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Dissertation

Foresight in Networks

— A Relational View on Corporate Foresight —

Vorgelegt von

Dipl. Ing. Tobias Heger

Potsdam, 18.04.2021

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This dissertation has become the longest continuous activity in my life so far; by now I also believe one of the most influential ones in my professional life. Truth be told, as I have worked on it besides a day-to-day job at all times—first as an employee and later in my own company—it has not been of the center of my attention all the time. However, I kept on coming back to it. Over time, I more and more valued the different perspective that comes with the ambition to meet scientific standards, the more profound and critical thinking process than usually seen in day-to-day business in the corporate world, the required scrutiny, the necessity to learn to question and adjust one's own reasoning and conclusions and the personal development that I believe comes with it and that goes way beyond scientific work. At some point Barack Obama said 'Trust science, it's our future"—although stated in a context that has nothing to do with my work it is a sentence that captures what I believe. These days more than ever. In the end, this work has accompanied me for a decade, a bit more even. In the best times it has kept me up day and night to finish a part of it but sometimes doubts were nagging if I will ever complete my work on this. Finally, I have. Along the way I have enjoyed the support of many and I am grateful to all of them. To some, however, I owe special thanks.

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This work is dedicated to the loves of my life, Noah, Mio and Lisa.

Abstract

The goal of this dissertation is to contribute to the corporate foresight research field by investigating capabilities, practices, and challenges particularly in the context of interorganizational settings and networked organizations informed by the theoretical perspectives of the relational view and dynamic capabilities.

Firms are facing an increasingly complex environment and highly complex product and service landscapes that often require multiple organizations to collaborate for innovation and offerings. Public-private partnerships that are targeted at supporting this have been introduced by policy-makers in the recent past. One example for such a partnership is the European Institute of Innovation and Technology (EIT) with multiple Knowledge and Innovation Communities (KICs). The EIT has been initiated by the European Commission in 2008 with the ambition of addressing grand societal challenges, driving innovativeness of European companies, and supporting systemic change. The resulting network organizations are managed similarly to corporations with managers, boards, and firm-like governance structures. EIT Digital as one of the EIT KICs are a central case of this work.

Research in this dissertation was based on the expectation that corporate foresight activities will increasingly be embedded in such interorganizational settings and a) can draw on such settings for the benefit of themselves and b) may contribute to shared visions, trust building and planning in these network organizations. In this dissertation the EIT Digital (formerly EIT ICT Labs) is a central case, supplemented with insights from three additional cases. I draw on the rich theoretical understanding of the resource-based view, dynamic capabilities, and particularly the relational view to further the discussion in the field of corporate foresight—defined as foresight in organizations in contrast to foresight with a macro-economical perspective—towards a relational understanding. Further, I use and revisit Rohrbeck's *Maturity Model for the Future Orientation of Firms* as conceptual frame for corporate foresight in interorganizational settings. The analyses—available as four individual publications complemented by on additional chapter—are designed as exploratory case studies based on multiple data sources including an interview series with 49 persons, two surveys (N=54, n=20), three supplementary interviews, access to key documents and presentations, and observation through participation in meetings and activities of the EIT Digital. This research setting allowed me to contribute to corporate foresight research and practice by 1) integrating relational constructs primarily drawn from the relational view and dynamic capabilities research into the corporate foresight research stream, 2) exploring and understanding capabilities that are required for corporate foresight in interorganizational and networked organizations, 3) discussing and extending the Maturity Model for network organizations, and 4) to support individual organizations to tie their foresight systems effectively to networked foresight systems.

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List of Abbreviations

CF	Corporate Foresight
CEO	Chief Executive Officer
CSO	Chief Strategy Officer
DC	Dynamic Capabilities
EC	European Commission
EIT	European Institute of Innovation and Technology
EU	European Union
Et seq.	Et alli (and others)
Etc.	Et cetera
FTE	Full-time Equivalent
IT	Information Technology
KIC	Knowledge and Innovation Community
MM	Maturity Model
MNE	Multi-National Enterprise
MNC	Multi-National Corporation (used synonymous to MNE)
NF	Networked Foresight
OF	Open Foresight
RBV	Resource-Based View
RV	Relational View
QoE	Quality of Experience
R&D	Research and Development
RWS	Rijkswaterstaat
SF	Strategic Foresight
SME	Small and Medium-sized Enterprises

Affidavit (Eidesstattliche Erklärung)

Eidesstattliche Erklärung und Einverständniserklärung nach § 7 Abs. 2 Nr. 6 a), b), c) der Promotionsordnung der Wirtschafts- und Sozialwissenschaftlichen Fakultät der Universität Potsdam vom 27.08.2002, sowie den Satzungen zur Änderung der Promotionsordnung vom 29.02.2012 und 20.06.2012

Hiermit versichere ich, Tobias Heger, an Eides statt, dass

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Potsdam, 9.11.2020

Tobias Heger

Statement of co-authorship

This declaration concerns the following article/manuscript:

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C. Equal contribution
D. Minor Contribution
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Element	Contribution (A-E)
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2. Planning of experiments/methodology design and development	C
3. Involvement in the experimental work/data collection	C
4. Interpretation of the results	B
5. Writing of the manuscript	C

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1 Introduction

Dealing with ever-faster environmental change is a key challenge for today's organizations. Recent research argues that for many organizations the environment has become volatile, uncertain, complex and ambiguous (VUCA), others call it TUNA—turbulent, uncertain, novel and ambiguous (Krupp & Schoemaker, 2014; Ramirez & Wilkinson, 2016). In 2020, the global COVID19 pandemic has once again markedly shown that for planning ahead, considering possibilities that lie outside of common expectations and projections are essential to ensure competitiveness of the firm and even survival of organizations (Scoblic, 2020).

Maintaining competitiveness and corporate success in the long-term is the fundamental challenge that firms face and is at the core of strategic management research (Teece, Pisano, & Shuen, 1997). In normal times, innovation abilities have been identified as vital factor for companies to become and remain at the competitive edge.

Companies must adapt to ensure their long-term survival, and this chance of survival has substantially decreased since the 1950s. Govindarajan and Srivastava (2016) analyzed 29,688 companies listed between 1960 and 2009 to conclude that those listed before 1970 had a 92 percent chance of surviving more than five years, while this number decreased to 63 percent for those listed between 2000 and 2009. A.T. Kearny analyzed strategic cycles and success in a 2014 study on corporate strategy of 2,010 respondents (Jonk, Aurik, & Fabel, 2014). It was revealed that companies with strategy cycles shorter than five years had a 53 percent success rate, and this was 48 percent for those with ad hoc strategy approaches. In contrast, those working with longer-term outlooks—five or more years—demonstrated success rates of 85 percent. However, only six percent of all firms in the panel worked with such a long-term strategic cycle.

The ability of organizations to see external change and act upon them is significantly supported by investing into anticipatory practices such as corporate foresight (Schoemaker & Day, 2019). For developing organizational future-preparedness (Rohrbeck & Kum, 2018), and more specifically discovering and evaluating new technologies, market and environmental developments and innovation opportunities, companies frequently utilize corporate foresight instruments (Rohrbeck, 2011; Rohrbeck & Kum, 2018; Rohrbeck, Kum, Jissink, & Gordon, 2018); often integrated into future-oriented departments like strategic planning, corporate development or innovation management (Becker, 2002; Rohrbeck & Gemünden, 2009; Vecchiato & Roveda, 2010). Foresight is commonly described as a set

of activities for scanning, sensing, interpreting, and utilizing internal and external signals for change. Further, the preparation for adequate organizational adaptations, the development of preparatory strategies to meet the challenges or even to influence the environment in a favorable way are part of foresight research—often referred to as strategic, organizational, or corporate foresight (Høyland & Rohrbeck, 2018; Liebl & Schwarz, 2010; von der Gracht, Vennemann, & Darkow, 2010). The effective identification and exploration of innovation potential in a highly complex and connected world requires collaboration across not only organizational boundaries, but also across industries, which far surpasses corporate borders. However, corporate and strategic foresight research often limits the scope of research to firms and their individual capabilities (Rohrbeck, 2011; Slaughter, 1997).

In light of an increasingly complex, intertwined, and rapidly moving world, interorganizational collaboration—often manifesting as one of various network forms—is a discipline of increasing interest (Kontos, 2004; Rohrbeck, Battistella, & Huizingh, 2015). Uncertainty and discontinuous change for organizations can emerge from an unprecedented breadth of fields, fueled by the integration of previously separate industries, digitalization, vanishing regional boundaries, and seemingly unforeseeable systemic effects on a global, national, sectoral and organizational level (Davenport, Leibold, & Voelpel, 2006). Consequently, opportunities, threats, and paths for companies can originate from far beyond a company's knowledge base and horizon. Especially in the digital economy, co-creation and network competencies may become key to attain or sustain a competitive advantage (Koch & Windspeger, 2017).

Research on strategic and corporate foresight is concerned with a firm's 'ability to create and maintain a high-quality, coherent, and functional forward view" (Slaughter, 1998, p. 382), or as Rohrbeck noted, 'an ability that includes any structural or cultural element that enables the company to detect discontinuous change early, interpret the consequences for the company, and formulate effective responses to ensure the long-term survival and success of the company" (Rohrbeck, 2011, p. 11). The resource-based view (RBV) bases competitive advantage on heterogeneity. Therefore, an organization with the ability to accumulate resources and capabilities that are scarce, valuable, non-substitutable, and hard to imitate will outcompete its competitors (Amit & Schoemaker, 1993; Barney, 1991). In contrast to the more static RBV, the dynamic view explicitly considers change in various forms to explain performance differences as the organization's need to adapt to this change (Teece et al., 1997).

Both theories assume that competitive advantage results from firm-specific resources, such as the ownership and control of individual firms' rent-generating resources or capabilities. Some argue that an ever higher level of unpredictable change requires a greater level of dynamic capability than the original concept put forward by Teece (Danneels, 2011; Schwarz, Rohrbeck, & Wach, 2020).

An emerging research stream investigates the requirements on an individual, managerial level; corporate foresight as microfoundation of dynamic capabilities in varying contexts (Kamprath, 2015; Schwarz et al., 2020). In parallel, an increasing body of research on networks and interorganizational relationships suggests that firms should be considered as embedded in networks of organizations and relationships. Dyer and Singh's (1998) relational view posits that 'a firm's critical resources may span firm boundaries and may be embedded in interfirm resources and routines" (p. 662). This gave rise to my interest of an analysis of foresight activities in dyads and networks instead of solely within the firm.

Research on foresight increasingly factors in resources outside of the focal organization. However, past studies primarily argued that resources outside of the company can be used as additional sources of information for the foresight activities conducted within the organization (Rohrbeck, 2011; Daheim & Uerz, 2008; Vecchiato & Roveda, 2010). Further, Rohrbeck (2011, p. 78) notes that 'the external primary function of the network is to source and channel external information into the company." Daheim and Uerz (2006) introduced the 'open foresight" concept in 2006, several authors have subsequently investigated the approach through different lenses (Burmeister & Schulz-Montag, 2009; Daheim & Uerz, 2008; Gattringer, Wiener, & Strehl, 2017; Miemis, Smart, & Brigis, 2012; Rau, Schweitzer, & Gassmann, 2014; Ruff, 2006). Nevertheless, interorganizational relationships, and their foresight practices and capabilities in particular, are underrepresented in literature and open foresight remains vaguely defined to date. Specifically, the degrees of openness range from completely open approaches to closed networks with few partners (Lazzaroti & Manzini, 2009).

This dissertation aims to contribute to the understanding of foresight in network settings and to advance the understanding of corporate foresight research from a relational perspective. The analysis' theoretical bases are therefore the resource-based and dynamic views and their extensions to networks—or specifically, the relational view of the firm.

Chapter	1 Introduction	2 Theoretical Foundation	3.1 Toward Networked Foresight?	3.2 Introduction of main case EIT Digital	3.3 In-depth analysis of networked foresight in practice	3.4 SF for collaborative business field exploration	3.5 Relational View on CF guided by Maturity Model	4 Concluding Remarks
Objective	Introduction of research objective and outline of present work	Set theoretical foundation and frames	Explore potential phenomenon in practice across three cases	Introduction to EIT Digital as basis for subsequent case study	Analysis of NF in practice and analyzing network partners' intentions and objectives	Best practice description	Synthesis and transfer of findings with Maturity Model for CF	Critical appraisal, outlook for further research, concluding remarks
Methodology	–	Literature Research	Explorative multiple case study with three cases: WINN/Rijkswaterstaat, EICT, EIT ICT Labs	Descriptive case study	Explorative case study: EIT Digital Innovation Radar	Descriptive case study	Theory building	–
Data	–	Literature	Observations, internal documents, interviews (n=10)	Publicly available documents, internal documents, observations	Observations, internal documents, interviews (n=49), questionnaire (n=53)	Publicly available & internal documents, observations, questionnaire (n=20), official project review	Data from all previous chapters, cases, complementing semi-structured interviews (n=3)	–
Key findings	Organizations need to prepare for ever faster changing environment Companies' own assets and resources do not suffice anymore Collaborative approaches for uncovering new sources of innovation and strategy making are required Existing research on future orientation of firms consider inter-organizational insufficiently A relational view on foresight is proposed	Theoretical foundations for research on inter organisational foresight can be found in: • Resource-based view (RBV) • Extended RBV • Dynamic capabilities • Relational view Systems dynamics and the holistic view on Corporate Foresight (CF) propagated by Rohrbeck provide the basis for a relational view on CF	Practices that can be summarized under Networked Foresight (NF) can be found in practice Cases indicate coherence of network partners' openness and existence of managed NF activities In the cases, NF • is not managed deliberately and adequately • could be leveraged to transform networks themselves	EIT Digital is a centralized networked managed by hub organization Objectives include support for mastering challenges of complex and fast-developing world by providing multiple catalysts for inter-organizational innovation Building foresight through the network by leveraging knowledge of its partners is core objective	Observable primary use of NF by partners for: • Data collection • Activity initiation Domains currently avoided: • Strategy development and decision-making • Breaking away from path dependencies Additional benefits observed on the network level: • Development of shared vision • Agenda setting & shaping • Partnering • Visibility	The described integrated foresight methodology • integrates qualitative and quantitative approaches • integrates different perspectives • benefits from inter-organizational participation • brings along substantial methodological synergies • creates profound and encompassing insights into the focal field	Relational view on CF implies changes and additions to original Maturity Model. A revised Maturity Model applicable to network organizations is suggested. Changes include context and capability items. Key elements added are • transfer capacities • trust • network cohesion • integration	Despite extensive databasis, present work comes with known limitations due to explorative case-based approach. Validation of findings and model with further cases and broader data basis required. Further research particularly required for • Organizational aspirations • Principal-agent / multiple agent theories • Role of individuals within NF
Publications	Thesis	Thesis; partly adapted from: Heger, T., ***A Theoretical Model for Networked Foresight***, presented at: The XXV ISPIM Conference, Dublin, Ireland on June 8-11, 2014.	Published: Van der Duin, P., T. Heger, and M. D. Schlesinger, ***Towards networked foresight? Exploring the use of futures research in innovation networks***, Futures, 59, pp. 62-78. ***doi: 10.1016/j.futures.2014.01.008***	Published: Heger, T. and Bub, U., ***The EIT ICT Labs – Towards a Leading European Innovation Initiative.*** it – information technology, 54 (6) 288-295. ***doi:10.1524/itit.2012.0691***	Published: Heger, T. and M. Boman, ***Networked Foresight – The Case of EIT ICT Labs.*** Technological Forecasting & Social Change, vol. 101 (Special Issue: Corporate Foresight), pp. 147-164 ***doi:10.1016/j.techfore.2014.02.002***	Published: Heger, T. and R. Rohrbeck, ***Strategic Foresight for Collaborative Exploration of New Business Fields***, Technological Forecasting & Social Change, 79 (5) 819-831, 2012. ***doi:10.1016/j.techfore.2011.11.003***	Thesis	Thesis; partly adapted from: Heger, T., ***A Theoretical Model for Networked Foresight***, presented at: The XXV ISPIM Conference, Dublin, Ireland on June 8-11, 2014.

