributes to actors, portrayed e.g. as lacking attitudes for innovation and entrepreneurship, requires some critical reflection. Even if departing from a biased sample, i.e. specifically studying firms that have conducted innovation projects, the cases explored in this research collectively suggest that such a deficit-oriented proposition cannot be maintained. In both study areas a large set of innovating firms can be found. Hence, the firms investigated as part of this research do not represent particular exceptions or outliers. In response to the indication of lacking entrepreneurial spirit, I will just briefly illustrate a few examples that invite for perceiving actors operating from peripheral regions as actively shaping rather than passively reacting agents.

Referring to innovation activities that were initiated by external requests, i.e. are indeed linked to a certain passivity for actors in terms of generating the specific initial ideas, this research underscores that firms strategically act upon arising opportunities for innovation. For instance, passive responses of EE4 (see 5.1.2) would have resulted in long-term contracts to supply raw birch sap to European importers. Instead, with the intention to eventually export higher value products to emerging international markets, own retail products were developed and actively promoted through various marketing channels such as trade fairs or the Estonian Birch Sap Association. Likewise, *passive* behaviour of EE1 would have resulted in terminating development activities after the initial project to develop an adjustable firmness bed failed. However, the knowledge accumulated throughout the first project was subsequently transformed into a new project, ultimately opening new market segments. In a similar vein, ERZ3 (see 5.2.2) seeks to build a holistic interior design concept which goes substantially beyond the initial flax wallpaper project, including a new collaboration with university partners as well as intended grant application for public innovation funding.

These selective examples from the empirical material illustrate that, although peripheral settings might induce structural deficiencies (see 7.1), instances of pro-active entrepreneurial spirit can be identified across cases and contexts – a perspective that has been affirmed by numerous interviewees from both the

⁹² At the time of the interview EE7 had a workforce of seven employees and EE9 of 72.

regional development (EE_CON1, EE_CON3 | ERZ_CON1, ERZ_CON2, ERZ_CON3) as well as the private sector (ERZ4, ERZ12):

'What I like here is that people are entrepreneurs and innovative. [...] [As a matter of history] things have always been solution-oriented here, necessity is the mother of invention [...].' (ERZ4; similar: ERZ13)

Furthermore, in both study areas a number of newly established firms (EE3, EE, EE7 | ERZ8, ERZ10) were investigated. These ventures not only reflect entrepreneurial spirit of local actors, but indicate at the same time that environments that are conventionally perceived and portrayed as peripheral provide new business opportunities as well as individuals that seek to exploit these opportunities. These new ventures generated direct and indirect impact on local and regional contexts for instance in terms of job and income creation (EE4, EE7)⁹³ as well as specific strategies to build local and regional supply chains (EE3 | ERZ8, ERZ10).

Interestingly, the entrepreneurial spirit of actors from the Erzgebirgskreis has been (self)described in a particular way. This representation refers a broadly held image on the Erzgebirge as a *'region of inventors'* ('Tüftler') and to their rather inward-looking characteristics (ERZ_CON1, ERZ_CON2, ERZ_CON3):

'We have quite a few companies which are small but of high quality, which have ideas and a good business without being noticed anywhere in the world. Which might relate to our mentality here in the East and in the Erzgebirge. [...] Our mentality is that we simply tend to do and get done with things without making much noise about it.' (ERZ12)

'We have many companies here in the Erzgebirge that produce really great products. But as people, we are quite modest here, but do not shout about these things from the rooftop, tend to do it more hidden [...].' (ERZ13)

'[...] mentalities here are conservatively ossified. [...] Because of the outside location people from the Erzgebirge cultivate an above-average modesty. Things are being developed and end up in the drawer. [...] Many companies simply don't embrace self-representation and external appearance. In this respect the potential of the region is absolutely underestimated.' (ERZ_CON2)

This rather modest approach to communicating innovation can be seen as both, a particular quality as well as impediment. These aspects of firm's innovation behaviour point towards the notion of 'slow innovation' as suggested by Shearmur and Doloreux (2016). Thus, regions like the Erzgebirgskreis allow firms to pursue and develop innovation activities without being exposed to immediate commercialisation pressures (*slow innovation* strategies). Conversely, it has been articulated that firms need to find a balance between defensively communicating innovation, which mostly has strategic considerations, and avoiding to miss potential business opportunities. Accordingly, a lack of marketing activities and capabilities is portrayed as a *'mentality driven'* deficiency of regional actors (ERZ_CON2, ERZ_CON3). Conversely, his research has shown that a substantial number of investigated firms maintain a set of extensive and diverse marketing activities and channels (e.g. ERZ6, ERZ8, ERZ10). Accordingly, while certain firms actively and broadly promote their development outcomes others seems to have unused potentials in this regard.

⁹³ responding to increasing demands for birch sap, EE4 engaged local forest owners as sap collectors; EE7 created seven new jobs for local people within the first two years of its establishment.

8 Summary: Conclusions, Implications and Reflections

This final part summarises the main findings of the dissertation and appraises these findings against the background of the applied research perspectives. Thereby, the initially posed research questions are explicitly addressed: Which key mechanisms facilitate the emergence and drive the dynamics of firm innovation in peripheral regions? How are the network relations firms from peripheral regions mobilise for innovation configured (spatially, relationally), and what is the role of spatial proximity in firm's innovation endeavours?

The first chapter of this part (8.1) presents the main findings of this research and provides distilled answers to these research questions. Additionally, it highlights the implications these the results have in theoretical terms: i.e. the ways in which results of the present thesis affirm, contest and expand theoretical positions, such as stylised claims on the configuration of the geography of innovation. In chapter 8.2 concluding remarks to this dissertation are provided. These comprise reflections in methodological terms, on limitations of this study as well as on open questions and avenues for future research.

8.1 Main findings, implications and conclusions

The departure point of this dissertation is the awareness that innovation activities of firms take on a key role in regional economic development processes. Innovation activities and the capacity building they induce, can be seen as particular mechanisms that contribute to the stabilisation and development of regions that face socio-economic challenges along multiple dimensions.

However, as part 1 of this dissertation illustrates, when adopting conventional perspectives, innovative capacity is primarily associated with urban environments and specific structural and spatial pre-conditions (see 1.3.1). Consequently, scholarship in economic geography and innovation studies, and likewise policy debates, exhibit distinct orientations towards urban settings (e.g. Ibert, 2007; Shearmur, 2017). Non-urban and peripheral regions typically receive less attention. Even though more recently a certain change in perception can be observed, illustrated by the discussion of some selectively reviewed empirical studies in section 1.3.2. The continued (re)production of this urban bias has generated a specific narration on the state of innovation in peripheral regions, one which this research synthesises as a particularly deficit-oriented label assigned to peripheral regions and their actors (see 1.3.2). This deficit-orientation regarding the innovative capacity of peripheral regions and their actors corresponds to dominant understandings of innovation as a locally anchored phenomenon. It emphasises the seemingly pivotal role of structural elements such as actor, resource and knowledge density and geographical proximity which urban regions, in contrast to peripheral regions, provide for. These indications, coupled with emerging empirical literature which corroborates that innovation does not exclusively occur in or involve actors from metropolitan regions, conditioned the specific interest of this research. It aimed to identify and understand the diverse mechanisms that facilitate the emergence and drive the dynamics of innovation activities of firms located in peripheral regions, i.e. regions that lack (some of) the specific qualities and characteristics of urban settings.

This research conceptualises innovation as evolutionary, knowledge grounded and interactive processes (see 1.2). Thus, I follow contemporary understandings in innovation geography (Shearmur, 2017). Consequently, this research does not suggest/expect that the determining features underlying innovation processes differ fundamentally between urban and peripheral settings. Hence, I assume that interaction, knowledge creation and internal capacities constitute central elements of the innovation efforts of both, firms from peripheral and metropolitan regions. The dissertation mobilises theoretical concepts that help to understand why innovation processes occur and take shape outside designated metropolitan hotspots. Utilised in a spatially non-deterministic way, networks between dispersed actors might substitute for the benefits of agglomeration (Johansson and Quigley, 2004). Because of their relative actor and resource thinness, peripheral regions tend to provide for lower knowledge diversity and density. It can therefore be supposed that firms organise innovation-relevant activities and interactions across distance (e.g. Grillitsch and Nilsson, 2015; Jakobsen and Lorentzen, 2015). Extended frameworks of proximity and distance (e.g. Boschma, 2005) suggest that geographical distance might be compensated by proximities in relational dimensions (Hansen, 2014) that ensure effective communication and facilitate interactive knowledge creation processes. Similarly, arrangements that provide for temporary co-presence between actors, such as trade fairs, conferences etc., can substitute for the benefits of co-location (Maskell et al., 2006; Torre, 2008). Mobility is a central element in these conceptual perspectives, emphasising that actors are not tied to particular spaces and locations.

In this context, a central finding of this dissertation is that the theoretically derived central mechanisms of innovation – interaction, knowledge generation, density and proximity which are implicitly and explicitly associated with urban settings – also drive, to varying degrees, the innovation activities of firms from peripheral regions. Exploiting these mechanisms requires active managing by firms through the mobilisation of specific practices and strategies such as mobility or the purposeful establishment of linkages to dispersed partners. In theoretical terms, this study provides indications that the elements which determine contemporary understandings of innovation, *interaction – knowledge creation – density – proximity*, and the interrelations between these elements might be less dependent upon specific spatial contexts and configurations than conventionally assumed – precisely because their role can be mediated through actor practices.

The empirical proceedings of this dissertation relate to two study regions: South Estonia and the Erzgebirgskreis. These settings can, within the context of their macro environments, be referred to as peripheral regions as they share exposure to socio-economic challenges such as continuous population decline, relative economic stagnation and relative geographical remoteness (see 3.4.1). The regions lack certain qualities and characteristics associated with urban settings. At the same time, South Estonia and the Erzgebirgskreis exhibit distinct differences, notably in terms of density (see 4.1 and 4.2). Such differences of study regions, despite similarities in other dimensions, were strategically mobilised as part of the dissertation's comparative endeavour. They illustrate heterogeneity and diversity of peripheral regions and suggest that there is not *the one* prototypical peripheral setting.

Detailed case explorations presented and analysed in part 5 illustrate the overall methodological approach of this dissertation with its biographical, actor-centred orientation and focus on the micro project-level. Thereby, this research deviates from established approaches in economic geography which typically approached the notion of innovation along quantitative methodologies. Actor-centred and micro-level explorations, coupled with biographical re-constructions of specific innovation projects allow to uncover and understand firm practices and strategies within their specific, multiple and contingent contexts. Consequently, this research adds to existing scholarship in the research field as it provides insights on concrete practices, motivations and intentions of actors. In-depth investigations of innovation projects of provide first indications that are corroborated more widely in subsequent cross-case analyses (parts 6 and 7). It can be taken away from these detailed case explorations and the wider set of cases investigated in both study regions that firms in peripheral regions actively pursue and participate in diverse innovation projects. These projects range from small scale and incremental innovations to significant novelties with potentially disruptive implications for organisations, industries and markets. This broad range of innovation projects encountered throughout empirical inquiries illustrate that actors from both study regions, and potentially from peripheral regions more generally, are active participants in wider innovation contexts.

These case illustrations identify specific practices by which firms manage and mediate distance and low density of environments. To complement comprehensive internal capacities, firms mobilise multi-scalar linkages that engage local and regional but also international partners if required. Actor mobility emerges as a central mechanism that facilitates and shapes the path of innovation activities – underpinning their multi-local nature. Mobility relates to different formats such as trade fairs, project meetings and dedicated visits as part of general business travel. These results clearly suggest that innovation-relevant activities and processes do not necessarily and entirely occur in the innovator's locality, but are distributed across space and time. This research provides new and comprehensive insights on the function of mobility of actors/individuals as well as artefacts based on which I argue to incorporate the notion of mobility more prominently in innovation theory as well as empirical investigations. In the present study the central role of mobility was underpinned specifically for the innovation activities of firms from peripheral regions, which does, however, not suggest that it plays a less significant role of the innovation endeavours of firms from urban settings.

This research finds that firms not only pursue own/internal projects, but frequently participate and cover specific functions in external projects (see 6.1.1). Thus, firms actively exploit arising opportunities for innovation. Firms and regions become potential starting points, transit stations, preliminary and final destinations of innovation processes (Schmidt et al., 2018). Both, internally fostered and externally induced project result in outcomes such as organisational learning and local/regional capacity building. Through these capacity building processes, innovation contributes to organisational, but also regional development processes. Detailed case explorations as well as cross-case analyses highlighted that also 'failed' projects and critical phases in projects give rise to extensive organisational learning. Thereby, and supported by its biographical and micro-level focus, this research, although rather implicitly, contributes

to a widely neglected perspective in innovation studies which typically embrace success-based rather than failure-based capacity building processes (Vinck, 2017).

Analyses regarding individual dyads mobilised as part of innovation projects generated a range of relevant findings. All investigated innovation projects involved at least one external partner (average of around 4 external partners per project). Thus, this research affirms the widely accepted and notion that innovation does not happen in isolation but requires interaction to handle related complexities (e.g. Fagerberg, 2006). The majority of realised linkages relate to other firms. Consequently, firms rely to large extents on market interactions with customers and suppliers rather than institutions providing more scientific or analytical expertise. Accordingly, the majority of linkages mobilised in innovation projects have a distinct transaction-orientation, aiming for instance at technology acquisition. Solely knowledge-oriented linkages, i.e. linkages involving intense processes of joint learning and mutual partnership, account for one in three ties realised by firms from the Erzgebirgskreis and one in five ties of South Estonia firms. 25% of linkages engage non-commercial partners such as research institutions, associations, intermediaries etc. In particular, this research finds that firms in both study regions have, as part of investigated project, only rarely mobilised existing or built new ties to research institutions (6.2.1). This rather moderate engagement of research partners might be partly attributed to the explicit focus on LMT manufacturing, where formal R&D activities are of limited importance. However, in case research partners were involved in innovation projects, their diverse and comprehensive functional contributions substantially shaped project paths and induced mutual learning and capacity building.

Analyses on the spatial orientation of network linkages reveal pronounced differences between firms from South Estonia and the Erzgebirgskreis (6.2.1). South Estonian firms, as part of the investigated projects, engaged more frequently in international partnerships (45% of linkages) compared to firms from the Erzgebirgskreis (8%). Hence, firms from the Erzgebirgskreis collaborate more frequently with national and regional partners. Consequently, from a scalar perspective, project networks of Estonian firms imply higher degrees of geographical distance. This particular international orientation points towards certain shortages of specialised and practical expertise within the *small* Estonian, i.e. national context. In search for access to innovation-relevant knowledge, firms are urged to also collaborate internationally. Thus, the distinct international orientation can be interpreted as a particular necessity rather than deliberate choice. Linking these analyses to the investigation of relational dimensions of proximity and distance suggests that such geographically distant configurations are mediated by proximity in other dimensions. For instance, Estonian firms exhibit preferences for partners in Nordic countries, particularly Finland. As part of these partnerships, firms seek to mobilise institutional similarities (language, culture) with Finnish partners – suggesting that institutional proximity can to a certain extent compensate for geographical distance. Because of rather diverse and comprehensive capacities available within Saxon and German contexts, firms from the Erzgebirgskreis are not immediately urged to collaborate internationally and, hence, organise networks at lower physical distances.

Furthermore, quantitative analysis of individual dyads in projects reveals that almost one in three linkages in both study regions refers to regional partners. Consequently, it can be deducted that regional contexts

provide, to certain extents, for innovation-relevant resources and partners – despite being typically perceived as thin contexts. Along these lines, this study finds that peripheral regions provide for regionally distinct resources and qualities, both material and immaterial ones (7.2). These relate for instance to specific historical legacies of regions that left imprints in terms of traditions or embedded knowledge, but also to natural resources and cultural assets. Activation of these resources not only induces regional and local collaboration, but also provides opportunities to create regionally distinct outcomes as well as marketing campaigns.