Figure 1: Structure and overview of this work

Figure 1 illustrates the structure of this thesis: after this introduction, guiding theories are summarized and contextualized. In section 3 the main dissertation papers and a complementing additional chapter are presented. Paper 1 in section 3.1 provides an initial, explorative analysis of foresight conducted in three different interorganizational settings; work that was previously published in *Futures in 2014 (vol. 59)*. The article connects foresight in a dyad and two networks to findings on corporate foresight and prospective innovation management at the time. Specifically, this involved prior work on the three roles of foresight (Rohrbeck and Gemünden, 2009) and the cyclic nature of innovation (Berkhout, Hartmann, van der Duin, & Ortt, 2006; Berkhout & van der Duin, 2007; Berkhout, 2007). Conclusively, the presented cases support the relevance of collaborative foresight activities in interorganizational settings, and simultaneously, a lack of active management and understanding of these activities at the time.

Subsequently, the EIT Digital (at the time still branded as EIT ICT Labs) are introduced in the article *EIT ICT Labs—Towards a Leading European Innovation Initiative* (section 3.2) as a prelude to the following in-depth case study *Networked Foresight —The case of EIT ICT Labs (section 3.3).* Both sections have been published separately, the former in *it—Information Technology in 2012 (vol. 54)*, and the latter in the special issue on corporate foresight of *Technological Forecasting and Social Change in 2015 (vol. 101)*. This case study investigates the preconditions and actual use of network resources for corporate foresight at the partner organizations and networked foresight within the EIT Digital network before discussing the potential value it contributes to its individual partner organizations and the network itself. The study demonstrates that at the time it was conducted, EIT Digital's partners exploited network foresight activities primarily to broaden their own knowledge base from the outside in, or specifically, to enhance their perceiving capabilities as advocated by Rohrbeck (2010). However, in the article we argue for substantial potential to interpret and validate information while increasing organizational learning capabilities. In the particular case of EIT Digital, this potential is used to a far lesser extent than contributions to perceiving capabilities of the network partners. We conclude the case by discussing value contributions to the EIT Digital hub organization, particularly in shaping and driving of its ecosystem, the generation of external visibility, and development of a shared vision and network partners.

Section **Fehler! Verweisquelle konnte nicht gefunden werden.** presents a case of foresight applied in a network setting that was published in *Technological Forecasting and Social Change in 2012 (vol. 79)*. In this case, we present and discuss an integrated approach of several strategic foresight methods applied for collaborative business field exploration in an interorganizational partner consortium from the telecommunication industry.

Following these previously published sections, I draw on the relational view bas a theoretical lens, original empirical data from interviews plus data from three additional interviews to revisit Rohrbeck's Maturity Model for corporate foresight (Rohrbeck, 2011). This section presents several suggestions to enhance the model relative to interorganizational relationships. Further, I investigate and discuss potential modifications in applying the Maturity Model to network organizations.

Finally, I conclude the dissertation by discussing managerial and theoretical contributions, potential future research directions and limitations of this work in section 4.

2 Research field and theoretical foundation

In this dissertation, the discussion of networked foresight as part of the broader research field corporate foresight is guided by the relational view and dynamic capabilities theories. In the following, these theoretical perspectives and the related Resource-Based View are introduced.

2.1 Corporate Foresight

Although corporate foresight and its methods are a fairly young research stream, the field of foresight is well-known, with practical relevance in a maturing body of research (Iden, Methlie, & Christensen, 2017; Rohrbeck & Bade, 2012; Rohrbeck et al., 2015; Gordon, Ramix, Rohrbeck & Spaniol, 2020). The increasing number of publications indicate a rapidly increasing interest in corporate foresight in the last 10 to 15 years. Besides rather narrow fields of research therein—for example focusing on the interplay of foresight and design or human-centered design methods such as Design Thinking (Buehring & Bishop, 2020; Gordon, Rohrbeck, & Schwarz, 2019)—recent research has centered on a more holistic, continuous integration into organizational processes and practices, strategic decision-making, and corporate value creation, while theory-testing research has also emerged (Iden et al., 2017; Rohrbeck et al., 2015).

Corporate foresight aims to ensure a firm's survival, longevity, and ability to act while anticipating change and reducing uncertainty, ultimately developing competitive advantage through value creation (Iden et al., 2017; Rohrbeck et al., 2015). While foresight research uses various terms and draws from different concepts for defining processes, innately, this typically involves the ability to anticipate or sense change, understand and interpret it, and prepare and trigger adequate action (Iden et al., 2017). It is an ability that benefits from integrating multiple sources, including external ones. Research indicates that companies with adequate foresight capabilities achieve better results in market capitalization and profitability (Rohrbeck & Kum, 2018). Still, many companies struggled with their own foresight processes in the past (Burgelman, Christensen, & Wheelwright, 2004; Martin, 1995; Rohrbeck, 2010a).

Rohrbeck et al. (2015) synthesized a definition for corporate foresight—or specifically, foresight in profit-oriented organizations—in their editorial to the Corporate Foreisght special issue of *Technological Forecasting and Social Change* (vol. 101); reiterated in a recent recap of 50 years of corporate foresight research in *Technological Forecasting and Social Change* (Gordon et al., 2020).

> '*Corporate foresight* permits an organization to lay the foundation for future competitive advantage. Corporate foresight is identifying, observing, and interpreting factors that induce change, determining possible organization-specific implications, and triggering appropriate organizational responses. Corporate foresight involves multiple stakeholders and creates value through providing access to critical resources ahead of competition, preparing the organization for change, and permitting the organization to steer proactively towards a desired future." (p.2)

Further, the authors distinguish four phases of foresight research; *organizational integration* is the most recent phase, and has been ongoing since the early 2000s. They denote four main themes in this current phase: 1) *organizing corporate foresight*, 2) *individual and collective cognition,* 3) *corporate foresight in networked organizations,* and 4) *quantifying value contributions*; the latter two are less mature themes. This work contributes to the third theme. In fact, with Heger and Boman (2015), an integral part of this dissertation (section 3.3) was included in this Special Issue.

Not explicitly mentioned or addressed, but arguably also a part of the third theme above, are the various forms of collaborative and open foresight. Foresight scholars have increasingly investigated several collaborative, open, and interorganizational forms of foresight. Combining the open innovation and collaborative value-creation processes (Chesbrough, 2003b; von Hippel, 2005) with corporate foresight practices has led to the open foresight concept (Burmeister & Schulz-Montag, 2009; Cuhls et al., 2016; Daheim & Uerz, 2006; Daheim & Uerz, 2008; Gattringer & Strehl, 2014; Gattringer et al., 2017; Miemis et al., 2012; Milshina & Vishnevskiy, 2018; Rau et al., 2014; Ruff, 2006; Wiener, Gattringer, & Strehl, 2018). Cuhls et al. (2016) define open foresight as 'the systematic use of distributed information sources in order to anticipate the future corporate business environment and support an organization's strategic decision-making." The perspective typically involves a broader ecosystem (Ena, Chulok, & Shashnov, 2017; Karel Haegeman, Spiesberger, & Könnölä, 2017) or that of a single organization, either as a part of dyads or embedded in a rather unspecified ecosystem (Wiener et al., 2018). Foresight activities in the latter are often controlled by the focal organization, with the goal to internalize knowledge from the partner, network, or ecosystem. Gattringer, Wiener, and Strehl (2017) differentiated several forms of open foresight:

- Completely open forms of foresight allowing anyone to join (Miemis et al., 2012).
- Participatory forms of foresight, which are often realized in projects with internal and external participants (Andersen & Andersen, 2014; Könnölä, Ahlqvist, Eerola, Kivisaari, & Koivisto, 2009; Wiener et al., 2018).

- Networked foresight, which involves institutionalized foresight activities conducted in innovation networks, as discussed in this work (Heger, 2014; Heger & Boman, 2013, 2015; van der Duin, Heger, & Schlesinger, 2014).
- Collaborative foresight, which involves foresight activities with only a few organizations and with a one-time character (Burmeister & Schulz-Montag, 2009; Melanie Wiener, Gattringer, & Strehl, 2015)

Regarding the nomenclature of open foresight, this work contributes to the understanding of the third category: foresight practices in a network organization. These are often orchestrated by a hub organization to benefit the network organization and its partners. Foresight in such organizations is hereafter also referred to as *networked foresight*. See Figure 2 for a conceptual view on the breadth of activities forms of foresight disciplines.

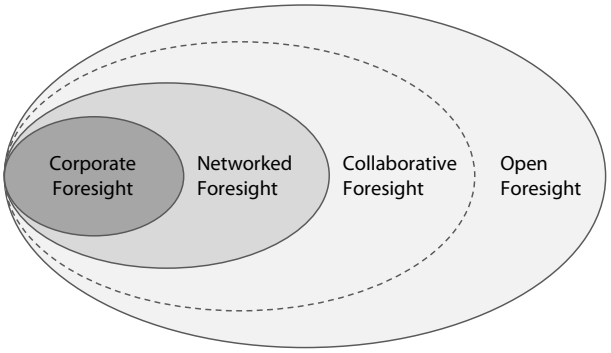

Figure 2: Networked foresight in the context of current corporate foresight-related concepts. A smaller circle indicates more closed foresight practices.

As this work stems from the newer understanding of corporate foresight research propagated by Rohrbeck et al. (2015), my definition of *networked foresight* closely relates to these authors' definition:

> '*Networked foresight* is an interorganizational network's structural and cultural ability to sense, analyze, and interpret changes and trends in the political, economic, legal environment, and in society and technology early for the benefit of the network itself and its partner organizations.
>
> Value for the partners is created by supporting the network partners in their objective to survive, stay at the competitive edge, or gain a competitive advantage in the long-run. Networked foresight contributes to corporate foresight systems, strategic decision-making, and innovation. For the network organization, this implies learning and adapting to stay valuable to its partners in the long-run."

Recently, Iden et al. (2017) conducted a systematic literature review and found the introduction to the Special Issue in *Technological Forecasting and Social Change* on

corporate foresight by Rohrbeck et al. (2015) as sole attempt at organizing the field and connecting it to general management research.

Strategic management, the dynamic capability theory, and social science are the most common theoretical frameworks or reference theories in corporate foresight research, but the literature is fragmented and lacks integration; the foresight field is ‘characterized by not being particularly theory based” (Iden et al., 2017, p. 92). Further, the field is dominated by explorative case studies, implying a lack of an explanatory dimension. In their systematic literature review, Iden et al. (2017) conclude that there is not yet a ‘single perspective that deserves loyalty on which a coherent theoretical foundation of strategic foresight is built” (p. 94).

This work, then, draws on the rich underlying theoretical understanding of the RBV and dynamic capabilities in general, and the relational perspective in particular, to further the discussion in the corporate foresight field toward a relational understanding. These frames are interpreted as paradigms as defined by Kuhn (1996, p. 10): ‘accepted examples of actual scientific practice […that] provide models from which spring particular coherent traditions of scientific research.” This approach at analyzing foresight somewhat diverges from the ‘launching platforms” proposed by Rohrbeck et al. (2015), who argue that organizations faced with uncertainty and competitive rivalry ‘can either focus on maximizing flexibility and responsiveness or acquire new capabilities to proactively build a future competitive advantage” (p. 7).

In their view, dynamic capabilities should be built by organizations choosing the latter path (Rohrbeck et al., 2015). Further, according to them dynamic capabilities—and especially in Eisenhardt and Martin (2000) conceptualization—do not sufficiently recognize organizational capabilities’ role to sense, interpret, and trigger responses. The present work follows the argument that corporate foresight qualifies as a dynamic capability (see section 2.3) that can—and should—be augmented (Ludwig & Pemberton, 2011), particularly as relational capability or appropriated relational rent (see section 2.4) in an extended understanding. Figure 3 shows the considered frameworks, their dynamicity and focus.

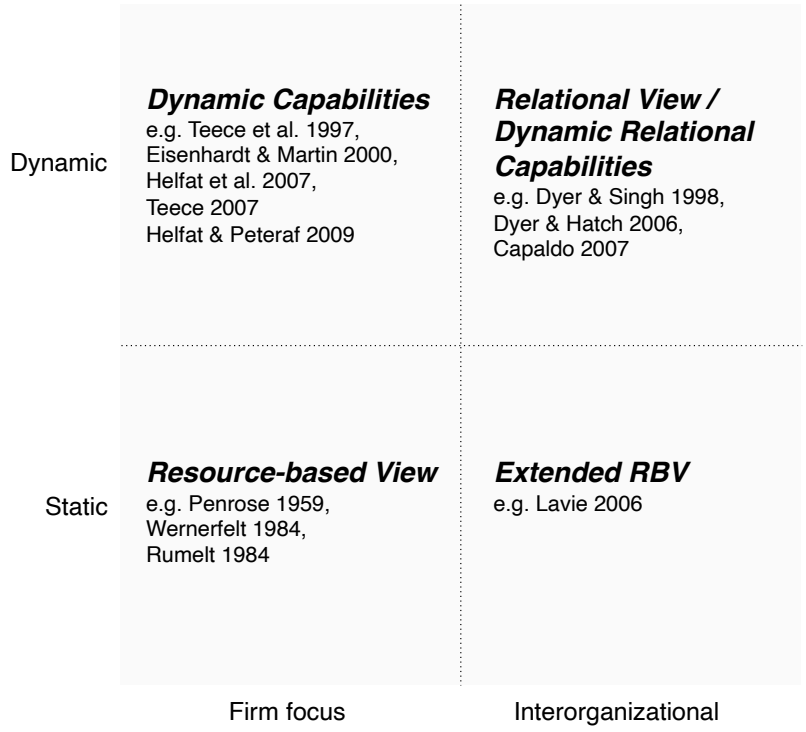

Figure 3: Perspectives and dynamicity of framing strategic management theories

These theoretical perspectives have guided this research, allowed anchoring it in established scientific contexts and eventually to synthesize a relational view on corporate foresight. Further, the Maturity Model of corporate foresight as introduced by Rohrbeck (2011) allows me to discuss my findings with an acknowledged, comprehensive framework from corporate foresight research that has been applied in first theory-testing research (Jissink, Huizingh, & Rohrbeck, 2014a, 2015; Paliokaitė & Pačėsa, 2015).

In the following, the RBV, dynamic capabilities, and the relational view are outlined as foundations of the relational view on corporate foresight. Further, networked foresight is briefly put into context of each framework.

2.2 Resource-Based View (RBV)

The RBV proceeds from the understanding that a firm's competitive advantage depends on its resources, their value, and how these resources are used (Collis & Montgomery, 1995). Resources can be tangible, physical assets, such as specialized equipment; intangible or human assets, such as brands or expertise in a certain domain; organizational assets, such as an organization' efficiency and flexibility; or competencies, such as the knowledge of how to use a firm's assets (Eisenhardt & Martin, 2000). The RBV is complementary to recognizing strategy-building as purely based on exogenously defined

factors as put forward in industry competitiveness and industry structure models such Porter's competitive strategy model (Porter, 1980b). With the RBV the focus shifted to take into account the firm's internal factors and organization as foundation for strategy development (Wernerfelt, 1984). It shifted researchers' focus to consider the firm's internal factors and organization as a foundation for strategy development (Wernerfelt, 1984).

The RBV has its origins in Penrose's (1959) work, which emphasized the importance of resources for profit generation. In strategic management research, Wernerfelt (1984) introduced the RBV and shifted research from the product as the object of study to the firm's resources, and from strategic positioning on industry structures to the internal organization. While Barney (1986a, 1986b) contributed to this shift to focus on resources to explain successful strategies to achieve competitive advantage, he argued that strategy development should focus on imperfections in the resource market instead of imperfections in the product (output) market. He argues that the market for resources is likely to have imperfections due to several reasons, but primarily involve differing expectations of resources' value (Barney, 1986b).

Amit and Schoemaker (1993) continue this thought to differentiate between resources that are tradable and non-specific to the firm and capabilities that are firm-specific and used to deploy resources within the firm, which consequently include implicit processes. Similarly, Peteraf (1993) argues that a sustainable competitive advantage can only be achieved with specific resources. He summarizes four conditions that must be met for a resource to be of strategic value, with a fifth condition added later. Resources must be: 1) *valuable*, 2) *rare* or scarce, 3) *inimitable*, and 4) *non-substitutable* (Barney, 1986a, 1986b, 1991; Collis & Montgomery, 1995; Peteraf, 1993; Rumelt, 1984; Wernerfelt, 1984). A resource is *valuable* when it enables an organization to deploy value-adding strategies and achieve competitive advantage (Barney, 1991), and *rare* when they can only be acquired by one or a few companies. The underlying assumption is that different expectations for a resource's value create an imperfectly mobile resource market (Barney, 1986b). Further, competitive advantage can only last if based on resources that are *inimitable*, in that competitors cannot easily duplicate these resources due to their high costs or a lack of knowledge, among other reasons (Peteraf, 1993). While valuable, rare, and inimitable resources can lead to competitive advantage, this might be short-lived if it is substitutable with a different resource fulfilling the same requirements (Barney, 1991), as they must also be *non-substitutable*. If an organization possesses assets with these attributes, value-creating strategies can be implemented to lead to a sustainable competitive advantage (Barney, 1991).

Corporate foresight capabilities qualify as resources in the understanding of the RBV (Rohrbeck, 2011). As previously defined, networked foresight in particular broadens the corporate foresight research perspective by considering interorganizational network settings in evolving organizations. As analyzed here, this is a means to improve assessments of internal and external resources, and to discover, interpret, and use resources in a beneficial way on different organizational levels (Heger & Boman, 2015), and thus, it is *valuable*. The successful, conscious application of networked foresight is difficult due to the *rare* competencies to build and act successfully in interorganizational settings (Kontos, 2004; van der Duin et al., 2014). These are also difficult to imitate—at least in in the short- to medium-term—as they depend on substantial interorganizational networks as sources of information. As considerable time is needed to build large consortia and implement foresight systems therein, one can also argue that such resources are *inimitable,* at least for some time. Compared to corporate foresight, one can further argue that a network's vast available knowledge can potentially provide more comprehensible results or a broader view than corporate foresight systems. Thus, the argument that it is a *non-substitutable* resource is analogues to corporate foresight, in that other systems are likely to fail to achieve similar results.

While the RBV is the basis of many modern management theories, several aspects have been criticized. Early studies have noted methodological issues, but main criticism centers on the RBV's inability to explain sustainable competitive advantage in rapidly changing markets (Teece et al., 1997; Eisenhardt & Martin, 2000). Critics argue that environmental changes must be adequately addressed to avoid negative effects on firm performance (Audia, Locke, & Smith, 2000), or specifically, the organization's long-term survival. The dynamic capabilities concept was proposed as a result of this criticism.

2.3 Dynamic Capabilities

The dynamic capabilities framework arose from the RBV's shortcomings to explain how firms maintain a competitive advantage in rapidly changing markets. Teece et al. (1997) introduced dynamic capabilities as 'the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments." Capabilities recognized in RBV theories are comparable to best practices, in that they are often introduced by one firm and spread among its competitors, such as Toyota's production system for automobile manufacturing. Teece et al. (1997) define dynamic capabilities as rooted in the organization's past and therefore subsequently unique to the organization and difficult to imitate.

Firms must adapt to change, in that they must adapt their set of resources and capabilities in response to, or preparation of, change. Several authors (Eisenhardt and Martin, 2000); Helfat, Finkelstein, et al., 2007; Teece, 2007; Teece, Pierce, and Boerner, 2002; Teece et al., 1997; Zollo and Winter, 2002) extended and enhanced the RBV view by elaborating on the underlying organizational processes to achieve dynamic capabilities. A dynamic capability is defined as 'the capacity of an organization to purposefully create, extend, or modify its resource base" (Helfat, Finkelstein, et al., 2007, p. 4). Therefore, dynamic capabilities' value 'lies in resource configurations that they create, not in the capabilities themselves" (Eisenhardt & Martin, 2000, p. 1106). Originally, Teece et al. (1997) introduced a basic process that involved sensing, seizing, and reconfiguring and recombining a firm's assets and positions to eventually increase firm performance and its underlying foundations that is also used to guide the analysis and discussion in section 2.3 (Heger & Boman, 2015). Subsequently, the literature has discussed, updated, and extended the dynamic capabilities concept to include the organization's prior paths and assets; upfront processes; and new paths, assets, and firm performance in later versions of the concept (Teece, 2007). Di Stefano, Peteraf, and Verona (2010) and Barreto (2010) extensively reviewed past research and possible future directions of dynamic capabilities.

When defining dynamic capabilities 'as organizational and strategic routines by which firms achieve new resource configurations as markets emerge, collide, split, evolve, and die," Eisenhardt and Martin (2000, p. 1107) focused on the organization's ability 'to achieve new and innovative forms of competitive advantage" (Rohrbeck, 2011, p. 50). Routines that become outdated or invaluable over time will be replaced or eliminated in organizations with dynamic capabilities (Helfat, 1997; Helfat, Finkelstein, et al., 2007; Helfat & Peteraf, 2003).

Researchers have also identified a broad set of routines classifiable as dynamic capabilities. For example, Eisenhardt and Martin (2000) mention several processes that can be categorized as such—product development, strategic decision-making, and alliance and acquisition routines—the latter of which are routines to acquire new resources. Closely related to this, Ludwig and Pemberton's (2011) quantitative empirical study on dynamic capabilities suggests that completely changing an organization's resource base in response to external change is neither possible nor beneficial. Instead, firms should focus on building dynamic capabilities, or preparing for change by building adequate routines to cope with it. In his dissertation, Rohrbeck (2011) suggests that corporate foresight can be regarded as a dynamic capability, as it is an ability enabling a firm to detect discontinuous change early. Similarly, Vecchiato (2014) argue that strategic foresight relates to the micro-foundations of

dynamic capabilities as discussed by Teece (2007) 'through its input into the firm's capacities to learn about its shifting environment" (p. 10).

Engaging in networked foresight as previously defined extends an organization's capability base. The focal organization can incorporate networked foresight systems to draw on the network's history and present asset base as well as the network partners in well-arranged collaborative processes and with mutual consent. In this respect, Helfat (1997) states that '[b]y altering the organization's resource base, dynamic capabilities […] open new strategic alternatives or 'paths' for the firm" (p. 357). As networked foresight systems allow organizations to access their network partners' resource base, one can argue for considering it a dynamic capability according to this definition.

Critiques on the dynamic capabilities theory and the RBV center around the assumption that resources belong solely to one organization. Research and practice has demonstrated that interfirm relationships become increasingly important. The relational view as introduced by Teece and Singh (1998) focuses on interfirm relationships and seeks to explain supernormal profits generated through their joint efforts.

2.4 Extended RBV, the Relational View and Relational Capabilities

The RBV and dynamic capabilities focus on resources within the firm, the former statically, and the latter dynamically. However, in the current intertwined and complex business world, firms' relationships and networks are increasingly critical. Consequently, Dyer and Singh argue already in 1998 that the prevalent views on competitive advantage—including the industry structural perspective closely linked to Porter (1980b) as well as the RBV—insufficiently explain competitive advantage. They argue that 'a firm's critical resources may extend beyond firm boundaries" (p. 660) and that 'competition between single firms […] is becoming less universal, as pairs and networks of allied firms have begun to compete against each other" (p. 675). Other researchers have argued that interfirm relationships and organization-spanning resources (also called 'commons") that are not under control of the individual firm must be considered in understanding competitive advantage (Borys and Jemison, 1989; Cowan, Jonard, and Zimmermann, 2007; Gulati, Nohria, and Zaheer, 2000; Holm, Eriksson, and Johanson, 1999; Rothaermel and Hess, 2007; Stabell and Fjeldstad, 1998; Zaheer and Bell, 2005). Miles, Snow, Fjeldstad, Miles, and Lettl (2010) used this understanding to develop *collaborative communities* as a new organizational form. When introducing this form they use Blade.org as an example of multi-firm collaboration, as 'members collaborate with their customers (end users) in the development of customized solutions, and collaborate with one another in small temporary

networks to produce solutions for existing or new customers" (Miles et al., 2010, p. 99). They then evolve this argument to argue that 'commons may actually grow and improve with use rather than be depleted, and collaboration among community members both utilizes and replenishes the commons" (Miles et al., 2010, p. 101).

In Dyer and Singh's (1998) extension of the RBV to the relational perspective they introduce *relational rents*, which are 'supernormal profit[s] jointly generated in an exchange relationship that cannot be generated by either firm in isolation and can only be created through the joint idiosyncratic contributions of the specific alliance partners" (p. 662). This *Relational View* focuses on competitive advantage based on 'dyad/network routines and processes as an important unit of analysis for understanding competitive advantage" (Teece & Singh, 1998, p. 661). Determinants of relational rents are: 1) relationship-specific assets, 2) knowledge-sharing routines, 3) complementary resources and capabilities, and 4) effective governance. Moreover, the authors argue that sustaining these rents depends on interorganizational assets' connectedness, partner scarcity, resource indivisibility, and the institutional environment (Teece & Singh, 1998). Gulati (1999) work on network resources used a longitudinal, multi-industry study to indicate that firms can extract rents from resources that are under the focal firm's control, in addition to those that are not.

The extent of relational rents depends on multiple factors, among them *absorptive capacity* (Cohen & Levinthal, 1990) and *relational capabilities* (Helfat, Dyer, & Kale, 2007). Absorptive capacity indicates a firm's capability to identify, evaluate, internalize, and exploit external knowledge, depending on two factors. First, the partners' basic compatibility is established by the extent to which their knowledge bases overlap. Second, the partners must develop effective interaction routines. In this manner, Helfat, Dyer, et al. (2007) discuss relational capabilities by combining the relational view and dynamic capabilities. They observe that the 'relational capability can be viewed as a type of dynamic capability with the capacity to purposefully create, extend, or modify the firm's resource base, augmented to include the resources of its alliance partner" (Helfat, Dyer, et al., 2007, p. 66). Additionally, they argue that 'firms can create value from their alliance relationships only if they move these away from generic, arm's-length relationships as a basis for competitive advantage" (Helfat, Dyer, et al., 2007, p. 67).

Synthesizing the rationale of relational rents and Gulati's work, Lavie (2006) revises the RBV to include network resources, and thus, network rent creation and appropriation (Dollinger, Li, & Mooney, 2009). Lavie argues that the '[t]he gap between mainstream theories of the firm and the emerging literature on alliances leaves open the question of

competitive advantage in networked environments" (2006, p. 639) and that 'assumed away is a cooperative type of interaction, in which the superior resources of counterpart firms can actually contribute to the focal firm's performance" (2006, p. 641). Subsequently, he identifies four different types of rents for network firms: 1) internal rents, or the focus of traditional RBV; 2) appropriated relational rents; 3) outbound spillover rents; and 4) inbound spillover rents. Appropriated relational rents can be extracted from intentionally committed, jointly possessed resources through relation-specific assets, knowledge-sharing routines, complementary resources, and effective governance (Lavie, 2006). Outbound and inbound spillover rents are derived from the unintended sharing of shared and unshared resources with network partners. Compared to the traditional RBV, it becomes less important that resources are innately 'inimitable" due to the intentional sharing of resources, resulting in opportunities for network partners to access resource benefits without obtaining the resources themselves; these resources can instead be internalized through proactive learning (Lavie, 2006).

Considering the relational view, I argue that networked foresight systems can be perceived as interfirm knowledge-sharing routines, or in Lavie's (2006) definition of rent types in his advancement of the RBV as *appropriated relational rents*. Both extensions of the RBV feature knowledge sharing as a core routine to generate relational or network rents, depending largely on the organization's absorptive capacity. 'For effective knowledge transfer, interfirm processes need to be developed and then institutionalized" (Helfat, Dyer, et al., 2007, p. 69), given that the organization possesses absorptive capacities (Lane, Salk, & Lyles, 2001). These routines should be developed to identify and interpret emerging developments and act on them. Cases have been studied in the past decade in which collaborative or networked foresight systems are under development, in place, or on the verge of becoming institutionalized (Daheim & Uerz, 2008; Heger & Boman, 2015; Jasner, 2006; Major & Cordey-Hayes, 2000; Paliokaite, 2010; Roveda & Vecchiato, 2008; van der Duin et al., 2014; Vecchiato, 2012; Zeng, Koller, & Jahn, 2019).

Ultimately, the following questions guided the present work:

- What is the state of network foresight routines in firms and networks—or in Lavie's terms the state of appropriated relational rents in the context of foresight and interorganizational settings?
- How can—and do—networks support the creation of such appropriated relational rents?
- How can the state of networked foresight practices be described? Can the

existing Maturity Model for Corporate Foresight be adjusted?

3 Dissertation papers

3.1 Toward networked foresight? Exploring the use of futures research in innovation networks[1]

Along with the rise of the now popular 'open' paradigm in innovation management, networks have become a common approach to practicing innovation. Foresight could potentially greatly benefit from resources that become available when the knowledge base increases through networks. This article seeks to investigate how innovation networks and foresight are related, to what extent networked foresight activities exist and how they are practiced. For the former, the Cyclic Innovation Model (CIM) is utilized as analytical framework and applied to three cases. The foresight activities are analyzed in terms of type, scope and role.

The cases are a collaboration between government agencies and a research organization and two interorganizational networks of different size. 'Networked foresight' is clearly observable in all three cases. Indeed, a networked approach to foresight seems to strengthen the various roles of foresight. However, the rooting and openness of foresight activities in the three networks varies significantly. The advantages that 'networked foresight' entails could be exploited to a much higher degree for the networks themselves, for example the broad resource base and the large pool of people with diverse backgrounds that are available. Furthermore, effective instruments for the reintegration of knowledge into the networks' partner organizations are needed.

3.1.1 Introduction

Both innovation and futures research have been identified as being crucial for the success of companies. The connection between futures research and innovation has been well established, e.g. by Cooper (1980) and Tidd (2005), and the use of futures research within individual companies has been studied on various occasions. These studies have provided insights into how futures research methods and innovation processes can be combined and integrated (van der Duin, 2006), how technology intelligence processes can be organized (Lichtenthaler & Ernst, 2007) and how corporate foresight affects companies' innovative capabilities (Rohrbeck & Gemünden, 2009).