The analysis of configurations along the lines of multi-layered relational dimensions of proximity and distance reveals complex interplays between the distinct relational dimensions and (temporary) geographical proximity (see 6.3). Analyses confirm theoretical propositions (e.g. Boschma, 2005) and recent empirical indications (Hansen, 2014; 2015) that non-spatial configurations act as productive substitutes in absence of physical closeness. In particular, this research finds that articulations of social proximity such as trust and reliability are indispensable elements for effective collaboration. Consequently, actors frequently mobilise linkages to existing partners. Operating on the basis of past experiences, i.e. acquainted social frameworks, does not necessarily require geographical proximity but tolerates distance. In case collaborations to new partners are initiated or intended, processes of trust building take on a pivotal function and are coupled with episodes of temporary proximity – underpinning the function of actor mobility, e.g. through initiation and project meetings, mutual visits etc. (see 6.4.2). This particular role of temporary geographical proximity for interpersonal trust-building processes has recently been highlighted for collaborations in knowledge-intensive business services (Grove, 2018), which this dissertation now confirms for LMT manufacturing firms. Additionally, this research finds that social relations in the sense of friendship and family ties are frequently expanded into the business sphere. Such practices were previously identified as typical for firms operating from peripheral regions, generally emerging as a thick fabric of social capital (e.g. Young, 2010; Bürcher et al., 2015). With respect to institutional and cognitive dimensions, this research indicates that distanced, rather than proximate, arrangements provide productive grounds for innovation and capacity building. Differences in overarching institutional frameworks, and especially informal ones, provide for new ideas and inspiration, which, if coupled with certain degrees of social proximity, effectively shape the path of innovation projects. In this sense it is also observed that institutional differences converge over time. However, institutional differences also induce complications. First, the formation of intended ties might be blocked if institutional differences between organisations are too big. Second, formal institutions induce complexities to firm's export and internationalisation endeavours. Cognitive distance emerges from this research as a central relational element. Actors involve partners and are involved in external projects exactly because differences in capacities and knowledge bases exist. Cognitive distance in collaborations constitutes a precondition for learning and capacity building. However, effective communication needs to be ensured in such distanced relations.

Collectively, this dissertation finds that successful innovation projects tolerate and even require distances, which can therefore be considered a particular asset (Grabher and Ibert, 2014). Distances in certain

dimensions (e.g. cognitive, institutional) are substituted by proximity in other dimensions (e.g. (temporary) geographical, social). From this research emerges, that a particularly important weight can be ascribed to the social configurations in projects. They appear as a pivotal element through which distance in other dimensions is negotiated and mediated. Building social acquaintance and interpersonal trust requires (episodes of temporary) geographical proximity. However, once established, actors can operate independently from geographical proximity. Furthermore, analyses of non-spatial types of proximity and distance reveals multiple instances regarding their specific dynamics. Therefore, along with its specific methodological approach, which is sensitive to proximity dynamics, this research adds to an identified gap in proximity research (Balland et al., 2015). It provides illustrations on how proximity dynamics shape and condition ongoing as well as (potential) future innovation projects.

Due to their diverse functions, I argue that relational dimensions of proximity and distance compose central elements of firm's (project) networks. They allow firms to construct particular spaces, in which territorial dimensions such as regional or national references, do not necessarily reflect essential dimensions. Rather, these networked 'activity spaces' (Bathelt and Glückler, 2018) are co-constituted by both, relational and geographical elements. Actor practices, communication and relational configurations can be perceived as determining elements through which the importance of spatial elements moves to the background – although must not be entirely neglected, as actors do ascribe value to the geographical dimension.

The analysis of actor perceptions towards spatial proximity (6.4.1) reveals that actors ascribe a generally easing and facilitating function to it, for instance based on reduced transaction costs. Physical proximity in innovation projects emerges as a desired condition. However, a lack of geographical proximity to relevant partners must not be considered as imposing insurmountable limitations on innovation endeavours. In fact, the state of being geographically distant shapes the routines of firms located in peripheral regions, as they actively adapt to the conditions of their environments. In this regard the dissertation highlights that different mobility formats act as central mechanisms to bypass shortcomings of regional environments and to manage distance (see 6.4.2). Firms from both study regions frequently engage in formats that generate temporary proximity and allow for exchange with relevant partners in co-presence. In particular, trade fairs play an important and multi-faceted role. As temporary clusters (Bathelt and Schuldt, 2008), trade fairs and related settings constitute platforms that allow firms from peripheral regions, just like firms from non-peripheral regions, to establish new and strengthen existing contacts, observe technology and monitor market developments, receive feedback, generate visibility and to facilitate marketing activities – and thereby to shape the path of innovation efforts.

Chapter 6.5 exceeds explicit network perspectives and indicates that firms operate from comprehensive internal knowledge bases, including technological expertise and practical knowledge. The availability of comprehensive internal resources constitutes a pivotal base for firm competitiveness and, likewise, conditions the effectiveness of network, i.e. the capacity to recognise and appropriate external resources (Cohen and Levinthal, 1990). This research suggests that firms from peripheral regions strategically maintain high levels of and even expand internal capacities in order to gain flexibility and ultimately to

build self-sufficiency. This self-sufficiency mechanism confirms recent research (e.g. Isaksen and Sæther, 2015) and suggests that, explicitly and implicitly, firms adapt to the rather thin environments from which they operate. Internal capacities can be regarded a central compensation mechanism, linked to at least two particular functions. First, firms respond to certain resources regional settings, and with respect to Estonia also the national scale, do not provide for. Second, firms avoid transaction costs and uncertainties related to knowledge sourcing through network linkages and, thereby, reduce their interaction requirements (Shearmur and Doloreux, 2016). However, to maintain comprehensive internal knowledge bases, firms have continuously high needs for specialised workforce. In this regard, the finding that a substantial number of case firms face immediate skill shortages (see 7.1) might, in the medium and long run, pose substantial issues to the viability of this particular self-sufficiency strategy.

Chapter 6.6 presents a synthesising, empirically grounded typology of innovation-related action strategies of LMT manufacturing firms from peripheral regions. Along the determining dimensions of internal capacities and interaction intensities, it identifies and characterises four types of action strategies: *self-sufficiency building* (type 1), *resource mobilising* (type 2), *complexity managing* (type 3) and *flexibly (re)acting* (type 4) action strategies. As an initial effort to provide an empirically grounded systematisation on firm's innovation efforts, this framework constitutes a distinct contribution to current scholarly debates concerned with innovation in peripheral regions.

Linked to these different types, policy implications were derived and discussed. In line with the overarching relational approach of this dissertation, I suggest to adopt relational and open-ended innovation policy instruments. Following recent contributions from within the field of economic geography (Faulconbridge, 2017; Schmidt et al., 2018), such approaches are in capacity to sufficiently integrate the multi-local, fluid and mobile nature of innovation. Consequently, it has been argued to devise innovation policy in a way that encourages spatially unrestricted and multi-scalar interaction and supports firms from peripheral regions to satisfy their continuously high demand for qualified and specialised labour.

8.2 Reflections and open questions

Collectively, the results of this dissertation suggest that actors, i.e. individuals and firms as collective actors, from peripheral regions generate their own meaning of the environment they face and, by adopting specific practices and strategies, adapt to these environments. Consequently, actors are in capacity to construct their very own environments needed for innovation and, importantly, actively mobilise this capacity. Networks can be considered a particularly important mechanism that helps firm to configure and construct environments. Along relationally multi-layered and multi-scalar spatial configurations, firms from peripheral regions overcome certain limitations of their peripheral environments and, thereby, construct networked spaces that comprise of 'centralities'. Thus, local firms can act as agents of change in contexts exposed socio-spatial peripheralisation processes. It is important to consider local agents as active participants in shaping environments rather than merely dependent, passive units. Nevertheless, the latter perspective (passive, deficit-oriented) prevails and continues to be reproduced as part of overarching discourses (1.3.2). What matters for understanding innovation capacity of peripheral regions more

coherently, is not to stop at depictions on the state of structural and material endowments, but to go beyond and seek to understand on how actors act upon these challenges (McDonagh et al., 2012; Shearmur, 2017).

As the present research exemplifies, such agency-oriented perspectives have legitimacy. However, it remains crucial to identify and take into consideration the specific structural deficits of peripheral regions, as these limit the extent upon which local agents (can) act (see 7.1). These deficits need to be addresses by policy measures in order for these not to be continuously reproduced. Potentially policy implications discussed previously (see 6.6.3) provide guidance on how innovation of firms from peripheral regions might be effectively supported. On the basis of this research I argue for a more differentiated perception of peripheral regions, their actors and practices in overarching discourses which involves not to retain largely dichotomous representations – neither solely deficit nor solely quality-oriented ones. Thereby, a particular achievement of this dissertations is its contribution towards a less partial, i.e. less agglomeration-oriented picture on the heterogeneous, complex and multiple nature of *innovation geographies*.

METHODOLOGICAL REFLECTIONS

In methodological terms, particular features of this research are its focus on the micro-level unit of analysis, its actor-centred orientations and the adoption of a time-variant, dynamic approach. These features, as well as the findings of this dissertation, closely relate to its empirical approach, largely grounded on innovation biographies. The focus on innovation projects allows for rather direct observations of innovation related activities, along with associated actor practices and strategies. On the basis of qualitative case studies, heterogeneous mechanisms leading to the emergence and driving the dynamics of innovation activities of firms from peripheral regions were identified and systemised against the background of rich contextual understanding (firm specific, regional, etc.). Thereby, this research provides new, i.e. practice-grounded and actor-centred, insights into the diverse and multiple geographies of innovation by transcending large parts of existing scholarship. These benefits need to be seen against the background of its specific limitations. As projects, such as the investigated innovation projects, are by definition unique one-off activities, their investigation inevitably relates to contingencies. For instance, the specific mechanisms and practices identified in a specific innovation project might not necessarily be encountered in future projects, or play out differently as new projects might be driven by different motives, market requirements etc. Even though it can be anticipated that individual projects within the same firm do not ground on radically different approaches and practices, results based on these micro-level investigations are largely context dependent. While integrating understanding on the contextual embedding of cases facilitates interpretation and sense-making, it also limits the scope of this study for generalisation. Thus, this study does not claim wider generalisation of findings. However, it complements the multiplicity of studies in innovation geography that draw, by mobilising quantitative methodologies, on large(r) samples and might offer wider scope for generalisation but, consequently, lack contextual embedding and understanding.

The design of this dissertation as a bi-national comparative study has been both, challenging and rewarding. Challenging because comparative research, and especially cross-national research, inevitably

adds layers of complexity. For instance, complexities and issues emerged in the process of selecting suitable study regions that share similarities but at the same time exhibit differences in order to be in capacity to generate robust results. Differences in national and regional contexts, legislations and understandings can operate as distorting elements in data analysis. Additionally, the qualitative approach of this study, based on collecting and analysing interview material, is directly affected by the study's bi-national design: interviews in Estonia were conducted in English, i.e. a language which is neither my nor the mother tongue of interviewees in Estonia. Consequently, parts of the data might be subject to limitations in accuracy, comprehensiveness and quality. Despite these challenges, the bi-national comparative approach has been rewarding as it added analytical robustness in case similar findings and observations were achieved in both contexts. Additionally, contextual particularities could be mobilised to partially explain specific findings within study regions. These aspects ultimately facilitated reflections of cases investigated in South Estonia from a Saxon perspective, and cases investigated in the Erzgebirgskreis from an Estonian viewpoint. In this sense, the cross-national comparative design yielded questions which would otherwise not have emerged and results which other designs would not have produced.

Additionally, this research allows to reflect on how to approximate the notion of peripheral regions in future studies by taking into consideration meanings of local agents. In part seven I revisited the investigated cases by adopting the 'periphery label' perspective. Narrations, articulations and reflections of business representatives and as well regional development actors on the environment(s) from which they operate were mobilised to provide regionally-grounded understandings on both, perceived deficits and qualities of regional settings. Throughout the interviews these actors have, in multiple ways, explicitly and implicitly expressed their meanings on the notions of periphery and peripheralisation. As the discussion in chapter 7.1 illustrates, articulations on perceived constraints can be condensed as structural limitations. In particular, the notion of distance is coupled with and reinforced by inadequate infrastructural access/endowment as well as tensions regarding local and regional labour markets. In a way, these recurring narrations on the limitations imposed by regional environments observed across study regions, can be interpreted as constitutive elements of what 'periphery' means to actors from the economic sphere. Consequently, future research that focusses on investigations of economic processes and practices in peripheral regions, might use these indications as guiding categories and elements to capture and operationalise to notions of periphery and peripheralisation. Thereby, regionally grounded articulations and meanings would to a certain extent be incorporated.

The very state of distance, coupled with perceptions on suboptimal infrastructural endowments, appears as a central, yet traditional, element of these articulations and meanings. Accordingly, approaches to operationalise the notion of peripheral regions might refer to socio-economic indicators such as differences in travelling time to agglomerations, or variations in the coverage/availability of high-performance ICT infrastructures. Such indicators depict the multi-layered nature of distance along the lines of accessibility and technological exclusion and, thereby, extend its mere physical dimension. Besides, indicators that point towards tensions and structural limitations on local and regional labour

markets, such as age selective population decline and age selective outmigration, indicators on vacant positions such as apprenticeships, technical and management staff etc., can be mobilised to depict another constitutive element of peripheralisation. I followed Steinführer and Kabisch (2004) and Kühn et al. (2016) in this research to operationalise peripheral regions as regional settings being affected by economic stagnation, population decline and an outside geographical location, which reflects a common strategy in innovation-oriented investigations (see 3.4.1). While the previously discussed meanings actors ascribe to peripheral regions somewhat reflect in these dimensions (geographical, demographic, economic), they offer a potential basis for further refining procedures to define and operationalise *peripheral* settings. As periphery and peripheralisation constitute complex and multi-layered concepts, they cannot be fully captured by statistical indicators. At the same time, selection of study regions requires pragmatism and it can be assumed that the outcomes of multi-layered peripheralisation processes partially surface in socio-economic indicators (Kühn et al., 2016). While further refinement in the ways peripheral regions are operationalised for research purposes is certainly needed, it has been suggested that attention should be devoted to approaches that allow to compare the results of research on innovation activities across regions and countries (Eder, 2018).

AVENUES FOR FUTURE RESEARCH

In order to achieve its primary goal, to gain more profound understandings of innovation processes that evolve outside of designated innovation hotspots, analyses in this dissertation focussed on firms operating from differently structured peripheral regions. Additionally, the empirical investigations focussed on firms active in low to medium-low tech manufacturing industries, thereby considering particularly relevant economic activities of both study regions. The study adopted these particular perspectives as they were identified to only be rarely adopted in existing economic geography and innovation studies literature. Due to its extensive, qualitative approach and its reliance mostly on primary interview data, this study did not allow for extensions beyond these specific spatial and sectoral contexts. Consequently, it is subject to a number of limitations which have direct implications in terms of its explanatory power and scope for generalisation. In particular, it can be argued that the present analyses lack counterfactual perspectives – by not considering actors/processes from agglomerations and high-tech manufacturing sectors. However, these gaps can be addressed and narrowed by future research.

Doing so would add to relevant fields of enquiry and contribute at the same time to evaluations of the findings generated by this research. Questions could be posed regarding the extent to which main findings are specific, maybe even unique for processes and actors from peripheral regions or more widely applicable across spatial and sectoral contexts. Although agglomeration-centred perspectives on the geography of innovation were integrated as part of discussing theoretical and empirical literature (1.3.1), own empirical investigations were not conducted. Therefore, actor-centred and micro-level investigations of innovation activities of manufacturing firms in actor-dense and knowledge rich environments, i.e. designated innovation hotspots, would be a valuable and comparative complement to this dissertation. The same holds true for the investigation of innovation activities pursued by high-tech manufacturing firms in both peripheral and agglomerated locations. Such studies would mitigate the explorative nature

8 Summary: Conclusions, Implications and Reflections

of the present research and constitute valuable contribution to position its findings and assess its scope for generalisation. Such investigations should also consider service sectors which play, despite their diverse economic significance, only a minor role in innovation related scholarship.

Furthermore, the typology of innovation-related action strategies developed in chapter 6.6 of this dissertation also provides a number of reference points for future research. Generally, the exploratory typology and the individual types of action strategies identified, i.e. self-sufficiency building, resource mobilising, complexity managing and flexibly (re)acting strategies, provides an initial framework that can be mobilised, (con)tested, expanded and further systemised as part of future research. Linked to the previous discussion, multiple research directions are conceivable: similar and differentiated regional contexts, different economic activities, etc.

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Visit Setomaa

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Visit South Estonia

<http://visitsouthestonia.com/en/>

Wirtschaftsförderung Erzgebirge GmbH

www.wfe-erzgebirge

Appendices

Appendices

AP1 Documentation of cases and interviews

South Estonia

Contextual Interviews

interview code	interviewed organisation	interview date	duration (min)	description
EE_CON1	Viljandi county Regional Development Centre (Arenduskeskus)	01.12.2015	80	Interview with head of Regional Development Centre, conducted at the premises of the Centre in Viljandi; Contextual interview to get entry to field and first relevant contextual information on study region from a regional development perspective; strengths, challenges and development dynamics from regional economic development perspective; identification of businesses
EE_CON2	Võru county Regional Development Centre (Arenduskeskus)	17.12.2015	55	Interview with head of Regional Development Centre, conducted at a café in Tartu; Contextual interview to get entry to field and first relevant contextual information on study region from a regional development perspective; strengths, challenges and development dynamics from regional economic development perspective; identification of businesses
EE_CON3	BAS - Tartu Business Advisory Services	11.01.2016	62	Interview with a business advisor of BAS, conducted at a café in Tartu; Contextual interview to get entry to field and first relevant contextual information on study region from a regional development perspective; strengths, challenges and development dynamics from regional economic development perspective; identification of businesses
EE_CON4	Põlva county Regional Development Centre (Arenduskeskus)	12.01.2016	35	Interview with head of Regional Development Centre and a business advisor, conducted at the premises of the Centre in Põlva; Contextual interview to get entry to field and first relevant contextual information on study region from a regional development perspective; strengths, challenges and development dynamics from regional economic development perspective; identification of businesses
EE_CON5	ECAC - The Estonian Chamber of Agriculture and Commerce; Food Division	12.04.2016	50	Interview with head of food section; conducted at the premises of the Chamber in Tallinn; Contextual interview with a focus on the Estonian agricultural sector and the food industry
EE_CON6	Ministry of Rural Affairs; Bureau of Rural Entrepreneurship	27.04.2016	70	Interview with head Bureau of Rural Entrepreneurship; conducted at the premises of the Ministry in Tallinn; Contextual interview with a focus on the Estonian agricultural sector and the food industry

Interviews with business representatives and collaborations partners

Appendices

interview code	Business characteristics	Description of business	Description of investigated project/process	comments
EE1	<p>Year of establishment: 2005 Field of activity: Manufacture of furniture: Manufacture of other furniture (NACE: 31091; low technology) No. of employees: 75 Sales (t€): 8,400 Export share (%): 99</p>	<p>Company is based in Viljandi and belongs to a Sweden based firm active in manufacturing and sales of beds. The interviewed Estonian branch is the production site of the Swedish company. The Swedish mother company was founded in 1993 while the production plant in Estonia (which is registered as a private limited company in Estonia) was established in 2005.</p> <p>Bed production is based in Estonia, while business administration and marketing plus showroom are based in the Stockholm headquarters. Almost the entire production is exported, with Sweden and Denmark being main export markets. Estonian production site employs 75 people. Various companies active in the manufacturing of furniture, cushions and other related products are based in and around the county of Viljandi in which companies from the wider furniture sector have a long history.</p>	<p>The project under investigation relates to the development of a bed which features an ‘adjustable firmness’ function (product development). At the time of the development, adjustable firmness beds were available on the market, but not produced case company, which therefore entered a new sub-market with the development. The development originated from an external request and took approx. one year. At the time of the interview, product marketing was just launched. Producing the new bed with adjustable firmness function also induced changes in the related production processes;</p>	<p>The interview was conducted with chief technician of Estonian production site at the company’s premises in Viljandi.</p> <p>date/duration (min): 14.01.16/66</p> <p>Request for interview with CEO of Swedish mother company was denied;</p>
EE2	<p>Year of establishment: 1992 Field of activity: Manufacture of food products: Production of meat and poultry meat products (NACE: 10131; low technology) No. of employees: 100 Sales (t€): 7,300 Export share (%): <1</p>	<p>The company, established in 1992, is active in meat processing and the manufacturing of meat products. It offers a wide range of different meat products which are sold via retailers and all major Estonian supermarket chains (i.e. not directly to the end consumer). The firm is located in Saarepeedi, a small village in Viljandi county, close to Viljandi. Being active exclusively on the Estonia market, the company faces high pressures from both Estonian as well as foreign competitors active on the Estonian market (mainly from Finland). The company actively promotes its abdication of the MSM technology (mechanical separation of remaining meat) and the rather high meat content of own products which results from this practice.</p>	<p>The innovation process under investigation relates to a product development project. Specifically the development of meat products which are free of artificial preservatives (what the firm refers to as its ‘E-free label’). At the time of the development, such E-free product were not available on the Estonian market and the firm was the first one to introduce this (upmarket) product range in Estonia.</p> <p>However, such products and the technology these products draw on were available elsewhere. Being essentially a product development, the wider development also induced wider changes with respect to meat processing. The development was started with the goal to market products for the upcoming season/year and roughly lasted for 6 months. As first products of the E-free range were well received on the market, the product range was gradually widened. Eventually, competitors active in the Estonian also came up with similar product.</p>	<p>Interview was conducted with the company CEO and chief technician at the company’s premises in Saarepeedi;</p> <p>date/duration (min): 14.01.16/75</p> <p>The CEO had quite a dominant role throughout the interview, which also related to his higher command of the English language compared with the chief technician.</p>
EE3	<p>Year of establishment: 2014 Field of activity: Manufacture of food products: Other processing and preserving of fruit and vegetables (NACE: 10391: low technology) No. of employees: 3 Sales (t€): 58 Export share (%): <1</p>	<p>The company was established in 2014 and is one of the start-up companies investigates in Estonia. The company operates from an industrial estate in Viljandi and is active within the food sector, specifically producing crisps from a range of different (root) vegetables such a potato, beets, carrots, parsnip and sauerkraut. The company was founded in is run by a pair of cousins, at the beginning of 2016 the first external employee was hired. With the exception of some products being sold to Finland, sales are exclusively generated within Estonia. Besides its core business on vegetable crisps, the company seeks to diversify its production by constantly adding products to the existing portfolio (e.g. vegetable juices, instant soups, fish crisps). The company</p>	<p>This process resembles a classical start-up case within the sample. Departing from vegetable crisps as being the company’s central product, focus is placed on tracing the overall development path of the wider enterprise. While vegetable crisps are certainly not new products, the company is (to their knowledge as well as the author’s knowledge) the first on the Estonian market to produce crisps from various veg varieties grown in Estonia.</p>	<p>Interview was conducted with the production manager conducted at the company’s premises in Viljandi;</p> <p>date/duration (min): 15.01.16/40</p> <p>Before the interview the production manager provided a brief tour through the facilities, trying to explain all stages of the production process to me. Therefore, in the end we ran a little out of time and the interview had to be terminated at some point.</p>

Appendices

interview code	Business characteristics	Description of business	Description of investigated project/process	comments
		actively promotes its links to the local Mulgi cultural heritage, which also constitutes the key aspect in terms of brand building.		A follow-up interview was attempted to be arranged in Nov. 2016 but did not work out in the end.
EE4	<p>Year of establishment: 2002 Field of activity: Manufacture of other food products (NACE: 10891; low technology) No. of employees: 11 Sales (t€): 800 Export share (%): 0</p>	The company is a well-known Estonian family run dairy farm which produced and sells all kinds of dairy product directly and in all major Estonian supermarkets. The company is located in the village of Kärinä, in the very South of Võru county. As part of the birch sap project investigated, a new company was founded in October 2015. The newly established company deals exclusively with the development of birch sap related product as well as their marketing and is run by the son of the owner of the dairy farm.	The specific development project investigated as part of this case relates to development along two lines: first of the development of placing and marketing birch sap in international markets. And secondly to develop, in collaboration with various partner, soft drinks based on birch sap. While the dairy company was already selling small quantities of fermented birch sap on the Estonian market, the development project investigated was initiated by an external request from a Germany based importer seeking to source larger quantities of birch sap. The strategy of the newly established business is to eventually not only provide raw material to importer abroad, but to access foreign markets with own final sales products.	<p>Interview was conducted with owner of the dairy farm his son (CEO of the newly established birch sap business) at the company's premises in Kärinä; in November 2016 a follow-up interview was conducted in café in Tartu;</p> <p>The first interview was shortly interrupted (approx. 10min);</p> <p>date/duration (min): 02.02.16/60 Follow-up interview: 02.11.16/40</p> <p>While requests for interviews with research partner was approved, request to also interview commercial partner with whom soft-drinks were co-developed was denied;</p>
EE4P1	<p>Contextual interview with collaboration partner of EE4: The collaboration partner is a research institute specialised in the area of food and fermentation technology. The research centre is located in Tallinn on the campus of Tallinn Technical University, but is not part of the University. It was founded in 2004 and employs a total of 54 staff, it mainly provides research services for national/international industry customers.</p>			<p>Interview was conducted with a food technologist directly collaborating with EE4; interview was conducted at the premises of the institute in Tallinn</p> <p>Interview date/duration (min): 12.04.16/45</p>
EE5	<p>Year of establishment: 1991 Field of activity: Manufacture of wood and of products of wood and cork (NACE: 16232; low technology) No. of employees: 65 Sales (t€): 3,000 Export share (%): 70</p>	The company mainly produced wooden houses and has been operating since 1991. It is located in the village of Helme in Valga county. Besides its focus on the production of wooden houses, the company, employing a total staff of 65, is also active in the of machine building sector. This specific combination allows the company to develop and maintain technological solutions needed for the production of wooden houses in-house (the preceding company of Ritsu was specialised in producing machines for wood works). The company is largely export oriented, with main export markets being Azerbaijan, Norway, Germany and Latvia.	The innovation process under investigation relates to a specific log house production line. This newly developed production line relates to create the so called 'Norwegian Knot' using machinery equipment rather than with manual procedures. The Norwegian Knot itself is a specific corner type for square logged wooden houses. The technique is well established and frequently used by handcrafters but not integrated as an automatic production process. Successful implementation of the Norwegian Knot technique would result in substantial cost reduction and potentially also widen international sales potentials. According to the company integrating the Norwegian Knot technique into an automated process is a market novelty. At the time of the interview, the production line was not yet entirely completed.	<p>Interview was conducted with the CEO at the company's premises in Helme;</p> <p>The interview was shortly interrupted (approx. 10min);</p> <p>date/duration (min): 02.02.16/75</p>

Appendices

interview code	Business characteristics	Description of business	Description of investigated project/process	comments
EE6	<p>Year of establishment: 1998 Field of activity: Manufacture of products of wood, cork, straw and plaiting materials (NACE 16231; low technology) No. of employees: 38 Sales (t€): 3,600 Export share (%): 99</p>	<p>The company is active in the production of wooden doors and was established in in Viljandi in 1998. It employs a total of 38 staff. The CEO of the company, who is also the majority shareholder, operates mainly from the UK where he is also active in timber trade. Almost the entire production is exported with the UK, Germany, Sweden and France being the main markets. Since establishment in 1998, the production capacity of the company has been steadily increasing.</p>	<p>The project under investigation relates to the development to the implementation of a finishing line (painting line) which allows to company to manufacture also finished doors alongside the unfinished doors it has been producing to date. Being a process development, the installation of the finishing line therefore relates adding new product to the company's portfolio, therefore indirectly inducing also product innovation.</p> <p>Alongside the physical implementation of the new finishing line (which involves various sub-processes which are concerned by this substantial upgrading), the development also necessitated to enlarge the production site. It is anticipated by the management, that the new production line will increase the capacity by 40% in terms of volume and 100% in terms of company turnover. Duration of implementation of the process was roughly 1.5 years and involved huge investments.</p>	<p>Interview was conducted with the CEO and the general manager at the company's premises in Viljandi;</p> <p>date/duration (min): 04.02.16/70</p>
EE6P2	<p>Contextual interview with collaboration partner of EE6: The collaboration partner is a distributor of different kinds of paints (building paints, industrial paints) as well as a distributor of specialised paint processes equipment of industrial purposes. The company is located in Tartu.</p>			<p>Interview was conducted with the general manager direct collaborating with EE6; interview was conducted at the company's premises in Tartu;</p> <p>date/duration (min): 13.04.16/71</p>
EE7	<p>Year of establishment: 2014 Field of activity: Manufacture of wood and of products of wood and cork (NACE: 16232; low technology) No. of employees: 7 Sales (t€): 460 Export share (%): 70</p>	<p>The company was established in 2014 and is one of the start-up companies investigates in Estonia. The company has refurbished a complex of a former collective farm in the village of Leie, Viljandi county. The central product of the company is a sauna with specific design feature which makes the product stand out on the sauna market. After its initial focus in saunas the company now also seeks to diversity its product range and tries, for instance, to place wooden holiday houses based on the same design platform in the market. The company has experienced intensive growth and, at the time of the initial interview, employed a total of 7 staff members. The company's product are place in the upmarket section of external outdoor saunas. It has a high export share with in main export market being Germany.</p> <p>The company is co-owned by two individuals, one of them being in charge of production and one being in charge of marketing in cooperation.</p>	<p>This development process under investigation traces the development path of the newly established business. While the sauna as such is not a new product, the novelty introduced by the company relates to the specific design features of the sauna and in particular its igloo shape for which a design patent application has been issued.</p>	<p>Interview was conducted with co-owner and marketing and cooperation manager at the company's premises in Leie; in November 2016 a follow-up interview was conducted in café in Tallinn;</p> <p>Interview date/duration (min): 05.02.16/61 Follow-up interview: 07.11.16/50</p> <p>Request for interview with investor to the company was denied because of time and language issues;</p>
EE8	<p>Year of establishment: 1995 Field of activity: Manufacture of products of wood, cork, straw and plaiting materials (NACE: 16219; low technology) No. of employees: 200 Sales (t€): 33,187</p>	<p>The company is active in the various sub-fields of the timber industry, which is one of the most important manufacturing industries in South Estonia, and located in the village of Verijärve in Võru county. With an employment of approx. 200 staff, the company is one of the biggest employers in the region. It was established in 1995 and mainly produces redwood timber parts</p>	<p>The development project under investigation relates to a rather small change in the production process of certain wooden parts. This change became necessary in order to tackle quality emerging problems which were raised by one of the company's key customers. Therefore, the development can be considered an incremental change/innovation which was in the first place</p>	<p>Interview was conducted with a board member at the company's premises in Verijärve;</p> <p>date/duration (min): 16.02.16/66</p>

Appendices

interview code	Business characteristics	Description of business	Description of investigated project/process	comments
	Export share (%) : 60	for internal use. It parts are used to assemble windows, frames, doors, stairs or mouldings. 80% of sales are going to export with the Nordic countries, Central Europe and Japan being the main export markets.	facilitated by customer complaints. The project aimed at sorting out the quality issues, lasted for roughly 6 weeks and was conducted mainly by mobilising firm-internal capacities but also in close cooperation with the customer who initially raised the issue to the company.	
EE9	Year of establishment : 1734 Field of activity : Manufacture of articles of paper and paperboard (NACE: 17291; low technology) No. of employees : 72 Sales (t€) : 5,500 Export share (%) : 80	This company is a paper factory and was originally a paper mill. It is based in the town of Rāpina in Põlva county. It is specialised in producing cardboard and edge protectors from recycled paper. Established in 1734 and operating as a paper factory since, the firm is the oldest industrial company in Estonia. As paper is only produced from recycled material the company accommodates a wide range of processes, encompassing treatment of raw material to production of final paper products. The export share is 80%	The investigated innovation projects relates to a process change. The change basically relates to upgrading an existing paper mill will has been in operation for decades and which doesn't meet contemporary industry standards anymore. Upgrading the paper mill would substantially increase the capacity of the firm. Parts of the existing and technical very complex paper machine were replaced by new technology, while other parts of the machine were upgraded. The upgrading project was facilitated by the need to catch up on a significant investment gap which the company has suffered from under the previous ownership. The second reason was to increase overall production capacity. The overall upgrading process stretched over more than three years.	Interview was conducted with the CEO at the company's premises in Rāpina; date/duration (min) : 19.02.16/78
EE10	Year of establishment : 1992 Field of activity : Manufacture of beverages: Manufacture of cider and other fruit wines (NACE 11031; low technology) No. of employees : 11 Sales (t€) : 2,740 Export share (%) : 80	The company was established in 1992 and is located in the village of Kobela in Võru county. It mainly produces fruit wines for customer in the beverage industry which uses the company's product to produce final products, mainly ciders and alcopops. The company is majority owned by a Finnish mother which facilitated, from 2002 onwards, a re-orientation towards business-to-business and a focus on wine fermentation. The company has an export ration of 80%, its customers are mainly located in the Baltic countries and Finland.	The development under investigation is basically a product innovation which is however linked to establishing a new process in the first place. Only the initial process development allowed the company to come up with this new product. The product development was substantially facilitated by requests of one of the key existing customers. The goal was to produce a fermented wine that was neutral in taste, not including any specific aromas anymore. Such a neutral ferment would ensure that the fermented fruit wine could be flexibly used for various final products with specific aromas only being added in the end. Thus, neutral fruit wines would reduce required tank capacity of the customers as only one wine, instead of multiple differently flavoured wines, would need storage. The development of this neutral wine lasted for roughly 2.5 years.	Interview was conducted with the CEO at the company's premises in Kobela; date/duration (min) : 14.03.16/50 The interview was not recorded; interview notes were the basis for constructing a detailed protocol after the interview; Request for interview with owner of the company was denied; Email exchange with interview partner after interview to follow up on some aspects;
EE11	Year of establishment : 2003 Field of activity : Manufacture of wood and of products of wood and cork (NACE: 16232; low technology) No. of employees : 28 Sales (t€) : 1,800 Export share (%) : 95	The company was established in 2003 and is located in the village of Valgjärve in Põlva county. The company manufactures wide range of wooden garden buildings which includes the manufacturing of saunas, hot tubs, garden offices, camping houses. Almost the entire production of the company is exported with Germany and the Nordic countries being the main export markets.	The innovation project investigated relates to the development of a specific type of sauna, a floating sauna which is essentially a sauna boat to be used on lakes. The idea for the floating sauna, which is not entirely new to the market, was essentially brought forward by the owner of the company. The goal was to create something rather different on the very stable and traditional sauna market, therefore to diversify production into a specific niche of sauna product. Existing links to existing foreign customers were used to promote the idea of the floating sauna from the start of the project. The duration of this project is approx. 2 years.	Interview was conducted with the CEO and the marketing manager at the company's premises in Valgjärve; date/duration (min) : 17.03.16/67