[1] This section was published in Elsevier's Futures: van der Duin, P., Heger, T., & Schlesinger, M. (2014). Towards Networked Foresight? Exploring the use of futures research in innovation networks. Futures, 59, 62-78. The final version is available at http://dx.doi.org/10.1016/j.futures.2014.01.008.

In 2003, Chesbrough coined the term 'Open Innovation' to describe the paradigm 'that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as firms look to advance their technology" (Chesbrough, 2003b, p.24). Since the introduction of the term, studies using it have attracted increasing academic and corporate attention (Dodgson, Gann, & Salter, 2006b; Rohrbeck, Hölzle, & Gemünden, 2009b). Several other studies came to a similar conclusion that organizations with complementary assets who cooperate will outperform those who innovate on their own, e.g. Edquist (1997a); Gassmann (2006); Rigby and Zook (2002). Indeed, empirical research shows that more and more companies have opened up their innovation processes and started to cooperate with others with regard to innovation (Gassmann, Enkel & Chesbrough, 2010). A way to practice open innovation are 'innovation networks'. Under this term, cooperations organized as interorganizational networks with the goal to innovate collaboratively are understood.

The link between the two fields futures research and innovation networks led us to investigate the following questions: 1) How is futures research related to the context of 'open innovation' in general, and to 'innovation networks' in particular? 2) Do activities that could be named 'networked foresight' exist? 3) How are these activities currently conducted? We explore these questions by describing three cases with different settings, by applying the Cyclic Innovation Model (CIM) and by analyzing foresight activities therein in terms of type, scope, and their respective roles.

In the next section the concept of networked foresight is approached in two ways: first, by investigating the relationship and analogies of innovation management and futures research; second, by explicating the link of futures research to innovation networks. Then, the approach for the analysis is outlined, the CIM is introduced as an analytical framework and the categorization of foresight is explained. This is followed by the description of the three cases according to the CIM concepts. Special emphasis therein is placed on foresight activities. The subsequent case-specific discussions are followed by a cross-case evaluation. The article finishes with concluding remarks.

3.1.2 Toward networked foresight

3.1.2.1 Analogies in the development of innovation management and futures research

Liyanage (1999), Niosi (1999) and Ortt & van der Duin (2008); van der Duin, Ortt & Kok (2006) distinguished between four different generations of innovation management:

1. Technology push: innovation processes are linear and rooted in scientific discoveries

and technological knowledge, leading to the development of products and services.

2. Market pull: innovation processes are (still) linear and start with discovering market and societal needs which form the basis of innovation processes. Therein, technologies suitable for new products and services that satisfy the previously identified market and societal needs are developed.
3. Parallel processes: innovation processes start with a new technology or with market needs. Innovation processes become less linear and feedback and feed-forward linkages are established.
4. Innovation in systems or networks: innovation processes are distributed among different organizations which contribute to the innovation process with complementary assets.

Within each of these generations, companies aimed to overcome disadvantages of the previous one to improve internal innovation processes and retain their competitive edge. Despite their sequential occurrence the fourth generation has not completely replaced the first three (von der Gracht et al., 2010). Nevertheless, the fourth-generation innovation processes with their networked character are becoming increasingly important.

Since the 1940s, the way people and organizations have looked at the future has changed from a technology-oriented attempt to predict the future towards a more exploratory perspective that incorporates many different societal aspects (e.g. economic, social, political, cultural and technological). Up to the 1980s, futures research focused on forecasting future developments by applying s-curves, Delphi studies and mathematical models (Cuhls, 2001, 2008; Phillips, 2007). Subsequently, futures research focused on identifying possible and preferable futures instead of trying to predict the future (Cuhls, 2003). Today, it aims at detecting new trends and developments that are likely to impact the future of the focal firm and the preparation of adequate measures to react to the various possible futures (Saffo, 2007).

The close link between innovation and futures research tempts analogies to be drawn between the historical developments of both concepts as illustrated in Table 1.

Since the connection between the different generations of innovation processes and futures research can be established for the past, this article seeks to analyze the apparent next step in the development of futures research: *networked foresight*.

3.1.2.2 Linking futures research to innovation networks

3.1.2.2.1 Trends driving corporate innovation toward open innovation processes

Innovation, i.e., the process of creating a new product, service or system (Hauschildt & Salomo, 2007), has long been considered a driving force behind economic growth (Solow, 1959). For a long time, internal R&D capabilities were closely associated with innovativeness. In fact, substantial efforts were put into keeping the results of innovation a secret. They were rarely shared, mostly in pre-competitive phases to reduce R&D costs.

A preceding concept to open innovation that takes a corporate perspective is *absorptive capacity.* This initially analyzed the 'ability [of firms] to recognize the value of new information, assimilate it and apply it to commercial ends" (Cohen & Levinthal, 1990, p. 128). Later, it was redefined as 'a set of organizational routines and processes by which firms acquire, assimilate, transforms and exploit knowledge to produce a dynamic organizational capability" (Zahra & George, 2002, p.186). This translates into the firm's aim at surviving over time and sustaining or gaining a competitive advantage over competitors. The strategic resources of a firm have been identified as the basis for this (D. Collis & C. Montgomery, 1995). *Dynamic capabilities* research shows that strategic resources lose their value over time (Ambrosini & Bowman, 2009). Thus, firms need to have innovative capabilities and instruments to renew their strategic resources in order to maintain a competitive advantage (Eisenhardt & Martin, 2000).

The last two decades have seen an increase in collaborations between different organizations driven by at least five trends in corporate innovation:

1. Fast technological change (Sood & Tellis, 2005) and increasing complexity of products (Kontos, 2004)
2. High innovation speed (Kessler & Chakrabarti, 1996)
3. Shortening product life cycles (Qualls, Olshavsky, & Michaels, 1981)
4. Spread of knowledge in the value chain and concentration on core competencies (Ahn, 1995; Kumar & Eickhoff, 2005)
5. Business models that integrate across various industries (Cowan et al., 2007; Gassmann, 2006)

Research investigating collaborative and open innovation describes the efforts and reasoning of companies to open up their innovation processes. The primary goal is to create or sustain a competitive advantage, i.e. the ability to sense change and acquire necessary capabilities to meet changes, including the challenges resulting from the above listed trends (Chesbrough, 2003a).

Table 1 shows parallels in generations of innovation management and futures research based on based on van der Duin (2008) and also Daheim & Uerz (2008).

Table 1: Generations of innovation management and futures research

	Innovation Processes	*Futures research*
Generation 1	Technology push	Technology forecasting
Generation 2	Market pull	Technology assessment
Generation 3	Coupled innovation processes	Exploratory futures research
Generation 4	Innovation in systems or networks	Networked foresight

3.1.2.2.2 Futures research and open innovation

Futures research aims at systematically exploring, predicting and/or explaining future developments with the means of different methods and techniques, for example scenario analysis, technology forecasting, roadmapping, and backcasting or the above-mentioned s-curves, Delphi studies and mathematical models. Thus, it supports companies' efforts to sense change and adapt or renew accordingly. In this context, the application of futures research methods can serve various goals such as testing strategies or identifying new business fields or new policy issues.

The link between futures research and open innovation became apparent in past research. Rohrbeck & Gemünden (2009) link three of the above-listed trends driving open innovation—*shortening life cycles*, *fast technological change* and *innovation speed*—to corporate foresight through the necessity of companies to renew their strategic resources as a result of these factors. The link is deepened through various studies that discuss foresight methods as means to embrace the open innovation paradigm. Heger & Rohrbeck (2012) describe the collaborative application of a set of foresight methods for exploration of new business fields, one of the previously listed three roles that corporate foresight should play within a company. Rohrbeck, Hölzle and Gemünden discuss the role of futures research for corporate innovativeness in the form of *foresight workshops* (Rohrbeck et al., 2009). These workshops are identified as one instrument of Deutsche Telekom for embracing the open innovation paradigm and as an instrument to increase the number of new innovations—the second of the key roles described above. They are described as instruments for open innovation as part of the idea generation stage of the innovation process and as inside-out and outside-in processes (see Gassmann and Enkel (2004) for three open innovation process archetypes) where external knowledge is brought into the company and internal knowledge and results are transferred to the outside for

commercialization. Jasner describes the 'Moonraker' project of the car manufacturer Volkswagen in Jasner (2006). The project was intended to increase the understanding of the US car market by having managers live with ordinary American families for a certain time in order to bring new experiences and external knowledge into the company. Among other things, it led to the insight that significantly different characteristics are attributed to the brand than expected. This insight eventually led to new car configurations, i.e. the results of the foresight project challenged existing development projects and led to strategic changes within the company. Thus, the project filled the third key role of foresight as described above while clearly embracing the open approach by using outside sources within the corporate innovation process.

In this section we have shown two paths that led us to believe that networked foresight is the next generation of futures research: First, the close connection between innovation management and futures research and analogies in their past developments hint at networked foresight as a logical next generation of futures research. Second, past studies on foresight, collaboration in innovation and open innovation reveal the link between foresight and collaborative innovation, also suggesting that networked foresight will indeed become increasingly important. However, systematic research about futures research in innovation networks as one form to embrace open innovation is lacking. In this paper, this relationship is investigated by applying the Cyclic Innovation Model to three cases. Moreover, activities observable in the three cases are investigated in terms of type, scope and foresight role. The goal is to identify and characterize 'networked foresight' as the basis for further research.

3.1.3 Methodology

3.1.3.1 Study design

For analyzing the link between futures research and innovation networks and assessing the use of *networked foresight* activities this study uses a multi-case design. This design makes it possible to capture the full richness of the focal phenomenon while taking into account the softer aspects that help identify new meanings, different interpretations, and new theories, models and solutions (Dyer & Wilkins, 1991). Case study research is therefore recommended for exploratory qualitative research characterized by scant previous knowledge (Eisenhardt, 1989; Yin, 2009, 2011).

Two rationales for multi-case study designs can be identified (Yin, 2011): First, two cases already allow for literal or theoretical replication and thus more robust conclusions (Herriott

& Firestone, 1987). The contexts of cases usually differ to some extent. Thus, the generalizability is substantially increased when arriving at common conclusions for the cases. Second, different cases can be used to cover the extremes of the unit of analysis, in our case 'networked foresight'.

The cases in this article allow the focal phenomenon to be described and discussed in greater depth than a single case, while also making it possible to compare different settings and eventually derive cross-case conclusions. The WINN case allows futures research to be examined in a cooperation between two partners (RWS and an external consultancy Deltares) enhanced by external knowledge. The EICT case allows a cooperation of a small set of trusted partners to be studied, while the EIT ICT Labs case made it possible to observe futures research activities in a large network of around 84 partner organizations.[2]

To collect data for the EICT and EIT ICT Labs case studies a participant-observer approach was utilized[3]. In both cases, data collection instruments included access to key documents, such as reports, internal documents, presentations and meeting minutes and observations through active participation within the organizations and, to some extent, in the build-up phase. In the WINN case ten innovators from RWS and its innovation partner Deltares were interviewed in addition to analyzing key documents.

For analyzing the future orientation and openness of the three networks we applied the Cyclic Innovation Model as an analytical framework. The identified foresight practices are categorized according to their character, in this article scope, type and the impact of its results. Finally, the link of future orientation, futures research and the network is analyzed by connecting the CIM analysis with the character of the foresight activities.

3.1.3.2 Analytical frameworks

3.1.3.2.1 The Cyclic Innovation Model

The main principles of the Cyclic Innovation Model are 1) that innovating is predominantly a cyclic interaction between different actors who exchange knowledge and information in the 'innovation arena' and 2) that every well-functioning innovation process should be based on one or more images of the future (Berkhout, 2000; Berkhout, 2007). The CIM can be described on two different levels of detail: level 1, which links 'the' future to innovation processes and level 2, which structures the partners involved in the innovation

[2] 84 partners at the time of writing the article, in 2020 more than 250 partners are in the network.

[3] Critics argue that the active involvement in day-to-day work creates bias in the participant-observers in that they may partly or completely neglect their external role or impose actions that are not in line with sound scientific practice, while being reasonable from a project perspective (Yin, 2009). However, we ensured that at least one researcher acted solely as an observer in both cases.

network and links them in a cyclic way. The cyclic nature of the relationships between the different actors means that there is constant feedback and feed-forward between the actors. In this analysis, level 1 of the CIM is applied since it comprises a direct link between futures research and innovation.

Level 1 of the CIM is illustrated in Figure 4, see Berkhout (2007) for details. This future-oriented part of the CIM consists of four components:

1. The *image(s) of the future*, which function as a kind of 'Leitmotiv' for all innovation-related activities. It is fed by the organization's internal ambitions for the future and by an awareness of external developments that may influence the organization's future goals and performance.
2. A *process model* that guides the organization towards the envisioned future.
3. The ongoing *innovation processes* together constitute a transition path that leads the organization from the present to the future.
4. The inner component *leadership* links the other three components. The management is responsible for consistent, interconnected and balanced links between the other components. It also includes setting out an inspiring vision of the future, while ensuring that this future vision is strategically aligned with a sound process model that allows managing and executing the innovation processes adequately and the actual transition to the envisioned image of the future.

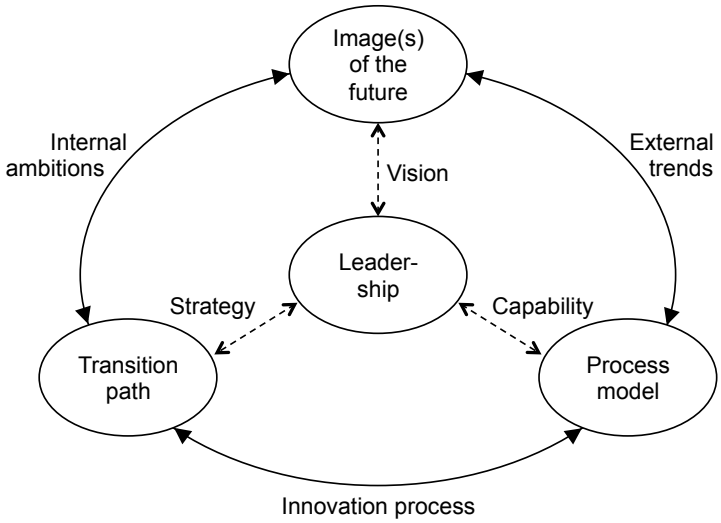

Figure 4: Level 1 of the Cyclic Innovation Model: the connection between innovation and the future.

The cyclic nature of the CIM is a result of the inherent constant feedback and feed-forward between the four components leadership, image of the future, process model and transition path. For instance, the transition path aims at realizing the once-set image of the future. At

the same time, changes in the image of the future—for example, due to an adapted vision as a result of leadership activities—can mean that the transition path has to be adapted just as the strategy might need to be updated.

3.1.3.2.2 Applying the CIM for analyzing the preferences on networking and the interconnectedness of futures research

In this article the CIM is used as a tool to structure and analyze the findings in our case studies. That is, the cases are translated into the concepts of the CIM and their relationship. For instance, the CIM states that its elements should be related to each other. If that is not the case the transition path might lead to a 'wrong' image of the future, i.e. an image that the network did not envision for itself. Also, the CIM requires every concept to be made explicit, i.e. that if a network does not have an explicit and formal process model the conclusion would be that systematic networked foresight is not practiced. Additionally, the application of the CIM can reveal various system failures that can limit the effectiveness of the use of futures research.