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interview code	Business characteristics	Description of business	Description of investigated project/process	comments
EE12	<p>Year of establishment: 1992 Field of activity: Manufacture of articles of paper and paperboard (NACE: 17211; low technology) No. of employees: 48 Sales (t€): 2,000 Export share (%): 60</p>	<p>The company was established in 1992 in is located in the village of Ihamaru in Võru county. The company manufactures paper products, especially cardboard based products, which are used in the packaging industry. The company employs just under 50 staff and has an export ration of roughly 60%. The company produces for a wide range of customers which are for instance active in the food or electronics industry.</p>	<p>The investigated projects relates to a product innovation. The idea behind the new product is to integrate smart solutions into the packaging product, in particular to integrate NFC technology (Near Field Communication) which is deemed particularly suitable for instance for customers from the electronics industry. The stimulus for the innovation project can be linked to the CEO of the company and his efforts to actively pursue and identify new market opportunities. One of the rationales for integrating NFC into packaging solution is that end-customers might save in packaging material, e.g. by avoid sending out copies of manuals as these manuals could be accessed digitally via the NFC technology. While NFC is an established technology its specific application in the field of packaging can be seen as adopting this technology for a new application.</p>	<p>Interview was conducted with the CEO at the company's premises in Ihamaru;</p> <p>date/duration (min): 17.03.16/59</p>
EE12P3	<p>Contextual interview with collaboration partner of EE12: The collaboration partner is a start-up entrepreneur from Tartu who is seeking to establish an IT related start-up. Knowing NFC technology, this individual was essentially involved checking feasibility of the ideas of the CEO of the innovating organisation and implementing the technological parts of the project.</p>			<p>Interview was conducted with collaboration partner of EE12; interview was conducted at the University in Tartu;</p> <p>date/duration (min): 19.04.16/55</p>
EE13	<p>Year of establishment: 1992 Field of activity: Wholesale of fruit and vegetables (NACE: 46311) No. of employees: 9 Sales (t€): 290 Export share (%): 10</p>	<p>The company was established as a farm in 1992 and today mainly active in processing fruit and berries. The sales company which now sells parts of the farm's produce was established in 2004. It has a wide product portfolio, all of which is organic produce, ranging from juices, jams and different berry products. It employs a total of 9 staff and is located in the village of Kangsti in Võru county. Most of the produce is sold within Estonia, mostly via specialised supermarkets and organic shops. The company is a family run business and employs a number of family members. The company erected a new building in 2015 which now bundles important function of the farm and manufacturing of products. The new building also accommodates a shop as a direct sales outlet.</p>	<p>The investigated innovation product refers to the development of 'berry crisps' which are essentially specifically processed berries and fruit product which crisp up as a result of the production process.</p> <p>However, the interview dynamics did not allow to keep explicit focus on this concrete development (e.g. because the start of the development was already 10 years ago which prohibited detailed narrations). Thus, the focus of the interview was more on the company and wider development, and various product developments, within the company rather than on one single project.</p>	<p>Interview was conducted with the manager at the company's premises in Kangsti;</p> <p>date/duration (min): 21.03.16/75</p> <p>The interview was not recorded; interview notes were the basis for constructing a detailed protocol after the interview.</p> <p>Prior to the interview it was given a quick tour through the newly established production facilities during which some of the key processes were explained to me.</p> <p>Business customers of the company were also present during the interview.</p>

Appendices

Erzgebirgskreis *Contextual Interviews*

interview code	interviewed organisation	interview date	duration (min)	description
ERZ_CON1	Wirtschaftsförderung Erzgebirge GmbH	31.08.2016	75	Interview with head of county economic promotion agency, conducted at the premises of the agency in Annaberg-Buchholz; Contextual interview to get entry to field and first relevant contextual information on study region from a regional development perspective; strengths, challenges and development dynamics from regional economic development perspective; identification of businesses;
ERZ_CON2	Netzwerkzentrum August Stark	15.12.2016	55	Interview with head of networking initiative, conducted at the premises of the initiative in Marienberg; Contextual interview to get entry to field and first relevant contextual information on study region from a regional development perspective; strengths, challenges and development dynamics from regional economic development perspective; identification of businesses
ERZ_CON3	Industrie- und Handelskammer Chemnitz, Regionalstelle Erzgebirge	11.01.2017	45	Interview with head of chamber's sub-unit for the Erzgebirge, conducted at the premises of the chamber in Annaberg-Buchholz; Contextual interview to get entry to field and first relevant contextual information on study region from a regional development perspective; strengths, challenges and development dynamics from regional economic development perspective; identification of businesses

Interviews with business representatives and collaborations partners

interview code	<i>Business characteristics</i>	<i>Description of business</i>	<i>Description of investigated project/process</i>	<i>comments</i>
ERZ1	Year of establishment: 1998 Field of activity: Manufacture of wearing apparel (NACE 1414, low technology) No. of employees: 26 Sales (t€): 2,000 Export share (%) : 30	The company was founded in 1998 but goes back to a textile company which first operated at the premises in the town of Thum in 1876. Today, the company produces functional sportswear and employs 26 people. There is two man channels for distribution. The initial channel is contract manufacturing for a variety of external customers which then sell the products under their brand. Second, in 2007 the company launched its own sportswear brand through which it sells directly to the end customer. The company's export share is roughly 30% which Austria, Switzerland and Italy being the most important export markets.	The investigated project relates to the company's participation in an external research project, together with a consortium of 5-6 partners, coordinated by the Chemnitz University. The project is in the field of developing functional work clothes. The part that the company covers in the project is essentially to test materials and to see if certain theoretical product properties are feasible in practice (i.e. can be produced). Functional work clothes with supportive but also preventive properties are rather new to the market. The project constitutes an interesting opportunity for the investigated company with the opportunity to potentially develop into a new niche market. At the time of the interview the project was still ongoing and at a relatively early stage.	The interview was conducted with owner at the company's premises in Thum. Prior to the interview the IP informed me that he can only coarsely talk about specific development projects, because of confidentiality issues. Therefore, during the interview only few details could be explored date/duration (min): 14.12.16/70

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interview code	Business characteristics	Description of business	Description of investigated project/process	comments
ERZ2	<p>Year of establishment: 1886 (1991 2003 2005)</p> <p>Field of activity: Manufacture of luggage, handbags and the like, saddlery and harness (NACE 15120, low technology)</p> <p>No. of employees: 32 (in production)</p> <p>Sales (t€): 5,800</p> <p>Export share (%): no data</p>	<p>The company is specialised in producing specialised cases, with cases for music instruments and the wider music industry being the central market for the company. It further produces cases for guns and other special equipment. The company was first established in 1886, re-privatised in 1991 and changed ownership again in 2003 and 2005 when the company became again family owned. While the production of the company is located in the Erzgebirgskreis its headquarters (including sales, marketing and business administration) is located near Frankfurt (Main).</p>	<p>The investigated project relates to a product development. The newly developed product is a multifunctional tool-bag which is produced for a new customer from the furniture industry who sells the bag under its own brand. The innovating company was contacted with a specific request to produce a multifunctional and sturdy bag which could accommodate various types of office equipment and is because of some of its features and design placed in a niche of the wider bag market.</p> <p>The development of this new product induced a number of changes to the internal production organisation.</p>	<p>The interview was conducted with chief technician at the company's premises in Satzung.</p> <p>date/duration (min): 14.12.16/67</p> <p>After the interview the interview partner provided me with an extensive tour through the production facilities, illustrating some of the stages in the production process of the new product.</p>
ERZ3	<p>Year of establishment: 1995</p> <p>Field of activity: Manufacture of textiles: Finishing of textiles (NACE 13300, low technology)</p> <p>No. of employees: 170</p> <p>Sales (t€): 32,000</p> <p>Export share (%): 75</p>	<p>The company was established in 1995 and is, since, 1997 located in the municipality of Mildenaу. The company's core technology is spunlace and needlepunch of textiles, technological competencies which have allowed the company to become a specialised producer of sophisticated technical textiles for various purposes, include a broad product portfolio. In some of its product segments, the company is world market leader. It employs 170 people at its Mildenaу facilities and has an export share of 75%, with the main export markets being the US and the EU. Although officially operating within low-tech manufacturing (manufacture and finishing of textiles as main NACE activity) the company has a R&D intensity of roughly 10%.</p>	<p>The investigated development project relates to a new product development. In 2015 the company finalised the development of a newly developed wall paper based on flax fibres. The novelty of this kind of wall paper lies in its functional properties as it provides for sound absorbing as well as insulating properties. Thus, flax wall paper is a product new to the market. The wall paper provided access to a market which is new to the company and further facilitated a number of organisational processes within the company: with the product the company entered the business to consumer market and therefore opened a web-shop as well as a showroom at its premises in Mildenaу. Currently, the company further develops more comprehensive interior design concepts based around the initial wall paper due to which the interior design market was accessed. The duration of the wall paper lasted for about 2 years.</p>	<p>The interview was conducted with the head of R&D at the company's premises in Mildenaу.</p> <p>date/duration (min): 13.01.17/98</p> <p>Before the interview I was given a tour through the production facilities with a special focus on getting an overview on the different stages of the production process related to the flax material which is central to the specific innovation project.</p>
ERZ4	<p>Year of establishment: 1890 (2001)</p> <p>Field of activity: Manufacture of paper and paperboard (NACE 17120, low technology)</p> <p>No. of employees: 106</p> <p>Sales (t€): 20,000</p> <p>Export share (%): 70</p>	<p>The company was first founded in the municipality of Grünhainichen in 1890 and newly founded in 2001. It produced paper and specialises in transparent, grease-proof and crepe paper. The company employs 106 people and has an export share of 70% with the US being the single most relevant export market.</p>	<p>The investigated project related to a process development. In particular, the goal of the process development was to reduce energy-costs in the production of glassine, by implementing a higher speed on the paper machine while maintaining the product specifications, thereby to improve productivity and to become more competitive in the production of glassine. The project was conducted in collaboration with a regional paper oriented research institution. The project has received public and formally lasted for 12 months. The ultimate goal of the project could not be reached, as it was not possible to increase the speed of the machine without compromises on product quality.</p>	<p>The interview was conducted with CEO at the company's premises in Grünhainichen.</p> <p>date/duration (min): 13.01.17/86</p>
ERZ5	<p>Year of establishment: 1991</p> <p>Field of activity: Manufacture of rubber and plastic products (NACE 22000, low technology)</p> <p>No. of employees: 54</p> <p>Sales (t€): 3,700</p> <p>Export share (%): no data</p>	<p>The company was founded and re-privatised in 1991 and is located close to Chemnitz in Gornau where it employs a total of 54 staff. In 2007 the company established an internal research and development department. While the initial focus of the company is in manufacturing of rubber and plastics it has built additional competencies in water treatment systems and various other technological fields.</p>	<p>The investigated projects relates to the company's in the water treatment sector. Specifically, the project relates to the development of a specific water treatment cycle for aquaponics applications. This specific focus on applications within the food systems sector has been completely new to the innovating organisation. The project was first initiated and then gradually evolved due to an external request of a start-up company settings</p>	<p>The interview was conducted with two of the owners at the company's premises in Gornau.</p> <p>date/duration (min): 09.02.17/63</p>

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interview code	Business characteristics	Description of business	Description of investigated project/process	comments
			up aquaponics projects in Berlin. As a result of the project, the innovation organisation became co-owner of the start-up company.	
ERZ6	<p>Year of establishment: 1945 (1990)</p> <p>Field of activity: Manufacture of brooms and brushes (NACE 32910, low technology)</p> <p>No. of employees: 70</p> <p>Sales (t€): 12,500</p> <p>Export share (%): 70</p>	The company was founded 1945 and re-privatised in 1990 since when it has again been family owner and managed. The company produced shaving brushes and shaving razors plus a broad range of related accessories. Its products are largely hand-made. The company employs about 70 people and is located in the village of Hundshübel. Over the last years, the company has experienced a dynamic growth, both in terms of turnover as well as in terms of employees.	The investigated project related to the development of a new product range including safety razors, shaving brushed and accessories. This new product range is largely based on introducing a new technology into the company which specifically allows to widen the portfolio towards items made of stainless steel, therefore reducing the product costs and access new markets. Besides new technological/material features, the new product range further exhibits specific design properties.	The interview was conducted with one of the owners (in charge of product development) at the company's premises in Hundshübel. date/duration (min): 09.02.17/90
ERZ7	<p>Year of establishment: 1651 (1992/2008)</p> <p>Field of activity: Manufacture of metal structures and parts of structures (NACE 2511, medium-low technology)</p> <p>No. of employees: approx. 55</p> <p>Sales (t€): no information</p> <p>Export share (%): 5</p>	The roots of the company in Johanngeorgenstadt, which is just by the Czech border, go back until 1651. The current owner of the company took over in 2008 and invested substantially into the company. The company focussed on household technology as well as steel and machine construction, with a particular focus on brass processes. The company employs about 50 people and is increasingly active in the renewable energy area.	The innovation project under investigation relates to the development of a brass based and foldable under-construction for photovoltaics panels. The development of the specific construction aims to reduce the related costs, thereby balancing out cost increases of photovoltaics due to various regulative interventions.	The interview was conducted with the owner at the company's premises in Johanngeorgenstadt. date/duration (min): 10.02.17/63 Interview partner provided extensive and confidential information material prior to the interview.
ERZ8	<p>Year of establishment: 2014</p> <p>Field of activity: Manufacture of other textiles (NACE 13900, low technology)</p> <p>No. of employees: 2</p> <p>Sales (t€): 10</p> <p>Export share (%): 0</p>	This case cannot really be considered a fully functioning business but fits more into the category of a specific project and will therefore be briefly presented in the next column.	The project investigated related to the development path of the start-up company. The project groups is actually based in Leipzig and the idea of the project was to create a fashion label fairly producing clothes from Thum, thereby supporting the operations of an existing linen company. The T-Shirts designed and sold within the scope of the project are produced by the linen company.	The interview was conducted with one of the project initiators at an incubator in Leipzig. date/duration (min): 10.02.17/45
ERZ9	<p>Year of establishment: 1882</p> <p>Field of activity: Manufacture of made-up textile articles, except apparel (NACE 13920, low technology)</p> <p>No. of employees: 135</p> <p>Sales (t€): 16,000</p> <p>Export share (%): 65</p>	This family owned company is located in the town of Aue and active in textile manufacturing. It produces a broad product portfolio ranging from bed linen to technical textile for use in the automotive industry. The company is also manufacturer of damask fabrics, where it has a world leading position. The company employs a total of 135 staff, including 10 apprentices.	The project investigated within the interview related a product development within the company's technical fabrics section. Specifically, the project involved the development of thermo-system fabrics for covering large supermarket chilling cabinets.	The interview was conducted with the owner at the company's premises in Aue. date/duration (min): 16.02.17/46 Detailed explorations were not really possible as the interview partner was only providing short answers
ERZ10	<p>Year of establishment: 2014</p> <p>Field of activity: Manufacture of furniture (NACE 31000, low technology)</p> <p>No. of employees: 2</p> <p>Sales (t€): 40</p> <p>Export share (%): 0</p>	This start-up company was officially established in 2014 and is run by two brothers-in-law. The company designs and assembles furniture (mostly tables, chairs, and benches) made brass and/or a combination of brass and wood. The company does not yet have an own production. The two individuals run the company alongside other main occupations.	The project investigated related to the development path of the start-up company.	The interview was conducted with one of the two owners at the company's office/showroom in Schwarzenberg. date/duration (min): 08.03.17/116