Since the use of futures research in innovation networks is not yet mature it can be expected that the application of the CIM to the cases reveals that the focal networks have not explicated or formalized networked foresight concepts or processes and that the components of the CIM are not linked to each other in a cyclical way. Thus, the cases will show different levels of networked foresight. In one case the different concepts might be present but not explicitly formalized, and in another the concepts might indeed be present and formalized but not sufficiently related to each other. In this article the network orientation of foresight is described and analyzed, but not formalized. The CIM provides a common basis for the analysis of the three cases and reveals the stages of development of networked foresight in the different cases.

In the case evaluations, three different levels are used (visualized as grey-shading) for each component of the CIM to visualize their preference concerning openness and network orientation of futures research activities. It is important to note is that the levels in the illustration do note rate or reflect business performance of the organizations. It merely reflects the state of each case concerning the planned and actual network orientation concerning futures research activities.

3.1.3.2.3 Categorizing the networked foresight activities

The implementation of the identified networked foresight activities is structured according to the three roles of foresight as introduced by Rohrbeck & Gemünden (2009): initiator, strategist, and opponent (Table 2).

Table 2: The three roles of foresight as described by Rohrbeck and Gemünden (2009)

Foresight Role	*Impact*
Initiator role	Identify new needs Identify emerging technologies Identify competitors' concepts early
Strategist role	Assess and reposition of innovation portfolio Provide strategic guidance Identify new business models Consolidate opinions Vision creation
Opponent role	Challenge basic assumptions Scan for disruptions that could endanger current and future innovations Challenge the state-of-the-art of current R&D projects

When foresight is implemented to contribute through these three roles, Rohrbeck and Gemünden (2009) expect the ability of the firm to innovate—and thus to remain at the competitive edge—to be significantly improved. We re-use these three roles to categorize the individual networked foresight activities in the three cases below. Additionally, we capture the type of the activity (long-term program, time-limited projects, non-recurring activity) and evaluate the scope of the activities, i.e. contributors and beneficiaries of the activities (open network, closed network, contract-based partnerships or single organizations).

3.1.4 Cases: Rijkswaterstaat, EICT, EIT ICT Labs

In the following section three cases are presented. In each case a brief introduction is followed by a description according to the components of the CIM.

3.1.4.1 Case 1: Rijkswaterstaat—WINN

Rijkswaterstaat (RWS, part of the Dutch Ministry of Infrastructure and Environment) is responsible for the management and implementation of the Dutch road and water infrastructure. Thus, RWS is continuously searching for innovations in their field and carries out various foresight activities organized in separate programs and projects. One of the RWS's programs, the Water INNovation (WINN) program, aimed at detecting, exploring and developing innovations in the Dutch water infrastructure and management. The program had two main slogans: 'To inspire, to challenge, to do" and 'Long-term thinking, short-term

action".[4] After having been carried out within various departments in RWS itself, a reorganization in 2007 resulted in the aim to cooperate with external organizations. Initially, this resulted in a partnership with Deltares, a research and consultancy institute in the area of delta technology.[5] WINN was supposed to 'engage on a joint search with the country's society, business community and scientific sector for durable and innovative combinations of the use and space and society". Therein, Rijkswaterstaat aimed at acting as network manager and facilitator to integrate all interested parties. This, includes established partners such as waterway users, interest groups, market players and experts, but also architects, people from advertising and art, secondary school children and students to provide a 'fresh perception of an appropriate future water policy" (Rijkswaterstaat, 2011).

3.1.4.1.1 Image of the future—Vision

Now WINN clearly aims at exploring and developing innovative solutions for water management in the Netherlands with many partners (Rijkswaterstaat, 2011). However, a mixed image emerged with regard to the presence and use of an image of the future regarding the innovation processes of WINN in the past. Some interviewees stated that a vision indeed existed and that it was used to inspire and steer the innovation process from an early stage onwards. Other interviewees, in contrast, were not aware of any vision at all. A third group of interviewees stated that during the WINN program a meeting was planned between the core project leaders of WINN and the overall manager to define a set of 'themes' that together should constitute the vision for the innovations developed in WINN. Given that the involvement of outside organizations in the WINN program was limited in reality (at least until 2010), a mismatch of input from internal ambitions and external trends could be identified.

3.1.4.1.2 Process model

Regarding the process model different views emerged during the interviews. Most interviewees stated that each of the project leaders had more or less their own way of managing and executing their (sub-)projects. Thus, no formal process model was in place; informal or implicit ones at best. Still, many interviewees stated that this was not necessarily a problem. Instead, they even feared that formal processes would put too much emphasis on 'filling in forms", as one interviewee phrased it. The transition from RWS-internal activities to open innovation projects and programs was facilitated through the integration of Deltares in 2007.

[4] See http://www.rijkswaterstaat.nl/water/innovatie_en_onderzoek/index/ for more details about WINN.
[5] From Deltares' website (www.deltares.nl): 'Deltares is an independent, institute for applied research in the field of water, subsurface and infrastructure".

3.1.4.1.3 Transition path

The transition towards an open innovation program has undergone several steps: from an initially government-internal planning program to an externally supported innovation program that also integrated external parties starting in 2007 to a new innovation program that is facilitated and managed by RWS but draws heavily from external knowledge starting in 2010.

3.1.4.1.4 Leadership

WINN operated as part of a government organization. As a result, it was subject to considerable political scrutiny. Leadership had the tasks of 1) managing the program in this political context, 2) establishing a common understanding of innovation, openness and involved risks, and 3) coordinating partner expectations. That is to say, the network manager had to act as guards against defective outside political influences while also making sure that the internal components of the network were aligned.

3.1.4.1.5 Networked foresight activities

Foresight activities inside Rijkswaterstaat and WINN were mostly singular activities that focused on solutions for the water- and landscape management, see Table 3 for a list of identified activities. Beyond that, a series of recurring future workshops were conducted for determining, monitoring and evaluating relevant societal developments. The future of WINN itself was not addressed within these activities.

Table 3: Networked foresight activities at Rijkswaterstaat

No.	*Activity*	*Short description*	*Type*
1.1	Inspirational workshop	Identified future 'themes' for inspiration and to structure innovation processes for WINN	Singular activity
1.2	Business modeling	Addressed technical issues, strategic positioning of Rijkswaterstaat vis-à-vis other organizations and decision making about exploitation of inventions.	Singular activity
1.3	Business case analyses	Used for sensibility analyses and to forecast newly identified development paths and potential new products and services within WINN	Singular activity
1.4	Series of future workshops	Determined relevant societal developments and innovation needs that the activities originating from WINN give rise to.	Project

3.1.4.2 Case 2: EICT

In 2004, the five German founding partners of the European Center for Information and Communication Technologies (EICT)—Deutsche Telekom AG (DTAG), Daimler AG (DAG), Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V. (FhG), Technische Universität Berlin (TUB) and Siemens AG (SAG)—decided to pool research and development activities in the area of information and communication technology[6].

The aim of pooling innovation activities in the ICT market was based on three considerations at the time of its foundation: (1) The USA and Asia were traditionally stronger than Europe in the ICT markets. The EICT was founded to concentrate innovation activities of its partners in Europe. In practice, the EICT supports collaborative projects in futures research, basic research, applied research, and new product development with expertise in innovation management, project management, and IT infrastructure. (2) All the founding partners had a strong international focus. The partners aim to further strengthen their international focus and expertise with the intra-organizational projects supported by EICT. (3) The exchange of knowledge between organizations and their external environment was expected to become more important in the future. Accordingly, EICT aims at facilitating open innovation by providing a setting that is conducive to the flow of information between industry and research in information and communication technologies (ICT), Europe's largest and one of its most decisive industries that is seen as core to many other industries.

As location for the EICT the campus of Technische Universität Berlin was selected. The physical proximity to faculties and local research institutions was supposed to enhance the knowledge exchange between industry and research. [7]

3.1.4.2.1 Image of the future—Vision

When applying the CIM to the EICT, the vision as stated by the network partners—becoming the leader in ICT innovation—emerges as the starting point for the network. It is reflected in the mission of the network, i.e. creating a highly visible innovation center in Europe in the ICT sector. The internal ambitions of the partners involved—being successful in international markets—and the external trend that ICT is becoming increasingly important in all business areas provided the foundation for this vision.

3.1.4.2.2 Process model

The activities of the EICT *itself* can be interpreted as an innovation process model. The founding partners decided on a public-private partnership (PPP) as their preferred framework to support collaborative innovation activities, allowing all partners to contribute

[6] In 2008 SAG left EICT and Opera ASA joined the network until 2012.
[7] See http://www.eict.de for more details about EICT.

and provide input in an optimal way (Bub & Schläffer, 2007). With organizations from basic research (TUB), applied research (FhG), and industry (DTAG, DAG, Opera), the entire innovation process is covered. To coordinate and organize the PPP, a German company with limited liability (German GmbH) was selected as the legal form for the organization. The EICT GmbH provides a legal framework and platform for collaboration covering the entire innovation process, from inception to successful completion.

It aims at providing an innovative environment where knowledge is pooled, new ideas are generated and a legal framework for the free flow of information is created. Specifically, the partners are supported at several stages of the innovation process, from futures research, topic identification and business field exploration to consortia building, project initiation and execution of R&D projects. To serve as a knowledge platform without complex assignments and layers of bureaucracy between all partners, EICT created a 'partner program', which facilitates the activities and support of EICT towards its partners and speeds up the creation of new innovation activities.

3.1.4.2.3 Transition path

The foundation of EICT represented a major step for all involved partners on their way to actually conducting open innovation. By establishing the public-private partnership and founding the GmbH as its legal form, the partners created a framework to facilitate the exchange of knowledge with predefined rules and clear IPR boundaries. With clearly defined processes and rules and the focus on open innovation EICT is supposed to support the innovation capabilities of its partners.

3.1.4.2.4 Leadership

Two aspects require special attention within the EICT: (1) Linking the innovation capabilities and resources of all partners adequately. The full potential of networked innovation projects can only be exploited if complementary capabilities are bundled together. Also, the risk and investments involved in taking innovations to the market can be shared. Here, collaborative futures research activities supported by EICT make it possible to identify risks and opportunities in the very early stages of product development (see below). (2) Obtaining new partners for the PPP. The integration of new partners with additional competences, ideas and insights broaden the innovation potential of the network.

3.1.4.2.5 Networked foresight activities

Futures research activities are conducted in particular within the innovation management unit of EICT. New businesses and markets are explored using a variety of methods, including methodologies combining scenario analysis, multi-issue actor analysis,

roadmapping and target costing (Heger & Rohrbeck, 2012), business modeling and future studies. The outcome of the applied futures research methods is substantially broadened in projects with interdisciplinary character and a combination of knowledge and insight from various industries.

The futures research activities at EICT have in common that they are usually applied on a project basis. Projects are set up with explicit definitions of time, scope and desired results. Futures research methods are subsequently used to explore and evaluate possible future developments within the project boundaries. Thus, the futures research activities within EICT usually address thematic issues in various industries.

The future of the partners involved and EICT as an innovation network is not addressed within the foresight activities of the innovation management unit. In Table 4 the identified foresight activities within EICT are listed, briefly described and their character stated.

Table 4: Networked foresight activities at the EICT GmbH

No.	*Activity*	*Short description*	*Type*
2.1	Future Studies	Continuously identify future trends in an industry based on Delphi and other studies	Program
2.2	Business field exploration	Explores pre-defined business fields with various innovation management methods, i.e. scenario analysis, multi-issue actor analysis, roadmapping	Project
2.3	Thematic innovation radar	Identifies new technologies, trends and topics in a pre-defined thematic field	Project
2.4	Working group	Provide a setting to explore future topics and ideas in guided workshops	Singular activity
2.5	Business modeling	Generates, plans and evaluates new business modeling concepts	Singular activity
2.6	Business case analysis	Provide revenue, cost and profit projections in pre-defined cases to establish a basis of decision-making	Project
2.7	Networking on demand	Identifies matching knowledge carriers in the partner network on demand, pool project partners for new projects, initiate project consortia	Singular activity

3.1.4.3 Case 3: EIT ICT Labs

The European Institute of Innovation and Technology (EIT) is the latest attempt of the

European Commission (EC) to increase European innovation performance. The idea to create an institute that combines excellent research, education and business activities emerged in 2005 (European Commission, 2005). In 2008, the European Parliament and Council established the EIT as an independent agency in the EU. In the summer of 2009, an official call for KICs was placed. Consortia of partners from academia, industry and research institutes were encouraged to create open innovation ecosystems that integrate the knowledge triangle consisting of education, research and innovation. So-called Knowledge and Innovation Communities (KICs) were to 'become key drivers of sustainable growth and competitiveness across Europe through world-leading innovation" (EIT ICT Labs, 2012c). Each KIC had to bring together three independent partners from at least three different EU member states, with at least one partner from higher education and one private company (EIT ICT Labs, 2012f). The organizational set-up and partner selection was left to the consortia themselves. At the end of 2009, the first three KICs in the areas of Climate Change (Climate KIC), Energy (KIC InnoEnergy) and Information and Communication Technologies (EIT ICT Labs; this case) were selected. They were supposed to be fully operational by October 2010. The EIT governing board developed an overarching Strategic Innovation Agenda (SIA), reviewed and revised with support of the KICs once they were established. In the SIA, a common vision, mission and strategy for the EIT and its three KICs was created.

The EIT ICT Labs consist of 28 core partners from industry and academia and approximately 56 associated or affiliated partners at the time of writing this article. Six nodes, in Berlin, Paris, Eindhoven, Stockholm, Helsinki and Trento, operate physical co-location centers (CLCs) where most of the KIC activities are carried out (EIT ICT Labs, 2012e). Activities center around and integrate the three fields education, research and business creation. Heger & Bub provide an in-depth introduction to the EIT ICT Labs in Heger & Bub (2012a).

3.1.4.3.1 Image of the future—Vision

The starting point of the EIT ICT Labs was the vision of an integrated institute. In the case of the EIT ICT Labs, the EC's call for KICs and the internal ambitions of multiple companies resulted in the shared vision of an integrated organization designed to drive innovation in ICT that would benefit from the different yet complementary assets and resources of industrial and academic partners. It was developed based on the initial EIT SIA in the application phase of the KICs. Later, both, the KIC's vision and strategy were in conjunction with the revision of the EIT's SIA.

The EIT ICT Labs envision their operations to substantially improve various fields related to innovation in ICT: the effectiveness of European public funding, corporate innovativeness, the relevance of academic research, and higher education.

3.1.4.3.2 Process model

In the innovation framework instruments for sharing, exchanging and developing knowledge were created, rules for developing and exchanging IPRs were pre-defined, and new educational ways to encourage entrepreneurship in Europe were created. The instruments can be divided into two categories:

1. *Carrier activities*, which are mostly co-funded projects (i.e. with external funding) with a thematic orientation, for example, the Software Campus as an instrument to strengthen and educate the CIOs of the future8, which is subsidized by the German Ministry for Education and Research (BMBF).
2. *Innovation catalysts* that aim at supporting existing activities methodological. They receive direct funding from the EIT ICT Labs and can be 'booked' to support the carrier activities.

Until 2010, the selection of innovation activities was made by the management team in various workshops based on proposals that were submitted by the partner organizations. To enhance transparency a formalized stage gate process was introduced in 2011. Since then, proposals for future activities have to meet a set of pre-defined criteria and are evaluated and selected by expert teams with regard to the thematic areas of education, research and business.