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interview code	<i>Business characteristics</i>	<i>Description of business</i>	<i>Description of investigated project/process</i>	<i>comments</i>
ERZ11	<p>Year of establishment: 2005 Field of activity: Repair of fabricated metal products, machinery and equipment (NACE 33100, medium-low technology) No. of employees: 15 Sales (t€): 700 Export share (%): 0</p>	<p>The company was bailed out from bankruptcy under new ownership in 2005. It located in Olbernhau, close to the border with the Czechia, and employ 15 people. While having its roots in machine building for the wood industry and construction of production lines for sawmills. Currently the company is active in part machining and supplies mainly firms from steel construction and the machine industry.</p>	<p>The innovation project investigated as part of this project relates to the participation of the company in an external research project. The company covers a part in this project which is mainly concerned with adapting and developing a technology that allows the production of wooden pipes. Over the course of the initial project, a number of new projects within the same field have been facilitated with the central partner in the project, Dresden University.</p>	<p>The interview was conducted with the manager at the company's premises in Olbernhau.</p> <p>date/duration (min): 09.03.17/59</p>
ERZ12	<p>Year of establishment: 1990 Field of activity: Manufacture of structural metal products: Manufacture of metal structures and parts of structures (NACE 25110, medium-low technology) No. of employees: 37 Sales (t€): 3,360 Export share (%): 45</p>	<p>The company was established in 1990 and is located in the town of Schneeberg. Originally a manufacturer of crash barriers and guardrails, the company has more and more specialised on the production of abrasive sludge extraction machines used for metal waterjet cutting processes. Within this business section the company is amongst world market leaders. It employs a total of 37 staff and almost 50% of production is exported.</p>	<p>Throughout the interview, focus on a specific project could not be kept. Rather, the interview focussed on the evolution of the company's range of abrasive sludge extraction machines.</p>	<p>The interview was conducted with the CEO at the company's premises in Schneeberg.</p> <p>date/duration (min): 29.03.17/99</p>
ERZ13	<p>Year of establishment: 2007 Field of activity: Manufacture of furniture (NACE 31000, low technology) No. of employees: 20 Sales (t€): 1,400 Export share (%): 0</p>	<p>The company was established in 2007 when its predecessor went into bankruptcy. From the very beginning, the company specialised on manufacturing solid wood furniture. It sells to large furniture brands but not directly to the end consumer. The company is located in the municipality of Seiffen, which is famous for its wooden toy production, and employs 20 people.</p>	<p>The investigated innovation project related to the development of specifically age-based solid wood furniture. The development was initiated by the innovating organisation and involved close cooperation with partners from Dresden University. While the project itself, which included a full cycle of designing, producing and testing the furniture, is finished, the products themselves are not yet available in the market. The goal is to place the newly developed furniture within the hotel sector.</p>	<p>The interview was conducted with the owner at the company's premises in Seiffen.</p> <p>date/duration (min): 29.03.17/70</p>

AP2 List of translated quotes

This tables lists original quotes from interviews conducted in Germany and their English translations. Interviews in Estonia were conducted in English and original quotes are shown throughout this dissertation. Quotes in this table are chronologically ordered as they appear in chapters/sections.

English translation (as appears in dissertation)	Original quote (in German)
4.2.1	
‘[Regarding application oriented research institutions Saxony provides for an] absolute density. Many of the companies here have direct contacts to these institutions. Metal construction and coating etc. to Freiberg University. Concerning electronics and IT TU Chemnitz is important and Mittweida regarding marketing. But also TU Dresden and Zwickau University.’ (ERZ_CON1)	‘[Hinsichtlich industrienaher Forschungseinrichtungen haben wir innerhalb der Region eine] absolute Dichte. Viele unserer Unternehmen, haben direkte Kontakte zu den Einrichtungen. Metallbau, Beschichtung, etc. in Freiberg. [...]. Wenn es dann um Elektronik und Informatik geht, spielt die TU Chemnitz eine wichtige Rolle, aber auch die die FH in Mittweida, hinsichtlich Marketing. Aber genauso nach Dresden und Zwickau’ (ERZ_CON1).
‘regarding materials they [firms from the Erzgebirgskreis] are looking towards Freiberg. [...]. Regarding processes and production planning the competence is in Chemnitz. In my opinion there is no need to necessarily look beyond’ (ERZ_CON3).	‘Was die Materialien betrifft wird sicherlich Richtung Freiberg geschaut. [...]. Was Prozesse und Produktionsplanung angeht, da sitzt die Kompetenz wirklich in Chemnitz. Da braucht man meiner Meinung nach gar nicht zwingend über die Grenzen zu schauen’ (ERZ_CON3).
5.2.1	
‘product developments always depend on what customers require’ (ERZ2).	‘Produktentwicklungen sind immer abhängig von dem was vom Kunden gefordert wird’ (ERZ2).
‘They had the idea of a modular solution but they did not have a precise design in mind. First, they had to get an overview on what we can offer regarding technology and material combinations. This has developed in dialogue and the customers appreciate that they don’t have to approach us with fully elaborated product ideas. This is basically the consulting we provide’ (ERZ2).	‘Die hatten eine Idee, dass die so ein System machen wollen, aber eine konkrete Ausformung hatten die noch nicht im Kopf. Die mussten erstmal sehen was bei uns überhaupt möglich ist und welche Materialkombinationen es bei uns gibt. Und was wir hier leisten können. Das hat sich schon im Dialog entwickelt und das schätzen die Kunden dann auch, sie müssen nicht mit einem fertigen Produkt zu uns kommen. Das ist quasi unsere Beratende Tätigkeit in dem Bereich’ (ERZ2).
‘Once you are done with the developers, you have to grapple with the purchasers. Which is not easy when it comes to these large firms. Then, it is only about the price of the final product’ (ERZ2).	‘Wenn man mit den Entwicklern durch ist, darf man sich mit den Einkäufern rumschlagen. Das ist bei den großen Firmen nicht so einfach. Es geht dann um den Preis des fertigen Produkts’ (ERZ2).
‘if possible, we want to have everything in our hands.’	‘Ich möchte immer, soweit es geht, alles selber machen’ (ERZ2).
‘We participate in such projects to get to know new matters. [...]. Such collaborations help us progress [...] and to get new ideas which we would otherwise not have. We get results from test series regarding materials that we use. In general it is always a fertile collaboration’ (ERZ2).	‘Also wir sind natürlich immer gerne vorne mit dabei um neue Sachen kennen zu lernen. [...] Es bring uns voran [...] und in der Zusammenarbeit werden natürlich auch Ideen entwickelt, die wir sonst nicht hätten. Und man bekommt dadurch natürlich auch handfeste Ergebnisse, bei denen man mal Messwerte und Messreihen hat zu den Materialien die man einsetzt. Also das ist eigentlich eine ganz fruchtbare Zusammenarbeit’ (ERZ2).
5.2.2	
‘There are always interpersonal aspects involved and we got along really well. It was fascinating, this company does flax since 200 years, which is not really a high end product. They were very visionary, open and solution-oriented. [...]. We continued close contact with them’ (ERZ3).	‘Es ist auch immer eine menschliche Frage. Wir haben uns sehr gut mit den Leuten von [XXX] verstanden. Das war total faszinierend, die Firma existiert seit 200 Jahren und macht Flachs, was nicht gerade die High-End Produktion ist. Und die waren total visionär, offen und lösungsorientiert [...]. Und wir sind immer im engen Kontakt geblieben’ (ERZ3).
‘we developed a new technology or adapted a technology so are able to process flax. So [we asked ourselves] how can we add value to this and we checked lots of options’ (ERZ3).	‘Wir eine neue Technologie entwickelt, oder eine Anpassung der Technologie vorgenommen und sind jetzt in der Lage Flachs zu verarbeiten. Wir können wir das also in Wert bringen. Wir haben überall geschaut’ (ERZ3).
‘The product is very innovative. Because we enter a market which has been very stable for YEARS. [...]. The market for wallpaper exists, but its functionality is very limited. Basically, it has always been the same, there are only few disruptive changes, but flax could be one’ (ERZ3).	‘Das Produkt ist sehr innovativ. Weil wir in einem Markt kommen der seit Jahren [starke Betonung] etabliert ist. [...]. Der Markt für Tapete existiert schon, aber Tapete ist ja relativ begrenzt wie es funktioniert. Es ist eigentlich immer die gleiche Sache, es gibt nur wenige disruptive Schritte, aber Flachs könnte einer sein’ (ERZ3).
‘we want to offer a complete package [...] and sell a concept. Not only wallpaper but also room dividers, ceiling panels and the like, so we create a consistent story’ (ERZ3).	‘wir versuchen ein Komplettpaket anzubieten [...], ein Konzept zu verkaufen. Nicht mehr nur Tapete, sondern Tapete, Trennwände, Decken-Panels. So dass wir eine konsistente Geschichte liefern können’ (ERZ3).
‘long term activities in which we want to secure the future and develop innovative products. Innovative in the sense of first-to-the-market novelties. With these projects we look into the future, want to be present on future markets’ (ERZ3).	‘in langfristigen Aktivitäten wollen wir die Zukunft sichern und ein innovatives Produkt entwickeln. Innovativ im Sinne, dass es niemand anderes das. Damit schauen wir in die Zukunft, wollen im Markt präsent sein’ (ERZ3).
5.2.3	

Appendices

<p>‘They showed me what is doable with the technology regarding decorative applications and I realised that this is indeed something future-oriented for us, potentially affecting wider parts of our product range.’ (ERZ6)</p>	<p>‘Die haben mir auch gezeigt was mit den Verfahren geht. Dann habe ich aber gemerkt, dass das für uns schon etwas zukunftsfähiges ist. Ich sehe das Potenzial nicht nur bei diesem Rasierhobel sondern auch bei anderen Teilen’ (ERZ6).</p>
<p>‘they disclosed a considerable amount of know-how’ (ERZ6)</p>	<p>‘Es hat mich auch erstaunt, dass die so viel Knowhow preisgegeben haben’ (ERZ6).</p>
<p>‘We were very interested to establish the technology with a partner from the region [...]. Although they didn’t know the specific method, they were very interested and we decided to go ahead together. [...] Because I see the potential for our wider product range, I thought it is good to proceed with a local partner. We are familiar with each other and we have short ways.’ (ERZ6)</p>	<p>‘Wir waren natürlich auch daran interessiert diese Technik hier in der Region heimisch zu machen und einen Partner in der Region zu gewinnen [...]. Die kannten das Verfahren noch nicht, waren aber sehr aufgeschlossen und dann haben wir gesagt, wir gehen es zusammen an. [...] weil ich dieses Potenzial für den Rest des Sortiments sehe, dachte ich es sei gut das mit [XXX] zu machen. Wir sind aufeinander eingespielt, man hat kurze Lieferwege’ (ERZ6).</p>
<p>‘The designer is a known partner and I appreciate that he always provides valuable input and provides lots of own ideas. [...] And I have the feeling that he understands quite precisely what I want.’ (ERZ6)</p>	<p>‘Das ist ein bekannter Partner und ich schätze an Ihm, dass er immer sehr gut Input gibt, also er bringt da immer sehr sehr viele eigene Ideen ein. Und zum anderen habe ich das Gefühl er versteht ziemlich genau was ich will’ (ERZ6).</p>
<p>‘If our production were in Leipzig or Berlin, a lot more would be feasible in terms of co-operations, we would have more buzz in our showroom, we could host cultural events in our production facilities. This is more difficult here.’ (ERZ6)</p>	<p>‘Wenn wir jetzt vor den Toren Leipzigs oder Berlins produzieren würden, dann wäre hier sicherlich wesentlich mehr machbar an Kooperationen. Da wäre mehr Musik im Werksverkauf. Man könnte überlegen holt man sich ab und zu Kultur in die Produktionshallen usw. Da ist halt hier schwieriger’ (ERZ6).</p>
<p>‘With the flagship store in Berlin we can reach people a lot easier and present as well as transport our brand very differently’ (ERZ6)</p>	<p>‘Mit dem Flagship Store in Berlin können wir einfach viel mehr Leute erreichen und die Marke einfach ganz anders präsentieren und transportieren’ (ERZ6).</p>
<p>‘for me, MÜHLE only works here in the Erzgebirge, separating the two is somewhat unthinkable’.</p>	<p>‘Also für mich funktioniert MÜHLE im Kopf halt irgendwie nur hier alles andere ist irgendwie auch undenkbar’ (ERZ6).</p>
6.1.1	
<p>I always had a certain design affinity and at some point we had the idea to build furniture, combining wood and metal elements. We have experimented a lot, but weren’t thinking about establishing a company. It was only in 2011 when we first thought we could do this, because friends gave us really good feedback, saying they would also like to have this furniture. [...] It was only in 2014 when we set the company up’ (ERZ10).</p>	<p>‘Und da ich schon immer ein bisschen designaffin bin hatten wir irgendwann mal die Idee Möbel zu bauen [...], verschiedene Materialien zu kombinieren, Acryl, oder Holz mit Metall. Wir haben da viel probiert, aber da ging es gar nicht um eine Firma [...]. Ich sag mal so, 2011, da haben wir zum ersten Mal drüber geredet, weil dann Freunde da waren, die Möbel sahen und sagten O cool, das hätte ich auch gerne. [...]. Die Firma haben wir erst 2014 gegründet’ (ERZ10).</p>
6.1.2	
<p>‘We have not invented this kind of furniture. There are other companies in Germany producing iron sheet furniture. So we are no inventors, that needs to be said. But, of course, we have our very own style. [...] We continue to progress and are not static in the sense that our products stay the same. We always have new ideas and try to develop one or two new models every year’ (ERZ10).</p>	<p>‘Wir haben diese Blechmöbel ja nicht erfunden. Und es gab in Augsburg eine Firma die haben so ähnliche Möbel gebaut, wie wir, auch vor uns. Also es heißt, wir sind keine Erfinder gewesen, das muss man auch immer dazusagen. Aber wir haben natürlich unseren eigenen Stil. [...] Wir sind nichts statisches, so dass unser Produkt immer gleich aussieht. Wir haben immer neue Ideen und versuchen immer ein oder zwei Modelle jedes Jahr neu einzubringen’ (ERZ10).</p>
<p>‘The product is very innovative. Because we enter a market which has been very stable for YEARS. [...] It is hard to enter a market with a new product in the sense that it does not yet exist. The market for wallpaper exists, but its functionality is very limited. Basically, it has always been the same, there are only few disruptive changes, but flax could be one’ (ERZ3).</p>	<p>‘Das Produkt ist sehr innovativ. Weil wir in einem Markt kommen der seit Jahren [starke Betonung] etabliert ist. [...] Der Markt für Tapete existiert schon, aber Tapete ist ja relativ begrenzt wie es funktioniert. Es ist eigentlich immer die gleiche Sache, es gibt nur wenige disruptive Schritte, aber Flachs könnte einer sein’ (ERZ3).</p>
6.2.2	
<p>‘Especially in terms of paper technology there are only few options [for collaboration]. Universities in Dresden, Darmstadt and Munich and the paper centre in Gernsbach [town in Baden-Württemberg]’ (ERZ4)</p>	<p>‘Gerade im Papiertechnischen Bereich haben Sie eingeschränkte Möglichkeiten. Sie haben noch die Unis in Dresden, Darmstadt und München und Gernsbach das Papiermacherzentrum’ (ERZ4).</p>
<p>‘[Regarding application oriented research institutions Saxony provides for an] absolute density. Many of the companies here have direct contacts to these institutions. Metal construction and coating etc. to Freiberg University. Concerning electronics and IT TU Chemnitz is important and Mittweida regarding marketing. But also TU Dresden and Zwickau University.’ (ERZ_CON1)</p>	<p>‘[Hinsichtlich industrienaher Forschungseinrichtungen haben wir innerhalb der Region eine] absolute Dichte. Viele unserer Unternehmen, haben direkte Kontakte zu den Einrichtungen. Metallbau, Beschichtung, etc. in Freiberg. [...] Wenn es dann um Elektronik und Informatik geht, spielt die TU Chemnitz eine wichtige Rolle, aber auch die die FH in Mittweida, hinsichtlich Marketing. Aber genauso nach Dresden und Zwickau’ (ERZ_CON1).</p>
<p>‘Supporting such formats is important for us and we do think that it is highly relevant for local and regional firms, which we also get as feedback [from firms]’ (ERZ_CON3).</p>	<p>‘Die Unterstützung solcher Formate ist wichtig für uns und wir denken, dass diese auch für lokal und regionale ansässige Firmen relevant sind – das ist zumindest die Rückmeldung die wir bekommen’ (ERZ_CON3).</p>
6.3.1	