Several collaborative instruments were established to support the identification and selection of activities for the future of the network, e.g., an innovation radar (EIT ICT Labs, 2012d) and best-practice benchmarking (EIT ICT Labs, 2012a). The innovation radar identifies external trends and developments in preselected fields, provides images of the future, identifies innovation opportunities and potential for commercialization, and creates cohesion within the ICT Labs about current trends. Experts of the partner organizations provide input. An IT platform serves as the basis for this activity. It allows people to post, comment, rate, search for and find innovation opportunities. Thus, it is aimed explicitly at establishing open innovation structures and an intra-organizational knowledge exchange

[8] See http://www.softwarecampus.de/en/ for details.

between the network partners. Thom provides an overview of the EIT ICT Labs Innovation Radar in Thom (2011).

The best-practice benchmarking activity aims at identifying best practices for 1) disseminating innovations among the partners, 2) overcoming innovation barriers, 3) meeting the expectations of the various partners, and 4) recommending practices to improve the activities within the network. A project team with members from education, research and industry and from several partner organizations identifies and evaluates the best practices in close cooperation with the network's management team. The aim is to create a continuously developing organization by establishing state-of-the-art methodologies and structures that improve and support the collaborative innovation efforts (EIT ICT Labs, 2012a).

3.1.4.3.3 Transition path

For this case, a transition path has yet to develop due to its relatively short existence of three years at this point. However, foresight activities aimed at the transition path have already been established: the aforementioned innovation radar helps ensure that the EIT ICT Labs and the partners are engaged in domains that will drive the future. The aim is explicitly to 'establish a common outlook on the future of ICT to create cohesion and a strong community across nodes and partner organizations" (EIT ICT Labs, 2012d). The best-practice benchmarking ensures the implementation of state-of-the-art instruments and methods.

3.1.4.3.4 Leadership

In contrast to most other publicly funded research instruments of the European Commission, the EIT ICT Labs are organized business-like. There is a clear vision and mission, a general assembly consisting of core and associate partners, an executive steering board and a chief executive officer (CEO), who leads a management team with 12 members. The CEO is also responsible for the application of the vision and strategy at a day-to-day operational level.

Three aspects are of high importance: 1) identifying the right topics on which to focus (effectiveness), 2) providing a setting for the partners to explore and exploit new topics and challenges successfully (efficiency) and 3) stakeholder management. Effectiveness and efficiency are addressed by several activities in the network: technology transfer activities, so-called spearhead research activities, and an annual selection process (quality assurance) add to the foresight instruments innovation radar and best-practice benchmarking.

The importance of stakeholder management results from the interorganizational set-up of the EIT ICT Labs. Organizations with very different backgrounds, philosophies and cultures, interests and goals, and work nature have come together to realize a common vision, for details see (Heger & Bub, 2012a). Eventually, the assessment of the outcome (network performance versus original expectations) will determine the partners' future commitment. Thus, the management of the organization needs to gauge the interests of the partners, emphasize the benefits for each individual partner organization and foster cooperation that are expected to give rise to super-additional effects in the best case (Rohrbeck & Pirelli, 2010).

3.1.4.3.5 Networked foresight activities

Within the EIT ICT Labs various foresight activities can be observed. The partners receive financial grants for their participation and are in turn expected to actively contribute to the activities. Clearly observable from the partners' actions and behavior within the network is their willingness to cooperate within the network. However, the re-integration of information (outside-in) into the organization is apparently quite a challenge.

In Table 5 the foresight activities are briefly summarized and their type is stated.

Table 5: Networked foresight activities in the EIT ICT Labs

No.	*Activity*	*Short description*	*Type*
3.1	Action Lines	Bundle R&D activities in pre-selected thematic fields, aim to bring forward significant improvements and business successes by combining, stimulating, and drawing research attention towards activities within these fields	Program
3.2	Experience & Living Labs	Let researchers and engineers test and modify products in close collaboration with end-users in a real-life or a real-as-life setting	Projects
3.3	Testbeds and Simulation Tools	Integrates hardware and software platforms and simulation tools across companies in order to test applications, service platforms, service set-ups and algorithms with respect to functionality, performance and conformance.	Projects
3.4	Spearhead Research	Grants additional research funds to facilitate collaborative research activities in high-potential topics	Projects
3.5	Business Modeling	Supports evaluation, generation, planning, and deployment of business modeling concepts in yet underexplored business fields	Project, singular activity
3.6	Technology Transfer Program	Increases the transfer activities from academia to business by detecting, stimulating and supporting	Program

No.	*Activity*	*Short description*	*Type*
		technological opportunities within universities and research institutes	
3.7	Innovation Radar	Identifies new technologies, trends and developments in selected fields, establishes a common outlook on the future of ICT and creates cohesion and a strong ties across the locations of the network	Program
3.8	Yearly selection process	Identifies underdeveloped technological and business opportunities on a yearly basis and provides the means to explore the field further	Program
3.9	Best-Practice Benchmarking	Collects information about best practices in collaborative R&D, helps to understand, apply and integrate them.	Program
3.10	Business Developer Program	Selects promising SMEs and Start-Ups within the partners' regions, supports cross-country fertilization and gives them access to experienced business developers	Projects

3.1.5 Evaluation of the cases

3.1.5.1 Case 1: Rijkswaterstaat—WINN

The vision of the WINN program has developed into what is now worded as 'joint search for durable new solutions for water" among various interested and related parties in the Netherlands (leaflet). Interview partners from the program confirmed that the innovation teams consisting of members from the governmental agency Rijkswaterstaat, from Deltares as consultancy and from external parties worked well due to the complementary competences of the team members. However, they also stated that collaboration between the government agency and private companies turned out to be difficult. This was mostly credited to differences in opinion and expectations. For instance, interviewees stated that the government—and therefore Rijkswaterstaat as its agency—was interested in unique one-time innovations whereas companies were more interested in exploiting and diffusing innovations to a broader market. Also, Rijkswaterstaat was primarily interested in innovations that addressed societal challenges while companies inherently seek to satisfy shareholders, thus predominantly aiming for business performance.

Given the doubtful existence of a clear vision at the beginning of the program the transition path was lacking direction. By now, the desired future and vision for WINN clearly embrace an open and networked approach to foresight to identify and explore innovations for Dutch water management. While the process model was adopted to integrate multiple parties as

well, the program management from Rijkswaterstaat was more focused internally and less 'open' than one would expect. Processes, for instance, were not sufficiently populated with the external parties according to some interviewees. Presumably because of its strategic nature, outsourcing parts of the innovation process is still considered a bridge too wide for Rijkswaterstaat. Figure 5 visualizes the analysis of WINN in terms of its openness and network orientation.

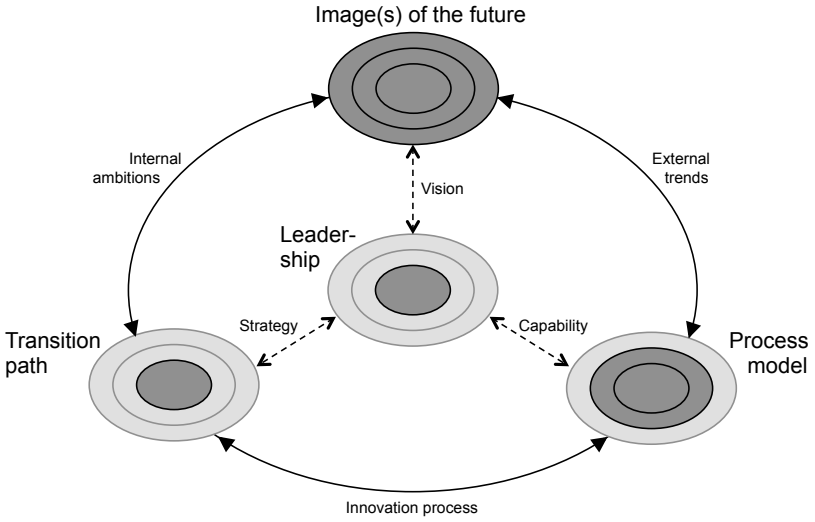

Figure 5: Visualization of WINN managed by Rijkswaterstaat in terms of its openness

3.1.5.1.1 Networked foresight activities

Foresight activities were limited to workshops, moderated discussions and other meetings—either as stand-alone events or as series of events (activity 1.4). Predominantly, the foresight activities were used to develop strategic guidance for the future in water management, to identify new business opportunities and assess and reposition the activities in place for water management. Thus, the *strategist role* as defined by Rohrbeck and Gemünden (2009) was filled. Additionally, the activities were aiming at identifying new opportunities and needs, i.e. filling the *initiator role* as well. The latter classification was not only backed by the interviewees, but also by the many new innovations that originate from WINN, such as 'The sand motor", 'Energy from water", and 'The most beautiful and safe delta" (van der Duin, Sule & Bruggeman, 2011). The *opponent role* was addressed ancillary within business case analyses.

Two factors were identified to significantly influence the results of the foresight activities. First, external participants of WINN were chosen because of their background in innovation and their apparently open mindset. However, being enthusiastic and very active does not necessarily promote i) contemplation about the future, ii) structuring, writing down, and analyzing thoughts about the future and iii) analyzing the possible impact of future

developments. Second, pressure from the top management level of RWS to present short-term results in addition to conceptual work about possible future developments created a kind of 'the urgent drives out the important"-atmosphere as Henri Kissinger put it. As a result, most networked foresight activities within WINN were rather ad hoc, took place just once, and were limited to participants from RWS and Deltares.

Table 6: The scope and roles the foresight activities in Rijkswaterstaat.

No.	*Activity*	*Initiator role*	*Strategist role*	*Opponent role*	*Scope*
1.1	Inspirational workshops	(✓)	✓		Contract partners
1.2	Business modeling	(✓)	✓		Contract partners
1.3	Business case analyses		✓	(✓)	Contract partners
1.4	Series of future workshops	✓	(✓)		Closed network

✓ = primary role of the activity, (✓) = secondary roles of the activity

Based on the CIM evaluation and the analyzed foresight activities the following conclusions can be drawn for Rijkswaterstaat:

- Within WINN foresight activities were primarily singular activities, either with the contract partners Rijkswaterstaat and Deltares or with selected participants.
- Beneficiaries of foresight were primarily the innovation activities originating from WINN and partly WINN itself. The latter in terms of identification of relevant developments and strategic guidance.
- While the setting of WINN has undergone two major changes towards more openness the grounding and reasoning leading to these changes were not clearly identifiable.
- Despite the communication of openness the management of WINN should embrace external partners to a higher degree.
- The partner network could be used to a higher degree within mid- to long-term foresight instruments and recurring activities. This way, cohesion within the network and quality of results could be further increased.

3.1.5.2 Case 2: EICT

When EICT was founded in 2004 its mission and vision were developed based on the aim to create a highly visible innovation center in ICT in Europe. While EICT performs well when it comes to conducting and supporting collaborative innovation among its partners, the image of the future, internal ambitions and external trends appear to mismatch by now. The internal ambitions seem to remain as they were when EICT was founded. However, other large innovation networks that provide frameworks for open innovation emerged in the last few years, e.g. Joint Technology Initiatives (JTIs), the European Alliance for Innovation and the EIT KICs (case 3). Thus, the image of the future for EICT seems to be in need of an update.

The partner structure of EICT of a research institute, a university and three industry partners and its division into the three units project management, innovation management and IT appears to be suitable to perform collaborative innovation activities in selected topics. EICT is equipped to manage projects, to provide methodological expertise and IT knowledge and to provide the suitable tools for the early steps of innovation from topic identification to execution of large-scale R&D projects. Thus, EICT appears to be well equipped to support collaborative innovation projects, including networked foresight.

Figure 6 visualizes EICT in regard to its openness and future orientation based on the CIM.

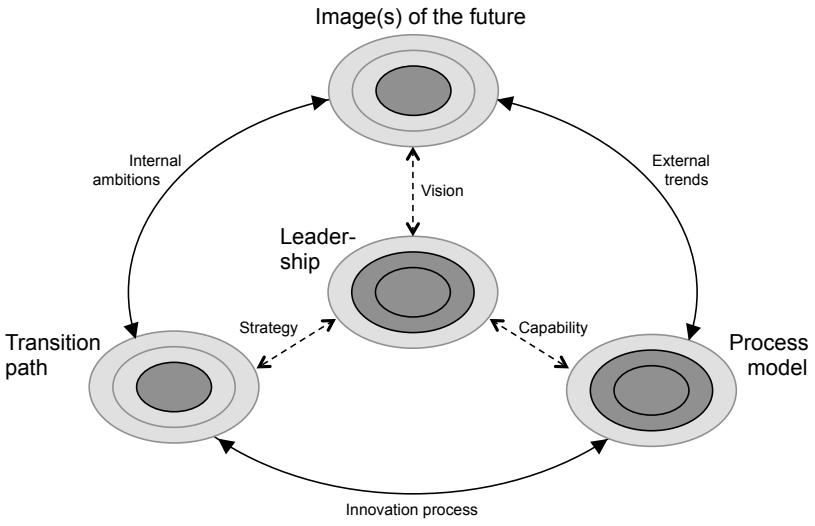

Figure 6: Visualization of the EICT concerning openness

3.1.5.2.1 Networked foresight activities

The partners use EICT's competences in foresight mainly on a project basis and for specific thematic topics; therein pooling the knowledge and information of several partners. Thus, it is expected that the outcome of foresight is enhanced due to the partner network of EICT. The project-based approach reduces the risk of failure and keeps investment levels

low.

However, the partners do not use the full potential of the network. For example, closely integrated collaborative foresight processes based on the neutral platform provided by EICT could improve the partners' own internal foresight processes. Also, a stand-alone and self-sustaining foresight process run by EICT could draw on the broad data basis available through the involvement of all partners. This would promise to identify new ideas across various thematic fields through cross-fertilization of ideas and knowledge.

In Table 7 the foresight activities provided by EICT are listed, their scope is shown and matched to the three roles of foresight.

Table 7: The scope and roles of foresight activities in the EICT.

No.	*Activity*	*Initiator role*	*Strategist role*	*Opponent role*	*Scope*
2.1	Future Studies	✓	(✓)		Open (organizations & end-users)
2.2	Business field exploration	(✓)	✓		Contract partners
2.3	Thematic innovation radar	✓			Contract partners
2.4	Working groups	✓	(✓)	(✓)	Contract partners
2.5	Business modeling		✓		Contract partners
2.6	Business case analysis		✓	(✓)	Contract partners
2.7	Networking on demand		✓		Closed network

✓ = primary role of the activity, (✓) = secondary roles of the activity

Based on the CIM evaluation and the analyzed foresight activities the following conclusions can be drawn for EICT:

- EICT applies foresight instruments mostly on a project basis for its network partners. Within the projects EICT's network is leveraged for information collection and knowledge exchange.
- Beneficiaries of networked foresight activities are the network partners within the pre-defined project settings.
- For developing the process model, adjusting the image of the future and the vision

and strategy of EICT quarterly board meetings, regular general assemblies and strategy meetings take place. EICT's own foresight competences could complement these meetings.

- The existing foresight activities could be utilized to capture external developments adequately to guide EICT prepare it for the future.
- Foresight would benefit from additional network partners that add to the existing knowledge base.

3.1.5.3 Case 3: EIT ICT Labs

The EIT ICT Labs have an elaborate mission and vision for the network based on the image of the future of an open network of partners that fosters research and business opportunities. Therefore, it applies instruments to utilize the need of companies to innovate collaboratively on the one side and the aim of universities to transfer research results to the market on the other side. Moreover, its thematic focus fields reflect external developments of the market and technological developments. The organizational build-up—basically a business-like set-up—that includes a supervisory board with representatives from the partner organizations and project teams consisting of employees from the working level helps to capture developments from the various partner organizations on different levels. A regular selection and review process lead by the management team ensures continuous tracking and adjusting of the network's activities.