Appendices

<p>„He is an existing partner and I appreciate that the always provides very good input and brings in many many own ideas. Moreover, I have the feeling that he knows fairly accurately what I want“ (ERZ6).</p>	<p>„Das ist ein bekannter Partner und ich schätze an Ihm, dass er immer sehr gut Input gibt, also er bringt da immer sehr sehr viele eigene Ideen ein. Und zum anderen habe ich das Gefühl er versteht ziemlich genau was ich will“ (ERZ6).</p>
<p>“It certainly is important to have more projects with the partner, because a certain business relation emerges, [...] trust emerges. There needs to be a certain mutual reliability“ (ERZ9).</p>	<p>„Das ist sicherlich wichtig, dass man mit dem Partner auch mehrere Projekte macht, weil sich da eine bestimmte Geschäftsbeziehung herausbildet, ein Vertrauen. Es muss ja schon eine bestimmte Verlässlichkeit gegenseitig da sein“ (ERZ9).</p>
<p>“Then I went up [to Berlin] to see them, we have sniffed at each other a little and identified what we really want“ (ERZ5).</p>	<p>„Dann bin ich mal hochgefahren, da haben wir uns ein bisschen gegenseitig beschnuppert und festgestellt, was wir wirklich wollen“ (ERZ5).</p>
<p>“[The collaboration with] the carpenter’s shop did not function very well. [...] That [having fundamentally different ideas and approaches] was also the reason why it didn’t work. [...] I don’t need a carpenter who always says: ‘this looks crappy’“ (ERZ10).</p>	<p>„Die Kooperation mit den Tischler hat nicht so gut funktioniert. [...] Das [grundsätzlich verschiedene Auffassungen] war auch der Grund weswegen es nicht funktioniert hat. [...] Ich brauche keinen Tischler der immer sagt: ‚sieht aber Scheiße aus‘ (ERZ10).</p>
<p>“On a personal level we got along well, he is a very accostable person. [...] It is always also an interpersonal question. We got along really well with the people [from the fibre supplier]“ (ERZ3).</p>	<p>„Wir haben uns auch persönlich verstanden, das ist ein sehr umgänglicher Mensch. [...] Es ist auch immer eine menschliche Frage. Wir haben uns sehr gut mit den Leuten von [XXX] verstanden“ (ERZ3).</p>
<p>“[...] thereupon [the existing partner] approached me, because we had already a good relation, if I could image to continue the project“ (ERZ11).</p>	<p>„Daraufhin ist die [XXX] an mich herangetreten, weil wir eben schon gute Beziehungen hatten, ob ich mir vorstellen könnte das Projekt weiterzuführen“ (ERZ11).</p>
<p>“[the collaboration with] the carpenter’s shop did not function very well. [...] I don’t need a carpenter who always says: ‘this looks crappy’“ (ERZ10).</p>	<p>„Die Kooperation mit den Tischler hat nicht so gut funktioniert. [...] Ich brauche keinen Tischler der immer sagt: ‚sieht aber Scheiße aus‘ (ERZ10).</p>
<p>“When you are done with the product developers you have to struggle with the purchasers“ (ERZ2).</p>	<p>„Wenn man mit den Entwicklern durch ist, darf man sich mit den Einkäufern rumschlagen“ (ERZ2).</p>
<p>“As I said, this [the collaboration with university partners] was a very very interesting experience and I would do it again anytime“ (ERZ13).</p>	<p>„Und wie gesagt, das war einfach eine sehr sehr interessante Erfahrung und von daher würde ich das jederzeit wieder tun“ (ERZ13).</p>
<h3>6.3.2</h3>	
<p>„It was totally fascinated to work with a company that does flax, not really a high end product, since 200 years. They were very visionary, open and solution oriented“ (ERZ3).</p>	<p>„Das war total faszinierend, die Firma existiert seit 200 Jahren und macht Flachs, was nicht gerade die High-End Produktion ist. Und die waren total visionär, offen und lösungsorientiert“ (ERZ3).</p>
<p>“I involved a partner with whom we have previously worked together. [...] This partner, in turn, also has projects with Dresden University and therefore knows the routines and how it works. So we were directly on the same wavelength“ (ERZ11).</p>	<p>„Ich habe einen Partner eingebracht mit dem wir früher schon gute Sachen gemacht haben. [...] Die wiederum haben auch Projekte mit der TU Dresden und kennen dann entsprechend den Ablauf und wie das funktioniert. Und da sind wir gleich auf derselben Wellenlänge“ (ERZ11).</p>
<p>„First of all we think of costs and marketing, we actually don’t think about customers to be honest. And the TU [partners from Dresden University] in principle don’t care about costs and so on to start with, for them it is about the topic“ (ERZ13).</p>	<p>„Wir denken halt sofort an Kosten und Vermarktung. Wir denken aber eigentlich gar nicht an den Kunden ganz ehrlich gesagt. Und der TU sind die Kosten usw. im Prinzip erstmal egal, es geht uns Thema“ (ERZ13).</p>
<p>“They [the start-up] are again floating in very different spheres and we are with the reality. [...] They are theorists and we are practitioners“ (ERZ5).</p>	<p>„Die schweben schon wieder in ganz anderen Sphären und wir sind bei der Realität. [...] Das sind Theoretiker, wir sind Praktiker“ (ERZ5).</p>
<p>“the larger firms have no inclination to be approached by a small mini company [like us] with its ideas“. [...] ‘I found a firm in the North [of Germany] which now produces single table plates for me“ (ERZ10).</p>	<p>„die größeren Firmen haben keinen Bock, dass so eine kleine Minifirma kommt und sagt ‚ich hätte da so eine Idee‘. [...] Ich habe im Norden eine Firma gefunden, die mir für Tischplatten Einzelfertigung anbieten“ (ERZ10).</p>
<p>“regarding materials they [firms from the Erzgebirgskreis] are looking towards Freiberg. [...] Regarding processes and production planning the competence is in Chemnitz. In my opinion there is no need to necessarily look beyond“ (ERZ_CON3).</p>	<p>„Was die Materialien betrifft wird sicherlich Richtung Freiberg geschaut. [...] Was Prozesse und Produktionsplanung angeht, da sitzt die Kompetenz wirklich in Chemnitz. Da braucht man meiner Meinung nach gar nicht zwingend über die Grenzen zu schauen“ (ERZ_CON3).</p>
<p>“I think we have quite some competent universities and institutes. And if we develop projects we first look what they can offer thematically. [...] For our topic such as metal sheet [expertise] can be found here in my opinion“ (ERZ7).</p>	<p>„Ich denke auch dass wir hier viele Universitäten, viele Institute haben, die eben auch kompetent sind. Wenn ich ein Projekt entwickle, schaue ich erstmal ob die da thematisch was anbieten können und würde jetzt nicht sonst wo hin gehen“ (ERZ7).</p>
<p>“We thought of it [collaboration with Czech partners]. I was over there to visit firms but it didn’t work out yet. I am not reluctant [...] but I don’t have the absolute urge“ (ERZ11).</p>	<p>„Es war mal angedacht. Ich war auch mal drüben und habe Firmen besucht, aber es hat sich noch nichts ergeben. Ich bin nicht abgeneigt [...], aber habe jetzt nicht unbedingt den Drang dorthin zu gehen“ (ERZ11).</p>
<p>“The distrust towards Czech partners is quite big. They also have a different economic and working culture. We have too few collaborations with Czechia especially when it comes to innovation“ (ERZ_CON1).</p>	<p>„Das Misstrauen in Richtung Tschechien ist ziemlich groß. Die haben auch eine andere Wirtschafts- und Arbeitskultur. Wir haben zu wenig Kooperation nach Tschechien, gerade im Innovationsbereich“ (ERZ_CON1).</p>
<p>“Especially in terms of paper technology there are only few options [for collaboration]. Universities in Dresden, Darmstadt and Munich and the paper centre in Gernsbach [town in Baden-Württemberg]“ (ERZ4)</p>	<p>„Gerade im Papiertechnischen Bereich haben Sie eingeschränkte Möglichkeiten. Sie haben noch die Unis in Dresden, Darmstadt und München und Gernsbach das Papiermacherzentrum“ (ERZ4).</p>
<p>Mutual respect and trust are values which we also nurse with our nurse with our customers. We play relatively transparent which is</p>	<p>„Gegenseitiger Respekt und Vertrauen sind Werte die wir auch mit unseren Kunden pflegen. Wir spielen relativ transparent. Das ist</p>

important for a good development, we want to be faithful and sustainable.’ (ERZ3)	wichtig für eine gute Weiterentwicklung, wir wollen auch treu sein, nachhaltig’ (ERZ3).
‘It is not only about the idea itself [...] but you need combatants and you need to convince people to interrupt their routines and production process.’ (ERZ10)	„Da geht es nicht nur um die Idee [...], sondern du brauchst auch Mitstreiter. Du musst Leute überzeugen, dass sie ihren gewohnten Produktionsprozess unterbrechen‘ (ERZ10).
‘They [the start-up] are again floating in very different spheres and we are with the reality. [...] They are theorists and we are practitioners.’ (ERZ5)	„Die schweben schon wieder in ganz anderen Sphären und wir sind bei der Realität. [...]. Das sind Theoretiker, wir sind Praktiker‘ (ERZ5).
‘First of all we think of costs and marketing we actually don’t think about the customer to be honest. And the TU [Dresden University] in principle don’t care about costs etc. to start with, for them it is about the topic. [...] We think as serial producers and our thinking has become very narrow. If we hear wardrobe, we think 2m high, 60cm wide, shelf and clothes rail. They are the categories we think in‘ (ERZ13)	„Wir denken halt sofort an Kosten und Vermarktung. Wir denken aber eigentlich gar nicht an den Kunden ganz ehrlich gesagt. Und der TU sind die Kosten usw. im Prinzip erstmal egal, es geht uns Thema. [...] Wir denken als Serienhersteller, unser Denken viel zu sehr eingeschränkt mittlerweile. Wenn wir Kleiderschrank hören, dann denken wir 2 Meter hoch, 60 breit, Hutboden, Kleiderstange. Also in dieser Region denken wir‘ (ERZ13).
‘If everything works fine we would like to continue [the collaboration with Dresden University]. We could apply for a new project to further optimise the process.’ (ERZ11)	„Wenn alles funktioniert, ist es angedacht [Die Kooperation mit der TU Dresden] fortzusetzen. Wir könnten ein nächstes Projekt beantragen um, sagen wir mal diesen Prozess der Rohrerstellung nochmal zu optimieren‘ (ERZ11).
6.3.3	
‘We have the advantage, my partner studied mechanical engineering and does not have much to do with design. He has got technical understanding but not necessarily the aesthetic sense. [...] And it is completely opposite with me, I have no clue about these [technical] things’ (ERZ10) (similar: EE3).	„Wir haben den Vorteil, mein Compagnon hat Maschinenbau studiert [...], aber der hat jetzt nicht unbedingt das Ästhetik-Empfinden. [...] Und bei mir ist es gerade umgekehrt, ich hab davon [technische Aspekte] überhaupt keine Ahnung‘ (ERZ10).
‘They showed me what is doable with the technology regarding decorative applications. I got an impression regarding the surfaces that can be realised, so what can be theoretically achieved. [...] but over the past two years I realise that they developed all the knowhow behind the technology over many years. It looks of course nice if you don’t have a clue, but the technology is tremendously complex’ (ERZ6).	„Die haben mir gezeigt was machbar ist, gerade im dekorativen Bereich. Und dann habe ich gesehen, welche Oberflächen da hinzubekommen sind, also was theoretisch geht. [...] in den letzten 2 Jahren habe ich einsehen müssen, dass die sich das über viele Jahre erarbeitet haben, und dass da ganz viel Knowhow dahinter steht. Das sieht natürlich alles toll aus wenn man keine Ahnung hat, aber das Verfahren ist enorm komplex‘ (ERZ6).
‘[...] I thought it is good to proceed with a local partner. We are familiar with each other and we have short ways’ (ERZ6).	„Ich dachte es sei gut das mit einem lokalen Partner zu machen. Wir sind aufeinander eingespielt, man hat kurze Lieferwege‘ (ERZ6).
‘We sat together and saw that it [the initial collaboration] functions well and that we have the same perspective’ (ERZ3).	„wir saßen zusammen und haben gesehen, dass das gut funktioniert und wir die gleiche Sichtweise auch haben‘ (ERZ3).
‘There were certain rough edges and difficulties. But a certain understanding of textiles was existing.’ (ERZ9)	„Es gab schon gewisse Ecken und Kanten und Schwierigkeiten. Aber ein gewisses Textilverständnis war schon da‘ (ERZ9).
‘We thought this was interesting but have no experienced in sound absorption. For us it is very valuable to learn about an entirely new field through such a project. It also fits with what we want to offer and the expertise one needs.’ (ERZ3)	„Wir fanden das interessant aber wir haben keine Erfahrung im Schallschutz. Für uns ist es ein riesen Wert wenn man durch ein Projekt ein komplett neues Gebiet einfach kennen lernen kann. Das passt für uns auch gut mit dem was wir anbieten wollen und den Kenntnissen die man dafür braucht‘ (ERZ3).
‘We have the advantage, my partner studied mechanical engineering and does not have much to do with design. He has got technical understanding but not necessarily the aesthetic sense. [...] And it is completely opposite with me, I have no clue about these [technical] things.’ (ERZ10)	„Wir haben den Vorteil, mein Compagnon hat Maschinenbau studiert [...], aber der hat jetzt nicht unbedingt das Ästhetik-Empfinden. [...] Und bei mir ist es gerade umgekehrt, ich hab davon [technische Aspekte] überhaupt keine Ahnung‘ (ERZ10).
‘We learned a lot on the production process [...]. Especially regarding the cuts of the shirts and how it can be produced in a way that it feels sophisticated in the end.’ (ERZ8)	„Wir haben in der Herstellung sehr viel gelernt [...]. Gerade im Schnittbereich und wie man Shirts so fertigen kann, dass es sich danach auch hochwertig anfühlt‘ (ERZ8).
‘this is what we know today and we operate accordingly. [...] we know that we cannot meet the highest requirements regarding transparency. So we don’t have to promise our customers. It is good to know what is doable and what it not’ (ERZ4).	„[...] das wissen wir heute und operieren auch so. [...] wir wissen, dass wir im Transparenzniveau nicht die höchsten qualitativen Ansprüche erfüllen können. Das brauchen wir den Kunden auch nicht versprechen. Es ist gut zu wissen was geht und was nicht‘ (ERZ4).
6.3.4	
‘We have now also joined a sales cooperation [...]. A sales cooperation that involves a number of companies, we jointly finance a sales representative who advocates our themes with architects, public administrations etc.’ (ERZ13).	„Wir sind jetzt auch eine Vertriebskooperation eingegangen [...]. Da gibt es eine Vertriebskooperation an der mehrere Firmen beteiligt sind, wir finanzieren gemeinsam einen Außendienstmitarbeiter der die Themen bei Architekten, Planern, öffentlichen Verwaltungen etc. vorbringt‘ (ERZ13).
‘[within the network] we provide knowledge which helps project partners, and we hope to receive such knowledge from others [other members] that might be of value for our future activities’ (ERZ1)	„[im Netzwerk] stellen wir im Grunde Wissen zu Verfügung was den anderen Projektpartnern hilft. Wir bekommen dann hoffentlich auch von den anderen gewisses Wissen zugespielt, was wir vielleicht in Zukunft für unsere Sachen verwenden können‘ (ERZ1).
‘We are also a member in the enamel association, because we do enamel ourselves. Recently, there was a project started on repairing enamel which brings together firms that are interested in the topic and which then allows to build a network’ (ERZ7).	„Wir sind zum Beispiel Mitglied im Emaille-Verband, weil wir emaillieren. Dort gibt es ein Projekt zur Reparatur von Emaille. Da kommen dann Firmen zusammen, die sich für die Thematik interessieren und daraus kann man dann ein Netzwerk bilden‘ (ERZ7).

<p>'We are also active in the association of the Eastern German textile industry which has 200 members from Saxony, Thuringia, Saxony-Anhalt, Brandenburg. And through this association projects emerge in which we as firms participate and actively contribute to the network' (ERZ9)</p>	<p>„Wir sind auch engagiert, im Verband der ostdeutschen Textilindustrie. Der Verband hat 200 Mitglieder aus Sachsen, Thüringen, Sachsen-Anhalt, Brandenburg. Über den Verband gibt es dann auch entsprechende Projekte, Förderprojekte, wo wir uns da auch als Firma mit einbringen und wodurch wir entsprechend im Netzwerk mitarbeiten, Entwicklungen anstoßen und begleiten“ (ERZ9).</p>
<p>'[within the INNtex network] we provide knowledge which helps project partners, and we hope to receive such knowledge from others [other members] that might be of value for our future activities.' (ERZ1)</p>	<p>„[im INNtex Netzwerk] stellen wir im Grunde Wissen zu Verfügung was den anderen Projektpartnern hilft. Wir bekommen dann hoffentlich auch von den anderen gewisses Wissen zugespielt, was wir vielleicht in Zukunft für unsere Sachen verwenden können“ (ERZ1).</p>
<p>'Within the paper industry there is an academic paper engineering association at TU Dresden. [...] We meet once or twice per year and this is how contacts facilitate.' (ERZ4)</p>	<p>„Es gibt in der Papierindustrie einen akademischen Papieringenieurverein an der TU Dresden. [...] Man trifft sich 1 bis 2 mal jährlich und daher kommen diese Kontakte einfach zu Stande.“ (ERZ4)</p>
<p>'[...] such activities like meetings once a month [in business-related groups] I'm not keen on this. Because I'm not the right person for this. I want to do my thing and not go and participate in events' (ERZ10)</p>	<p>„[...] solche monatlichen Treffen, auf sowas hab ich keinen Bock. Dafür bin ich nicht der Richtige. Ich will mein Ding machen und nicht auf irgendwelche Veranstaltungen, gehen“ (ERZ10)</p>
<p>'We have now also joined a sales cooperation [...]. A sales cooperation that involves a number of companies, we jointly finance a sales representative who advocates our themes with architects, public administrations etc.' (ERZ13).</p>	<p>„Wir sind jetzt auch eine Vertriebskooperation eingegangen [...]. Da gibt es eine Vertriebskooperation an der mehrere Firmen beteiligt sind, wir finanzieren gemeinsam einen Außendienstmitarbeiter der die Themen bei Architekten, Planern, öffentlichen Verwaltungen etc. vorbringt“ (ERZ13)</p>
<p>6.4</p>	
<p>'Because I see the potential for our wider product range, I thought it is good to proceed with a local partner. We are familiar with each other and we have short ways' (ERZ6)</p>	<p>„Weil ich dieses Potenzial für den Rest des Sortiments sehe, dachte ich es sei gut das mit [XXX] zu machen. Wir sind aufeinander eingespielt, man hat kurze Lieferwege“ (ERZ6).</p>
<p>'[...] these 1.5 hours that it takes to get there are a real problem. Because you simply cannot briefly coordinate and make quick decisions, it is always quite time-consuming.' (ERZ8)</p>	<p>„[...] diese eineinhalb Stunden die man dort hinfährt sind ein wirkliches Problem. Weil man dadurch eben nicht dieses, es gibt was kurzes zu besprechen man spricht es ab und es geht weiter, hat, sondern alles ist immer aufwändig.“ (ERZ8)</p>
<p>'I was there [Berlin] a few times. Just for one day, getting there in the morning and leaving again in the afternoon. But there is also the internet and telephone.' (ERZ5)</p>	<p>„Ich war ein paarmal dort [Berlin]. [...] Nur so einen Tag, morgens hin nachmittags zurück. Dann gibt es ja auch das Internet und Telefon.“ (ERZ5)</p>
<p>'They really showed a lot of effort, we had many telephone conversations, we went to see them and they also came here.' (ERZ13)</p>	<p>„Also die haben sich ja wirklich reingekniert, es gab sehr viele Telefonate, wir sind ab und zu hingefahren und die waren bei uns.“ (ERZ13)</p>
<p>6.4.1</p>	
<p>'[Geographical proximity to partner] does play an important role and we try to have partners as close by as possible, not only partners for development purposes but also production partners.' (ERZ7)</p>	<p>„Das [geographische Nähe zu Partnern] spielt schon eine wichtige Rolle und wir versuchen schon auch alles/ also nicht nur im Entwicklungsbereich sondern auch im Fertigungsbereich Partner so nah wie möglich hier her zu holen.“ (ERZ7)</p>
<p>'It is always helpful to have partners locally, to have short ways. It good to coordinate or if partners need to be on site. It also minimises the costs of projects.' (ERZ4)</p>	<p>„Hilfreich ist das immer Partner vor Ort zu haben. Kurze Wege zu haben. Wenn es dann mal Abstimmung geben muss oder Partner vor Ort sein müssen. Im Projekt minimiert es ja auch die Kosten.“ (ERZ4)</p>
<p>'Because you simply cannot briefly coordinate and make quick decisions, it is always quite time-consuming.' (ERZ8)</p>	<p>„weil man dadurch eben nicht dieses, es gibt was kurzes zu besprechen, man spricht es ab und es geht weiter hat, sondern alles ist immer aufwändig“ (ERZ8).</p>
<p>'[...] I don't consider this a disadvantage because we are always on the move. There is hardly a week in which we are not in Berlin or abroad, in the UK or elsewhere. [...] So it's less a matter of where we are located, but more a matter of how my time we can devote [to these activities] besides our day-to-day business' (ERZ6).</p>	<p>„[...] ich sehe das nicht als Nachteil weil wir ständig auf Achse sind. Es vergeht halt kaum eine Woche wir nicht irgendwo in Berlin oder auch im Ausland sind, in England oder sonst wo. [...] Es ist weniger die Frage wo sitzen wir, sondern eher die Frage wir viel Zeit kann man sich im Tagesgeschäft [für solche Aktivitäten] nehmen kann“ (ERZ6).</p>
<p>'My opinion is that you can only discuss certain things on the telephone or via web-conferences. Real interpersonal contact is still not possible. Current technology is still not good enough to replace it.' (ERZ3; similar: EE7, EE8 ERZ2, ERZ5, ERZ7, ERZ12)</p>	<p>„Ich bin der Meinung, dass sich am Telefon oder via Web-Konferenz nur einige Sachen besprechen lassen. Menschlicher Kontakt ist nach wie vor immer noch nicht möglich. Die Mittel die zurzeit existieren sind immer noch nicht gut genug um das zu ersetzen.“ (ERZ3; similar: EE7, EE8 ERZ2, ERZ5, ERZ7, ERZ12)</p>
<p>6.4.2</p>	
<p>'That [increased levels of mobility] is important. As I said, [...] one has to spend quite some hours in the car.' (ERZ9)</p>	<p>„Das [Mobilität] ist wichtig. Wie gesagt, man muss viel mit dem Auto erschließen, und man sitzt da eben viele Stunden im Auto“ (ERZ9).</p>
<p>'In terms of marketing it is essential for us to go to trade fairs. At the moments it is not the big fairs in Munich, Basel or Zurich that play a role. We still do this quite regionally, which means we are going to fairs in Plauen, Leipzig and Dresden' (ERZ10)</p>	<p>„Für den Vertrieb und fürs Marketing ist es unbedingt notwendig für uns, essentiell ist das, auf Messen zu gehen. Dabei spielen im Moment noch nicht die Messen in München, Basel oder in Zürich eine Rolle. Wir machen das noch sehr regional, das heißt wir gehen nach Plauen, Leipzig und Dresden“ (ERZ10).</p>

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'[to go to Berlin] to see them, we have sniffed at each other a little and identified what we really want' (ERZ5).	„Dann bin ich mal hochgefahren, da haben wir uns ein bisschen gegenseitig beschnuppert und festgestellt, was wir wirklich wollen“ (ERZ5).
'For me, the on-site visit was very important: to be at [potential partner] and to see how capable this technology is' (ERZ6).	„Für mich war dieser Besuch vor Ort ganz wichtig. Also dort bei [XXX] zu sein um zu sehen wie leistungsfähig diese Technologie ist“ (ERZ6).
ERZ2 highlights that 'it doesn't make sense to initiate [a project] without a visit [here on-site]. People need to have a look because for many, our products are new and they don't really have precise ideas'.	„Es ist unsinnig ohne einen Besuch ein Projekt anzustoßen. Die Leute müssen es erstmal gesehen haben, weil für viele die Produkte neu sind und die noch keine Vorstellungen haben“ (ERZ2).
'we were approached while exhibited at a supplier fair for the furniture industry. We were exhibiting moulded parts, they [partners] saw this and in combination with the felt covering they got the idea that it could also make a bag.'	„wir haben auf einer Zulieferermesse für die Möbelindustrie ausgestellt. Und dort ist man an uns herangetreten. Wir haben Formteile gezeigt, die [Partner] haben gesehen, OK, Filzoberfläche, vielleicht können wir dann auch eine Tasche machen“.
'I mainly use fairs to get in touch with research institutions and universities. Fraunhofer institutes are around, often also TU Dresden and other German universities. You can easily observe what they do and if there is interest. You can feel free to simply contact them' (ERZ3).	„Ich nutze [Messen] um mit Forschungseinrichtungen und Universitäten in Kontakt zu kommen. Die ganzen Fraunhofer Institute sind da, oft auch die TU Dresden oder andere Universitäten aus Deutschland. Man kann relativ einfach sehen was die tun, sehen ob es Interesse gibt. Man kann sich frei fühlen die zu kontaktieren.“ (ERZ3)
'To find partners we increasingly visit trade fairs [...] and present ourselves as a powerful partner in the textile field. We have found a number of partners during trade fairs with which joint developments were started.' (ERZ9)	„Und zum Finden von Partnern gehen wir verstärkt auf Messen [...] und präsentieren uns als der leistungsfähige Partner im Textilbereich. Und wir haben da schon einige Partner gefunden mit denen wir gemeinsam entsprechende Entwicklungen gemacht haben.“ (ERZ9)
'generally I would say that trade fairs now play a less important role for marketing. We consider trade fairs more as opportunities to directly talk to customers' (ERZ6).	„also grundsätzlich finde ich, dass Messen mittlerweile eine untergeordnete Rolle fürs Marketing spielen. Wir sehen die Messen eigentlich als Möglichkeit mit Kunden persönlich zu sprechen“ (ERZ6);
'from 2014 onwards we have realised that exhibiting at trade fairs is absolutely essential for us. [...]. Even though you must not always consider direct sales on the spot. We visited also fairs without selling anything but sales really increased afterwards, so in the end it was very effective' (ERZ10).	Wir haben ab so 2014 mitbekommen [...] dass es unbedingt notwendig ist, für uns essentiell ist das, auf Messen zu gehen. [...]. Man darf nicht immer von den Vor-Ort-Verkäufen ausgehen. Es gibt auch Messen [...] da haben wir nix verkauft, haben aber im Nachfeld so viel generiert, dass es dann schon super war“ (ERZ10).
'Nowadays people google so we try to generate as many intersections as possible, i.e. to generate visibility for our brand and company we try to feature our brand wherever it is possible.' (ERZ6)	„Heutzutage wird gegoogelt und man versucht halt im Netz möglichst viele Schnittpunkte zu schaffen, d.h. versucht die Marke zu featuren wo es auch immer geht um Aufmerksamkeit auf Marke und Firma zu lenken“.
'without the internet the firm could not have taken such a dynamic development' (ERZ6).	„ohne das Netz hätte auch die Firma nicht so eine Entwicklung nehmen können“ (ERZ6).
'the internet is not a healer. [...]. The internet is so big, our company gets lost, it's like the needle in a haystack' (ERZ10).	„Das Internet ist ja nicht der Allheiler. [...]. Das Internet ist so groß, da verliert sich Blechmöbel, das ist die Nadel im Heuhaufen“ (ERZ10).
6.5.1	
'I think that our production depth is somewhat part of our DNA and very important for the company. [...]. We try to keep as much in-house as possible.' (ERZ6)	„Ich denke die hohe Fertigungstiefe ist ein Stück weit [unsere] DNA [und] ganz wichtig für das Unternehmen. [...]. Wir versuchen so viel wie möglich selbst zu machen.“ (ERZ6)
'we can sew bags and we can produce cases, we can integrate a zip, we can rivet, glue and screw items, produce a belt strap – anything that is needed' (ERZ2).	„Wir können Taschen nähen, wir können den Koffer herstellen, wir können einen Reißverschluss einziehen, wir können Sachen nieten, kleben, schrauben - alles was dazu gehört“ (ERZ2).
'it was very appreciated by the customer [that we could produce the entire item], they thought we could only produce the case' (ERZ2).	„Das hat die Kunden sehr angesprochen, die dachten auch zuerst wir könnten nur die Schalen fertigen“ (ERZ2).
'[the production of isolation fabrics] needs to be technologically implemented. And we didn't have much experience with these materials. So we had to adapt the machine settings to process the different materials' (ERZ9).	„das [die Produktion der Isolationsstoffe] muss maschinentechnisch umgesetzt werden. Und da hatten wir nicht so große Erfahrung mit den Materialien. Da mussten dann entsprechende Maschineneinstellungen vornehmen, um eben diese anderen Materialien zu verarbeiten“ (ERZ9).
'this comprehensive production depth is paradoxically exactly the opposite of what is being taught at university. The mantra there is to make to production lean. [...]. Back in the days we have only produced shaving brushed, just like our competitors. [...]. We have simply picked from the toolkit of our suppliers who have focussed on producing handles, mounts and the like. Consequently our product were quite similar to those of our competitors. [...]. The moment we decided to produce increase our production depth, the company grew really dynamically. [...]. Externalising parts of the production, and be it only to a company in the neighbour village has always been a limiting factor. [...]. Now, I think that our comprehensive production depth might actually be part of the brand DNA, it is very important for the	„Diese unglaublich hohe Fertigungstiefe ist paradoxerweise genau das Gegenteil was an den Wirtschaftshochschulen gelehrt wird, denn dort heißt es immer ‚mach deine Produktion schlank‘ [...]. Wir haben früher eigentlich nur Rasierpinsel gemacht, wie unsere Konkurrenz. [...]. Und haben uns quasi aus dem Baukasten anderer Hersteller, die sich eben auf diese Griffe und Halterungen konzentriert haben, bedient, mit der Konsequenz dass wir vergleichbare Produkte hatten wie die Konkurrenz auch [...]. [...]. In dem Moment wo wir gesagt haben, wir machen das alles selbst ist die Firma unglaublich dynamisch gewachsen. [...]. Wenn wir Sachen außer Haus gemacht haben, und sei es auch nur im Nachbarort, es war immer irgendwie ein Hemmschuh. [...]. Mittlerweile denke ich die hohe Fertigungstiefe ist vielleicht auch so ein Stück weit DNA der Marke, es ist ganz wichtig fürs