However, informal talks with network members showed that the transition towards an open innovation network is potentially threatened by inertia, rigid mindsets and a fear of opportunism. First, regulations and specifications imprinted by the parent organization and frequent reporting duties equal to those of significantly larger projects subsidized in the European Framework Programs (FPs) not only significantly slow down the network's activities, but also discourage the people who are active in the network.

Second, the management of the organization cannot impose open innovation processes on its employees; it can only create an adequate environment with supporting instruments. Beyond that, collaborative innovation requires a change in the mindset of the people within the organizations. The EIT ICT Labs are an attempt to create an environment of open innovation, but the people therein still appear to be in need of adapting to the new notion of sharing results.

Closely connected to the mindsets of people is the fear of opportunism. While the EIT ICT Labs partner organizations overcame the fear of opportunism to a degree that lead them to

join the network at all, some partners anticipate that others withhold information—especially information that is valued as important within the industrial partner organizations.

Finally, managerial challenges develop due to the size of the network. While the shared vision of the EIT ICT Labs serves as a common denominator, sensitive and precise leadership is required to ensure constant satisfaction and commitment on the part of the partners involved.

Figure 7 visualizes the EIT ICT Labs in regard to its future orientation and openness.

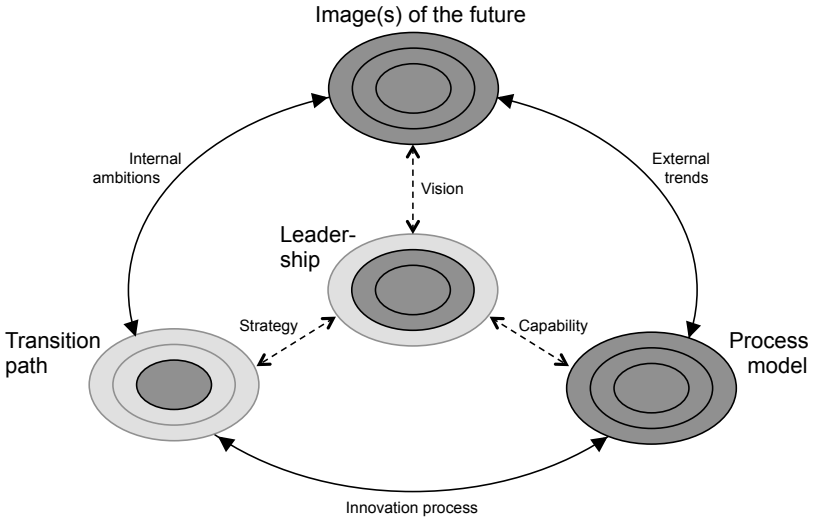

Figure 7: Visualization of the EIT ICT Labs concerning openness and networks for futures research activities.

3.1.5.3.1 Networked foresight activities

In the EIT ICT Labs 10 foresight activities with varying roles and scope were identified. All activities use sources from the within network; five leverage additional information from outside organizations and one seeks to integrate end-users as well. As can be expected, the network is used to identify new needs, emerging technologies, and—to a lesser degree—competitors' concepts at an early stage (initiator role of foresight). Several instruments consolidate opinions and help to identify new business models for either all network partners or those partners of the network that participate in the activity. In contrast, strategic guidance, the assessment and repositioning of the innovation portfolio and vision creation are mostly limited to the network itself. Some industry partners hesitated to disclose the use of information within their affiliation, especially concerning strategy development and core business. Others revealed that they are unsure to this moment how to effectively re-integrate information from the network in internal processes (outside-in). Finally, several instruments provide information to challenge basic assumptions and existing R&D projects,

and to scan for disruptions (opponent role of foresight).

In Table 8the foresight activities are matched to the three roles defined by Rohrbeck and Gemünden (2009). Additionally, the scope (contributors and beneficiaries) is shown.

Table 8: The scope and roles of foresight activities in the EIT ICT Labs.

No.	*Activity*	*Initiator role*	*Strategist role*	*Opponent role*	*Scope*
3.1	Action Lines	(✓)	✓		Closed network
3.2	Experience & Living Labs		✓	(✓)	Open (organizations & end-users)
3.3	Testbeds and Simulation Tools			✓	Closed network
3.4	Spearhead Research		✓	(✓)	Closed network
3.5	Business Modeling		✓	(✓)	Open (organizations)
3.6	Technology Transfer Program		✓	(✓)	Open (organizations)
3.7	Innovation Radar	✓	(✓)		Open (organizations)
3.8	Annual selection process		(✓)	✓	Closed network
3.9	Best-Practice Benchmarking			✓	Open (organizations)
3.10	Business Developer Program		✓	(✓)	Closed Network

✓ = primary role of the activity, (✓) = secondary roles of the activity

Based on the CIM evaluation and the futures research activity analysis the following conclusions can be drawn for the EIT ICT Labs:

- Within the EIT ICT Labs foresight that utilizes the network on various levels is practiced.
- Beneficiaries of these activities are the network partners and the network itself. However, efficient processes to benefit from the information within the partner organizations remain unclear.

- Some networked foresight activities, e.g. the Innovation Radar, are used to provide the basis for the process model of the network especially when it comes to external developments.
- Some activities, e.g. the action lines (thematic fields) and the selection process, could be applied further to guide the transition path towards an open network that generates excellent research and business results.
- The existence of a management team within the network facilitates the use of results from networked foresight to define and guide the future of the network.

3.1.5.4 Cross-case evaluation

3.1.5.4.1 Towards networked foresight within the three cases

In Figure 8 the classification of the foresight activities in terms scope and foresight role are shown on a grid for each case. Additionally, the shape of the boxes represents the type of activity in the sense of long-term program, time-limited project and non-recurring, singular activity. When comparing the three cases based on the earlier descriptions and analyses and the illustration above the following observations can be made.

In the WINN program a set of short-term, non-recurring foresight activities are conducted. These are managed by RWS with support by Deltares and partly with additional external participants. The emphasis of WINN activities is on the strategist role of foresight: first, to assess and reposition the portfolio of WINN and to provide strategic guidance for the program; second, to pool and consolidate knowledge and opinions related to water management. The former are those activities that are predominantly conducted between the contract partners RWS and Deltares, the latter within the larger, loosely coupled network of experts. Thus, WINN can be described as a bundle of conventional foresight activities to consolidate knowledge, to identify new ideas and to initiate new solutions for water management enhanced through external support and knowledge. In the sense of this article the WINN activities can be characterized as *foresight supported by a loosely linked network*.

EICT predominantly creates a platform for networked foresight ‘on demand’ and on a project basis. When one of the network partners requests futures research for a selected topic EICT creates a network tailored for that topic and provides the methodological background for futures research. The foresight activities are mostly mid- to short-term activities within the network of constant network partners or on a contractual basis. The strategic role of foresight for the corporate strategy of the partners is the focus of attention. The activities in this case can be described as *project-based networked foresight*.

The EIT ICT Labs are a network as such. Networked foresight is driven endogenously in selected fields with dedicated funds. Foresight activities are longer-term activities than in the other two cases. They are either completely open to outsiders or limited to the network partners. On first sight it appears that strategic information is the focus of the activities as well. However, especially the two aspects *consolidation of opinions* and *identification of new business models* are exploited within these strategic activities. The aspects concerning strategy and vision of the partner organizations are of much less interest. Thus, although the activities belong to the strategist role of foresight, they initiate, consolidate and evaluate new ideas, technologies, etc. as well. Furthermore, when considering the secondary goals of the various activities it becomes apparent that the opponent role is of great importance within the EIT ICT Labs as well. Futures research in the EIT ICT Labs can be characterized as thematically driven *networked foresight conducted by equal partners*.

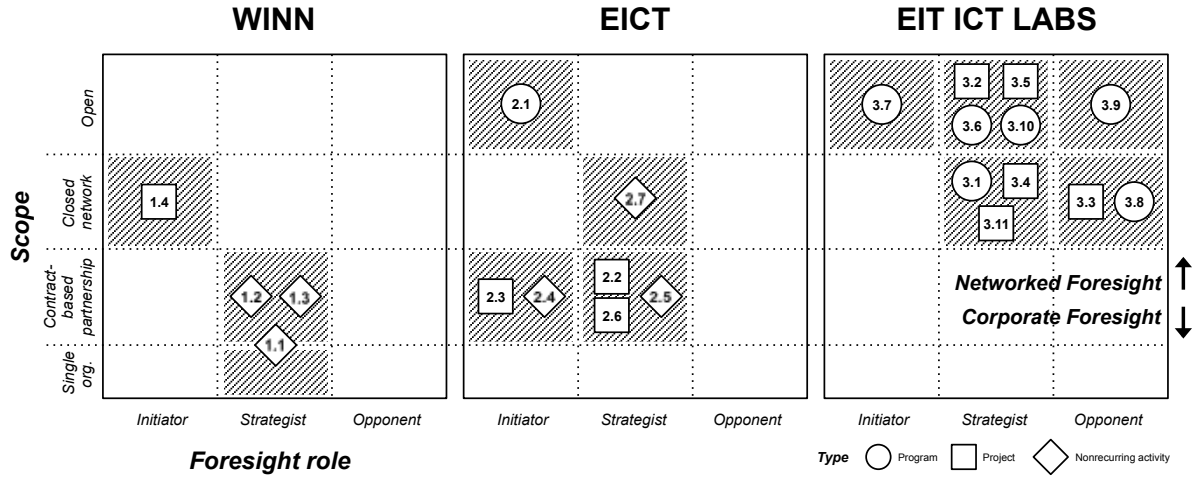

Figure 8: Foresight activities from the cases matched to foresight roles, scope and type of activity

3.1.5.4.2 Networked foresight linked to open innovation

When recalling the application of the Cyclic Innovation Model to the three cases at least three issues are noticeable: First, foresight can and should be used to develop a suitable process model towards an envisioned future of an innovation network. The networks can benefit from networked foresight especially due to its varying perspectives, diverse backgrounds of the involved people and broad information base. Second, foresight—and especially networked foresight—can also be used to guide the transition path towards the envisioned future. Third, the management teams of the three networks need to establish ways to integrate and utilize the information that its partners contribute. Furthermore, they should initiate instruments to help the networks' partners re-integrate the results into their organization.

When combining the differences in networked foresight with further research on collaboration in innovation at least two known process archetypes of open innovation are observable in the cases:

- In all three cases the foresight activities are used as information sources for initializing new activities internally within the network partner organizations (outside-in).
- In all three cases the network partners contribute information to the foresight activities independently from further use therein (inside-out). The degree of openness seems to vary.
- In the EICT and EIT ICT Labs cases the results are used for updating and refining product roadmaps and corporate strategy internally within the network partner organizations (outside-in).

Additionally, foresight activities in the WINN and EIT ICT Labs cases are used to provide information for guiding, shaping and modeling the future of the network *itself*, i.e. in terms of the CIM especially the image(s) of the future, the vision and the process model of the network. From the perspective of the network this is a *coupled* (outside-in and inside-out) information flow, from the perspective of the partners it is an *inside-out* information flow.

3.1.6 Conclusions

This paper aimed at exploring futures research in innovation networks by applying the Cyclic Innovation Model as analytical framework to three cases and analyzing foresight activities therein in terms of type, scope and role of each activity. The scope comprises contributors and beneficiaries, ranging from individual organizations to networks of organizations and end-users. The role refers to three known roles that foresight plays: the initiator, strategist and opponent role.

In the literature review two paths that indicate networked foresight as a next generation of futures research were identified: First, the close connection and analogies of innovation management and futures research hint at networked foresight as the logical next generation of futures research; second, the close connection between foresight, collaborative innovation and open innovation suggests that networked foresight is already being practiced, albeit not necessarily knowingly as discipline on its own.

The three cases—the WINN program managed by Rijkswaterstaat, EICT and the EIT ICT Labs—implicate that networked foresight is indeed in use. The application of the Cyclic Innovation Model shows that the envisioned and practiced openness of the three networks

differs substantially. Furthermore, the use of foresight within the networks could be increased i) to address the future of the networks themselves and ii) to adjust the process models and eventually the transition path. Doing this with the networks' partners promises to sharpen the results by including additional perspectives, ideas and stimuli.

The smaller networks of RWS and EICT concentrate on foresight with a focus on strategic implications, ideation or initiation of new business activities—thus the strategist and initiator roles of foresight[9]. In contrast, the opposition role of foresight is strengthened in the large network of the EIT ICT Labs. This appears to be explicable with the inevitably added new perspectives and consolidation of unconnected information through the network. Long-term foresight activities are predominantly conducted within the large network of the EIT ICT Labs. The same is true for foresight activities that are open to new participants. Thus, the analysis implicates that networked foresight activities are more likely to be activities with a certain degree of continuity, i.e. longer-term projects or programs. In contrast, the role of foresight is not limited. On the contrary, foresight that serves all three roles is facilitated when conducted in the networks.

It should be noted that this article is based on data from three cases. Although these give important impulses for research addressing foresight and implicate networked foresight as a new generation of foresight, empirical and quantitative analyses are needed in order to ensure reliability and generalizability of any conclusions.

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[9] In the context of innovation networks, the allocation of two aspects of the strategist role of foresight appears to be in need of further research: 'consolidation of opinions" and 'identification of new business models" appear to initiate new activities instead of altering strategy.

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3.2 The EIT ICT Labs - Towards a leading European innovation initiative[10]

In this introductory article to the EIT ICT Labs we outline its innovation ecosystem and recap the underlying motives for its foundation from the perspectives of industry, academia and society. The EIT ICT Labs are one of the initial Knowledge and Innovation Communities (KICs) of the European Institute of Innovation and Technology (EIT) that was founded in 2008. It bundles and facilitates the competences and resources of its 65[11] high profile partners from academia and industry to tackle the grand societal challenges such as ever increasing importance of ICT for various industries, the digitalizing energy environment and advanced mobility systems and the increasingly urbanized society.

3.2.1 Introduction

Innovation—the process of creating a new product or service from the initial idea to its introduction to the market (Hauschildt & Salomo, 2007)—has long been understood as driving force of corporate competitiveness and economic welfare of society (Solow 1959).

Information and communication technologies (ICT) are at the core of many products and have become the foundation for innovation in knowledge-intensive domains today. Besides the ICT sector itself as an important sector for economic growth, the importance of ICT for many related industries increases at a fast pace, e.g. in automotive, energy, logistics and health (Dutta, Lanvin & Paua, 2002; Hannan, 2009; UNDP, 2009). The importance of innovation in ICT becomes clear when considering the very short life cycles in the industry. Leading technology companies generate approximately 50% of their revenues with products less than two years old (Federal Ministry for Education and Research (BMBF), 2007). The ICT industry itself is characterized by strong competitive dynamics, quick technological changes and a high industry clock-speed.

3.2.2 Corporate innovation—from innovation silos to Open Innovation

The way towards new products has undergone substantial changes in the past. For long, R&D capabilities were closely associated with innovativeness of firms. Substantial efforts were put in keeping innovative results a secret; sharing of results was rare and occurred mostly in pre-competitive phases.

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[11] 65 partners at the time of writing the article, in 2020 more than 250 partners are in the network.