company. It is not possible in every single area, but we try to keep as much of our production in-house' (ERZ6).	Unternehmen. Geht zwar nicht in jedem Bereich, aber wir versuchen schon so viel wie möglich selbst zu machen' (ERZ6).
'For funded project we always have a person in charge of content in one in charge of administrative handling. Here this is a colleague with a background in chemistry. The writes things of which 80% make already up a project proposal. He knows exactly how thing have to be written and what needs to be considered. He is really knowledgeable on funding schemes, SAB, BMBF etc. [...] which is really helpful.' (ERZ3)	'Wenn wir Projekte anschieben es gibt immer eine Person die sich fachlich kümmert und die administrativen Teile regelt. Das ist zum Beispiel ein Kollege hier bei uns, ein Dr. in Chemie. Er schreibt etwas und zu 80% Prozent ist das dann schon ein Projektantrag. Er weiß genau wie man es schreiben muss, was man beachten soll und kennt die ganze Förderwelt, SAB, BMBF etc. [...] das hilft schon' (ERZ3).
6.5.2	
'We now know that [the paper characteristics change] and operate accordingly. [...] we now that the transparency level cannot keep out expectations. So we don't have to promise to our customers [...]. Is very important to know what is doable and what is not.' (ERZ4).	'Dass [sich die Papiereigenschaften ändern] wissen wir nun und heute operieren wir so. [...] wir wissen dass wir dann im Transparenzniveau nicht die höchsten qualitativen Ansprüche erfüllen können. Das brauchen wir dem Kunden auch nicht versprechen [...]. Es ist klar zu wissen was geht und was nicht' (ERZ4).
7.1	
'generally we still have a good location, being close to Chemnitz. 20km further away it is much worse. [...]. We miss a motorway through the Erzgebirge, [having this] would make the region interesting. But it's not if it takes one hour to go to Olbernhau.' (ERZ5)	'Wir haben an sich noch einen guten Standort im Speckgürtel von Chemnitz, 20km weiter sieht es schlimmer aus. [...]. Es fehlt eine Erzgebirgsautobahn, [wenn es die gäbe] dann machst du die Region interessant. Aber nicht wenn du eine Stunde brauchst um nach Olbernhau zu fahren.' (ERZ5)
'A constraint is that we are not well connected to Chemnitz. It takes one hour to Chemnitz, one hour to Freiberg. Which is time-consuming. [...] It sounds banal, but the first thing is the physical condition of streets, it's really bad.' (ERZ11)	'Ein Hemmnis ist, dass wir keine gute Anbindung nach Chemnitz haben. Wir fahren eine Stunde nach Chemnitz, eine Stunde nach Freiberg. Das ist eben mit viel Aufwand verbunden. [...]. Es klingt zwar banal, aber geht geht schon beim Straßenzustand los – es ist schlimm.' (ERZ11)
'We simply don't have a really infrastructural connection. If you need to get here, coming from the motorway - a real catastrophe.' (ERZ12)	'Wir haben hier einfach keine richtige Anbindung. Wenn Sie von der Autobahn kommen und hierher müssen – eine Katastrophe.' (ERZ12)
'The internet connection continues to be a really locational disadvantage. [...]. When I came here in 2008 our entire internet connection was based on ISDN. Of course it was really difficult, especially with large customers which operate with direct online sales. Which means that we receive orders electronically, handle and process them electronically. [...]. Thanks god, we now have a private provider who established a stable grid here. But still, we couldn't realise industry 4.0 projects, not even 2.0. This is a real disadvantage.' (ERZ9)	'Die Internetverbindung ist nach wie vor ein echter Standortnachteil. [...]. Als ich herkam hatten wir nur einen ISDN Anschluss. 2008 war unsere komplette Internetanbindung nur über ISDN. Das war natürlich sehr schwierig, gerade im Großhandelsbereich wird immer mehr über Direktbuchungen gemacht. Das heißt wir bekommen die Aufträge elektronisch rein, bearbeiten sie elektronisch und geben die auch elektronisch zurück. [...]. Wir haben jetzt gottseidank durch einen privaten Anbieter einigermaßen stabile Leitungen aufgebaut. Aber 4.0 Projekte könnte ich jetzt hier gar nicht realisieren, nicht mal 2.0. Das ist ein klarer Standortnachteil.' (ERZ9)
'For many the people the region is simply not attractive. The infrastructure is not good and the population dynamics are also negative, so we have to see what happens.' (ERZ6)	'Die Region ist halt für viele nicht attraktiv. Aufgrund der Infrastruktur ist man schon mal benachteiligt und dann ist es auch relativ bevölkerungsschwach, man muss also schauen.' (ERZ6)
'We do not work with the minimum wage because Chemnitz is so close, [...] and VW is located there. They [VW] go into the villages and suck away all skilled employees. [...] and you have educated excellent people and VW comes and gets them. This is also an issue for us.' (ERZ5)	'Wir arbeiten nicht mit dem Mindestlohn, weil Chemnitz gleich da ist, [...] da ist VW. Die [VW] gehen in die Dörfer und saugen dort die ganzen Fachkräfte ab. [...] Dann hast du super Leute [ausgebildet] und VW greifen sie ab. Das Thema haben wir auch' (ERZ5).
'finding skilled people and specialists is not a problem for us. [...] We were able to find replacements for all relevant positions' (ERZ7)	'Fachkräfte sind überhaupt kein Problem [...] wir haben für alle relevanten und wichtigen Schlüsselstellen Nachfolger gefunden' (ERZ7).
'When we started here is was really difficult to find staff. Nowadays we have 160 employees and are really visible, we have a reputation and people come to us. We also advertise a lot, in all direction and especially for the development department, looking for academics. Today it is a lot easier for us than it was 10 years ago. But still, skilled employees continue to be an issue' (ERZ3).	'Als wir angefangen haben war es wirklich schwierig jemanden zu finden. Inzwischen sind wir 160 Leute und wirklich sichtbar. Wir haben einen Namen und die Leute kommen auf uns zu. Es wird viel mehr beworben, in alle Richtungen. Verstärkt im Entwicklungsbereich wo wir die Akademiker suchen. Das macht es heute viel einfacher als vor 10 Jahren. Aber die Fachkräfte bleiben eine Schwierigkeit' (ERZ3)
'we have to educate employees and young professional ourselves' (ERZ9)	'wir müssen unsere Fachkräfte, unseren Nachwuchs selbst ausbilden' (ERZ9).
7.2	
'of course a nice story for marketing purposes' (ERZ6).	'Das ist natürlich auch eine schöne Geschichte fürs Marketing' (ERZ6).
'metal sheet manufacturing has a long tradition in the Erzgebirge [...]. This is a of course one aspect that we like to communicate.' (ERZ10).	'Diese Blechverarbeitung gibt es im Erzgebirge schon ganz lange [...]. Das ist natürlich auch eine Sache die wir gern nach Außen kommunizieren' (ERZ10).
7.3	
'What I like here is that people are entrepreneurs and innovative. [...] [as a matter of history] things have always been solution-oriented here, necessity is the mother of invention [...]' (ERZ4).	'Was mir hier gefällt ist, dass die Menschen hier Entrepreneur sind und innovativ. [...] [Aufgrund der DDR-Geschichte] waren die

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	Dinge hier immer lösungsorientiert, Not macht erfinderisch [...].’ (ERZ4).
‘We have quite a few companies which are small but of high quality, which have ideas and a good business without being noticed anywhere in the world. Which might relate to our mentality here in the East and in the Erzgebirge. [...]. Our mentality is that we simply tend to do and get done with things without making much noise about it.’ (ERZ12)	‘Wir haben hier viele Unternehmen die klein und sehr hochwertig sind, die Ideen haben und Geschäfte machen ohne dass irgendwo in der Welt was darüber erscheint. [...]. Das hat wahrscheinlich auch mit unserer Mentalität zu tun, im Osten und hier im Erzgebirge. Die Mentalität im Erzgebirge ist so, dass wir Dinge einfach machen – wir tun nicht so viel klappern’ (ERZ12)
‘We have many companies here in the Erzgebirge that produce really great products. But as people, we are quite modest here, but do not shout about these things from the rooftop, tend to do it more hidden [...].’ (ERZ13)	‘Wir haben im Erzgebirge ganz viele tolle Unternehmen, die ganz tolle Produkte herstellen. Aber wir Erzgebirgler sind ja sehr bescheiden, hängen das ja alles nicht so hoch an die Glocke, sondern machen das alles eher im Stillen’ (ERZ13).
‘[...] mentalities here are conservatively ossified. [...]. Because of the outside location people from the Erzgebirge cultivate an above-average modesty. Things are being developed and end up in the drawer. [...]. Many companies simply don’t embrace self-representation and external appearance. [Consequently] in this respect the potential of the region is absolutely underestimated.’ (ERZ_CON2)	‘Die Mentalitäten hier sind konservativ verknöchert. [...]. Der Erzgebirgler, die Randlage mach ihn, er pflegt eine überdurchschnittlich falsche Bescheidenheit. Er entwickelt etwas und legt es in die Schublade. [...]. Viele Unternehmer mögen die Außendarstellung und Selbstdarstellung einfach nicht. [...]. In der Hinsicht unterschätzt man das Potenzial der Region total’ (ERZ_CON2)

AP3 Stylised version of interview guide with firm representatives

GENERAL INTRODUCTION

Could you please describe your own professional background, your position and experience at [*name of company*]?

Could you please describe [*name of company*] and its main activities?

TRANSITION TO INNOVATION PROJECT:

As the main theme of the interview I would like to talk with you about the development process of the [*project name*]

1ST NARRATION STIMULUS: PROJECT IDEA

Can you please tell me about the situation in which the first idea for developing [*project name*] came up – how did idea for the project emerge?

Narration corridor:

What were significant events, milestones at this stage? What went well? What were the problems of the project at this stage?

Which actors were involved at this stage? Why them? What was their contribution? How was contact established? Where are they based? Conflicts with actors?

2ND NARRATION STIMULUS: DEVELOPMENT PATH

After talking about the early phase of the development project, I would now like to focus on the further development path, i.e. what happened after the idea was established? Therefore,

Can you now please describe the process of how the initial idea for the [*project name*] developed further?

What did it take to develop the initial idea to the current state of the project?

Narration corridor

What is the current state of the project?

What were specific milestones during the development?

Which problems did occur during the development?

- technical / internal / with partners
- phases were you were stuck during the development?
- how were they overcome?

Which events do you consider crucial for successful completion of the project?

Have you visited trade fairs during and with relation to the project? What goals did you link to your participation in the trade fairs?

Which external partners were engaged in the project? What was the contribution of these partners?

How was the contact to these partners established?

GENERAL NARRATION CORRIDOR

ACTORS AND NETWORKS

What was the specific role and importance co-operation partners during the development process?

- Which partners were involved?
- What was their contribution/input?
- At what stages were which partners important?
- How was contact initiated to these partners initiated?

Co-operation with external partners and trust:

- How do you see the role of trust in collaboration with external partners?
- How do you describe trustful co-operation? How do you established trust in cooperation projects?

Interaction modes:

- Do you think personal meetings with partners are important?
- How have these meetings been arranged, in what frequency and formats?
- Can personal meetings be replaced by other forms (e.g. telephone, digitally based)?

MILESTONES

What were project related milestones?

How can these milestones be described?

Which partners/events contributed to completing the milestones?

CRITICAL PHASES

Which problems occurred during the development process?

What were critical phases during the project and how were they overcome?

COMPLEMENTARY ITEMS

How would you describe and evaluate your location in [*name of place*]?

What are the biggest problems of your location?

What are the benefits of being located in [*name of place*]?

How do you see the potential of doing business in and from [*name of place*]?

Do you consider this region as remote?

Have you received any public financial support for the development project? If so, which schemes?

TERMINATING THE INTERVIEW

Are there any themes that you would like to add to what we have already been discussing until now?

Do you think we have missed any particular issues?

AP4 Characteristics of individual dyads in innovation projects

For data protection reasons, data on individual project partners were anonymised.

case	no. of external partners	partner	type of linkage		nature of linkage			spatial scale*			existing linkage	new linkage
			inter-firm partner	extra-firm partner	trade-oriented	knowledge-oriented	both	regional	national	inter-national		
EE1	5	P1	X		X					X	X	
		P2	X		X	X	X	X			X	
		P3	X		X			X			X	
		P4	X		X	X	X			X	X	
		P5	X		X				X		X	
EE2	2	P1	X		X					X		X
		P2		X		X			X		X	
EE3	5	P1	X		X			X				X
		P2	X		X					X	X	
		P3		X	X				X			X
		P4	X		X				X			X
		P5		X	X	X	X	X			X	
EE4	9	P1	X		X					X		X
		P2		X	X	X	X	X			X	
		P3		X		X			X		X	
		P4	X		X			X				X
		P5		X	<i>not specified</i>				X			X
		P6	X		X	X	X	X				X
		P7		X	X				X		<i>not specified</i>	
		P8	X		X			X			X	
		P9	X		X					X		X
EE5	1	P1		X	<i>not specified</i>				X		X	
		P2	X		X					X	X	
		P3		X	X				X		X	
		P4	X		X			X			X	
EE6	6	P1	X			X				X	X	
		P2	X			X		X			X	
		P3	X		X	X	X			X		X
		P4	X		X					X		X
		P5	X		X					X	X	
		P6	X		X					X	X	
EE7	5	P1		X	X	X	X	X		X		

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		P2	X		X	X	X		X			X
		P3	X		X			X				X
		P4	X		X					X		X
		P5	X		X	X	X			X		X
EE8	1	P1	X		X	X	X			X	X	
EE9	4	P1	X		X	X	X			X	X	
		P2	X		X			X			X	
		P3		X	<i>not specified</i>				X		X	
		P4	X		X	X	X			X		X
EE10	6	P1	X		X	X	X		X		X	
		P2		X	X	X	X			X		X
		P3		X		X		X			X	
		P4	X		X					X	X	
		P5	X		X					X		X
		P6	X			X				X		X
EE11	2	P1	X			X				X	X	
		P2	X		X				X			X
EE12	2	P1	X			X		X				X
		P2	X		X					X		X
EE13	-	-	-	-	-	-	-	-	-	-	-	-
Σ EE	51	-	38 (75%)	13 (25%)	26 (54%)	8 (17%)	14 (29%)	15 (29%)	13 (25%)	23 (46%)	28 (56%)	22 (44%)
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ERZ1	3	P1		X		X		X			X	
		P2		X		X			X		X	
		P3		X		X			X			X
ERZ2	2	P1	X		X	X	X		X			X
		P2	X		X			X			X	
ERZ3	8	P1	X		X	X	X			X	X	
		P2		X		X				X	X	
		P3	X		X	X	X			X		X
		P4	X		X			X				X
		P5	X		X			X				X
		P6	X		X			<i>information missing</i>				X
		P7		X	X			X			X	
		P8		X		X			X			X
ERZ4	1	P1		X		X			X		X	
ERZ5	2	P1	X		X	X	X		X			X
		P2	X			X			X			X
ERZ6	7	P1	X			X			X			X

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		P2	X		X	X	X	X			X		
		P3	X			X			X			X	
		P4	X			X			X		X		
		P5	X		X			X			X		
		P6	X		X				X			X	
		P7	X		X				X			X	
ERZ7	3	P1	X			X			X			X	
		P2	X		X	X	X		X			X	
		P3	X		X				<i>information missing</i>		X		
ERZ8	8	P1	X		X	X	X	X			X		
		P2		X		X			X		X		
		P3	X		X			X				X	
		P4	X		X			X				X	
		P5	X		X			X				X	
		P6	X		X					X			X
		P7	X		X					X			X
		P8		X		X				X			X
ERZ9	1	P1	X		X	X	X		X		X		
ERZ10	4	P1	X		X			X				X	
		P2	X		X			X				X	
		P3	X		X				X			X	
		P4	X		X	X	X		X			X	
ERZ11	5	P1	X		X			X			X		
		P2		X		X			X			X	
		P3		X		X			X			X	
		P4	X		X				X		X		
		P5	X		X			X			X		
ERZ12	3	P1	X		X	X	X		X		X		
		P2	X		X					X	X		
		P3		X		X			X		X		
ERZ13	4	P1	X		X				X		X		
		P2	X		<i>not specified</i>					X		X	
		P3		X		X			X			X	
		P4		X	X				X			X	
Σ ERZ	51	-	37 (73%)	14 (27%)	23 (46%)	17 (34%)	10 (20%)	16 (29%)	29 (59%)	4 (8%)	23 (45%)	28 (55%)	

* regional scale in Estonia related to the ‘Lõuna-Eesti’ NUTS-3 region (comprising of the four counties of the case study area plus the counties of Tartumaa and Jõgevamaa; see Map 1); regional scale in the Erzgebirgskreis relates to the Chemnitz NUTS-2 (comprising of the city of Chemnitz, the Erzgebirgskreis, the counties of Mittelsachsen, Vogtlandkreis und Zwickau; see Map 2).