In the last two decades interorganizational cooperation has gained significant momentum (Hagedoorn, 2000). Today, closed innovation processes are no longer considered appropriate. Partnerships of multiple organizations with complementary assets are expected to outperform companies with closed innovation processes (Gassmann, 2006; Heger & Bub, 2012b). Companies adjusted their innovation processes accordingly: they emphasize the internalization of external knowledge resources and increasingly open up their formerly internal processes. Concurrently, efforts to add to early research on cooperative innovation, e.g. by Edquist (1997b) or Rigby and Zook (2002), were increased. Especially research under the term ‘open innovation‘ coined by Chesbrough (2003b) gained attention in the last years (Dodgson, Gann, & Salter, 2006a; Rohrbeck, Hölzle & Gemünden, 2009).

The main reasons for opening up corporate innovation processes can be summed up as follows:

- Complexity of products and services is ever increasing (Freeman, 1994; Teece, 1986). Technology fields merge and major advancements in various industries can be attributed to ICT-related services and technologies (Basole & Rouse, 2008; Federal Ministry for Education and Research (BMBF), 2007). Additionally, business models that integrate across various industries emerged. Knowledge and capabilities beyond the competencies of individual companies are required (Kontos, 2004).
- *Knowledge is spread in the value chain.* As a result, cooperation in the value chain is indispensable. Traditionally, it takes place along the value chain and aims at leveraging the core competencies of the individual partners. That way, organizations gain access to complementary knowledge and goods covering important segments of the value chain (often referred to as ‘vertical cooperation’). But in case of a common goal, competitors in the same industry can work together to pursue the goal jointly (‘horizontal cooperation’), e.g. concerning standardization issues. In both cases cooperation capabilities, corporate flexibility and agility are central corporate necessities (Ahn, 1995; Gulati, 1999).
- *Costs for and risk in research and development (R&D) can be distributed.* In large R&D projects expenditures can be spread among multiple partners. Moreover, the risk of failure decreases and long-term projects—often publicly funded—provide financial stability (Barnes, Pashby & Gibbons, 2002; Hagedoorn, 2000; Roberts & Liu, 2001).
- *Innovations are increasingly based on unconventional, creative or informal know-how*. The corporate innovation environment needs to encourage diffusion of unconventional, creative and informal knowledge into the organization.

Innovativeness is thus increased by dissolving corporate perspectives that became narrowed and phlegmatic over time (Ahuja, 2000; Bub, 2010).

- *Customer needs change at a fast pace*. Specialists and increasingly also untrained users create innovations at a fast pace to meet steadily changing customers preferences and needs. The probability that disruptive innovations originate from far-off regions is higher than ever today. Knowledge and competences for internalizing knowledge into the company is required to answer demand, development, competition and market dynamics adequately (Cowan et al., 2007; Gassmann, 2006).

Thus, the need for open innovation processes is widely accepted in the research and corporate worlds. However, effective and efficient organizational forms to conduct sustainable collaborative innovation are needed, just as ways for public authorities to support these efforts are needed.

3.2.3 Cooperation for innovation

Open innovation processes can be facilitated through stable partnerships that offer a legal, managerial and methodological framework. Collaborative innovation generation necessitates close relationships between the partners, mostly due to the socially embedded nature of knowledge creation (Brown & Duguid, 2001). Although somewhat special (Perkmann & Walsh, 2007), university-industry collaboration has proven to deliver innovations on a regular basis (Balconi, 2004).

3.2.3.1 University-Industry Collaboration (UIC)

Companies are usually profit-oriented, aim at winning a technological advantage over competitors, keep the time-to-market short (Gulati, 1999; Soh, 2005), keep knowledge that is crucial to their success internal, i.e. retain the exclusive rights for intellectual property (IPR), and eventually aim to produce superior products to competitors. Although the interests of universities are partly contrasting to these aims as we outline below, UIC brings along substantial advantages for companies.

- *Explorative capabilities:* collaboration in general was found to have positive, but varying effects for the ambidextrous company (Ahuja, 2000). Whereas collaboration with buyers and suppliers increases exploitative capabilities, co-operation with academic organizations address the challenging explorative capabilities (Faems, Van Looy & Debackere, 2005; Zahra & George, 2002).
- *Technological innovation capabilities:* research on the effects of industry-funded

university research revealed that UIC increases technological innovation capabilities. As a result economic competitiveness of companies increases as well (Berman, 1990).

- *Ways to master complexity:* early research on university-industry linkages also showed that UIC helps companies meeting the market demands resulting from the high complexity of products (Ahn, 1995; Teece, 1986; Utterback, 1994).
- *Access to information:* external and complementary information and resources become available and data on competitors becomes accessible through third parties (Soh & Roberts, 2005).
- *Knowledge transfer:* the translation of scientific findings into commercializable products has sped up significantly. Thus, companies are dependent on scientific results; tight collaboration with academia becomes indispensable (Ahn, 1995).

In sharp contrast to companies, universities aim for high-quality scientific results that are freely accessible under their label in high-rated journals, leading to recognition and reputation for the university, and eventually to serve the public good (Cohen, Nelson, & Walsh, 2002). Simultaneously, the identification, creation and eventually commercialization of knowledge have become vital objectives of universities (Etzkowitz & Leydesdorff, 2000). Thus, universities have an inherent interest in UIC for transferring their research results into companies and ultimately products. Most prominently, universities benefit by gaining access to (1) industrial expertise (2) empirical data and (3) financial resources. Also, (4) university researchers gain the possibility to easily exchange ideas with industry staff. Finally, (5) education is improved and turns to practical problems through the confrontation with real-world problems and collaborative problem solving with industry staff (Bonaccorsi & Piccaluga, 1994; Brenner & Sandström, 2000; Bub, 2010; Perkmann & Walsh, 2007).

3.2.3.2 Interorganizational innovation networks

A commonly used set of characteristics define interorganizational networks as consisting of at least three autonomous partners, a high degree of interdependencies among the partners, while also showing high levels of resource redundancies. They are polycentric and generate output based on collaborative activities of its partners (Kontos, 2004).

In regional innovation networks cooperation is limited by distance, thus few partners of a region co-operate. Porter (2000) identified three main effects of these clusters for the company: new business field creation is fostered, innovativeness of companies increases and their productivity improves. Other positive externalities include knowledge spillovers, access to highly skilled workers in the region and lower transportation costs.

The orchestration of networks is often conducted by hub firms (Rowley, 1997)—also known as key actors (Knoke, 1993), triggering entities (Doz, Olk & Ring, 2000) or network orchestrators (Batterink, Wubben, Klerkx & Omta, 2010). Often, these hub firms are network members that have a central position and possess prominence and power within the network structure. They push the network forward as they seek to create value and extract value for themselves (Dhanaraj & Parkhe, 2006).

Four to five different perspectives on interorganizational networks have been subject to research in the past. 1) The perspective of the whole network (Provan, Fish, & Sydow, 2007), closely related 2) the perspective of an industry (Hagedoorn, 2000); 3) the perspective of an orchestrating entity (Sydow, 1992); 4) that of a single partner organization in the network (Porter, 2000) and 5) that of the individual within the network (Kadushin, 2012).

3.2.3.3 Funding by public authorities

Reflecting recent changes in the European innovation landscape, large-scale and decentralized innovation networks develop. Most recently, the financial crisis forced companies to reduce R&D budgets while they simultaneously need to outcompete competitors through innovation. As a result, companies increase cooperative innovation efforts horizontally and vertically.

Due to the importance of innovation for economic growth, public authorities seek to drive innovative performance of society, i.e. the transformation of research results into new products and ultimately into economic welfare. On the European level, the European Commission aims to overcome the so-called 'European Paradoxon' (Dosi, Llerena, & Labini, 2006). The phenomenon describes the gap between high quality research results and lacking products on the market. Whereas excellent research results originate from companies located in the European Union—indicating high levels of research productivity and an apparently well-designed European funding system fostering collaborative research—the transfer into new products fails to materialize, yet (European Commission, 1995).

One major reason causing this phenomenon is insufficient knowledge transfer between academia and industry (Tijsen & van Wijk, 1999). Thus, the EC is actively encouraging university-industry linkages (Barnes et al., 2002). Therefore, it has established new processes for public R&D funding by transferring responsibility to long-term Public-Private-Partnerships, e.g so-called Joint-Technology-Initiatives (Koschatzky & Stahlecker, 2010) and eventually the European Institute of Innovation and Technology (EIT) in 2008 (European Commission, 2008).

3.2.4 The European Institute of Innovation and Technology (EIT)

In its efforts to promote integrated centers of excellence in research, education and innovation the European Commission has put out tenders for Knowledge and Innovation Communities (KICs) through the EIT in 2009. These KICs are supposed to improve the transfer of research results into new products; ultimately increasing economic welfare of Europe's society. The EIT's mission reflects the need to improve Europe's innovativeness directly. Specifically, its mission is

> *[…] to increase European sustainable growth and competitiveness by reinforcing the innovation capacity of the Member States and the EU […]. This translates into developing a new generation of innovators and entrepreneurs. To do so, the EIT has created integrated structures (Knowledge Innovation Communities, or KICs), which link the higher education, research and business sectors to one another thereby boosting innovation and entrepreneurship (European Commission, 2008)*

In 2009, three consortia were selected to become the initial KICs in the fields Climate Change, Energy and ICT. For the latter, a consortium of 20 core partners and approximately 45 associated and affiliated partners from industry and academia in Europe have joined forces to form the EIT ICT Labs.

3.2.4.1 The EIT ICT Labs

In the EIT ICT Labs, a central organization was founded for orchestrating the network activities and granting funding to the partners, the 'EIT ICT Labs IVZW'. Bound by partner agreements are national node organizations—Berlin, Eindhoven, Helsinki, Paris, Stockholm, Trento—that orchestrate activities regionally.

The EIT ICT Labs' mission is to turn Europe into a global leader in ICT innovation. More specifically, the EIT ICT Labs aim at (EIT ICT Labs, 2011):

- *breeding entrepreneurial top talents* in Europe by promoting creativity and entrepreneurial spirit in higher education;
- *speeding up ICT innovation* in Europe by providing labs for researchers, innovators and entrepreneurs;
- *generating leading ICT businesses* in Europe by supporting broader and faster productization of research results.

The facilitation of the partners' capabilities is implemented along the innovation process of *innovation creation*, *transition* and *acceleration* and the two channels *new business creation* and *innovation in established companies*. The innovation nucleus embraces entrepreneurial talent by providing adequate teaching methods and fosters knowledge creation through

advanced R&D instruments. Innovation transition and acceleration, i.e. facilitating valorisation and commercialization, is supported through end-to-end support for high potential ideas by various instruments of the EIT ICT Labs.

Underlying the innovation framework are the core notions of fostering and supporting open innovation, creating a culture of innovation and an attractive environment for entrepreneurs, researchers, developers and investors. Additionally, co-location centers were established in the six national entities to create neutral foundations for cooperative projects, to increase effectiveness of collaboration and to support facilitating and building up social networks (Figure 9).

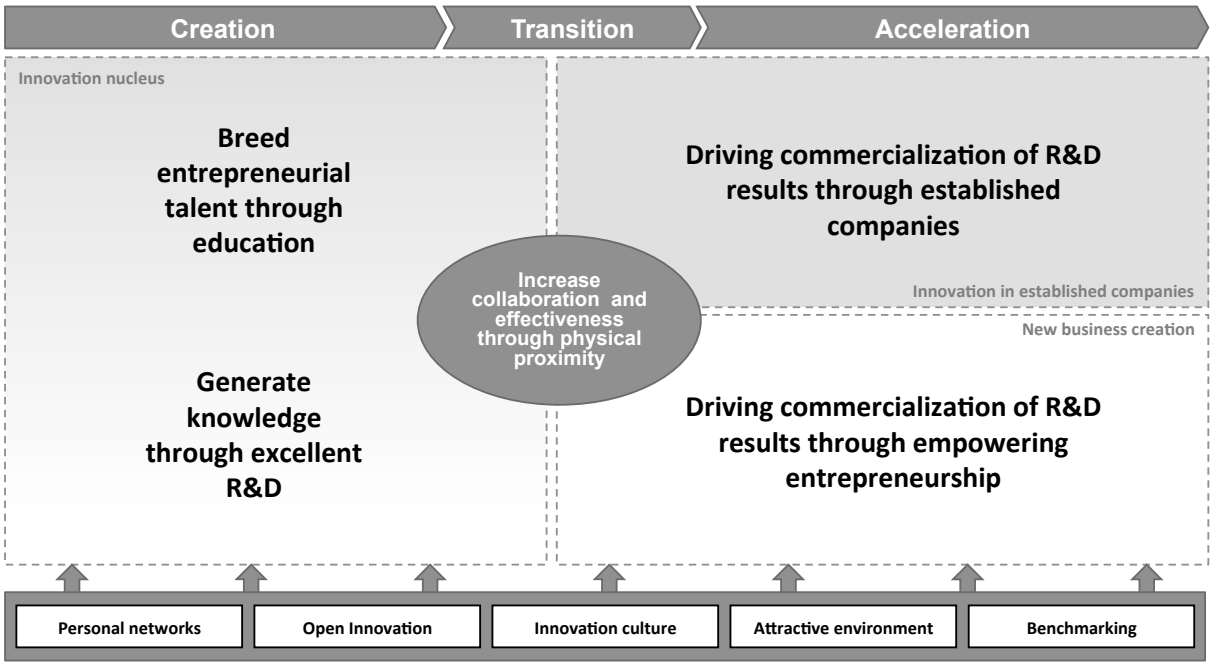

Figure 9: The EIT ICT Labs framework to foster innovation. EIT ICT Labs illustration based on own reflections early in the EIT ICT Labs concept development phase.

In so-called 'Action Lines' joint activities of the partners focus on deploying EIT ICT Labs methodological competences on major societal ICT challenges with high potential for innovation and business creation. 'Catalysts' bundle and provide the methodological competences. Currently, six application domains are addressed (EIT ICT Labs, 2011):

6. *Smart Spaces*, focusing on the creation of areas that enable the co-operation of objects, systems and individuals.
7. *Smart Energy Systems*, focusing on the smart grid, i.e. the application of digital technology to the electric power infrastructures, and especially smart energy management and green ICT management.
8. *Health and Wellbeing*, focusing on challenges resulting from demographic and societal

changes and the migration towards a user-centric system allowing people to live an uncompromised, healthy and pleasant life.

9. *Digital Cities of the Future*, addressing new challenges in security, environmental issues, transportation, water distribution and resource management in general resulting from migration towards cities.
10. *Future Media and Content Delivery*, addressing ubiquitous storage, delivery and usage of personalized content on a wide range of end user devices.
11. *Intelligent Mobility and Transportation Systems*, focusing on autonomous, accessible, sustainable and social mobility and safe and sustainable traffic and transportation systems in general.

With these six application domains the EIT ICT Labs seek to address the profound changes of private and business life that are currently taking place, to reflect the growth and high clock-speed in the ICT market and prepare its partners for increasingly intertwined industries. They are inherently supported by education, research and business progams. *Master* and *doctoral school* complement the research fields *cloud computing*, *cyber physical systems*, *Internet technologies and architectures*, *network solutions for future media* and *privacy, security and trust in the information society*.

3.2.4.2 The capability profile of the EIT ICT Labs in Germany

As one of the six national entities the EIT ICT Labs Germany aim to build up five capabilities supported and in close cooperation with the central European organization and the other five national entities.

The EIT ICT Labs bundle and facilitate the exchange of the competences and resources of its partner network of organizations from academia, industry and research institutes—supported by national and European public authorities (Figure 10).

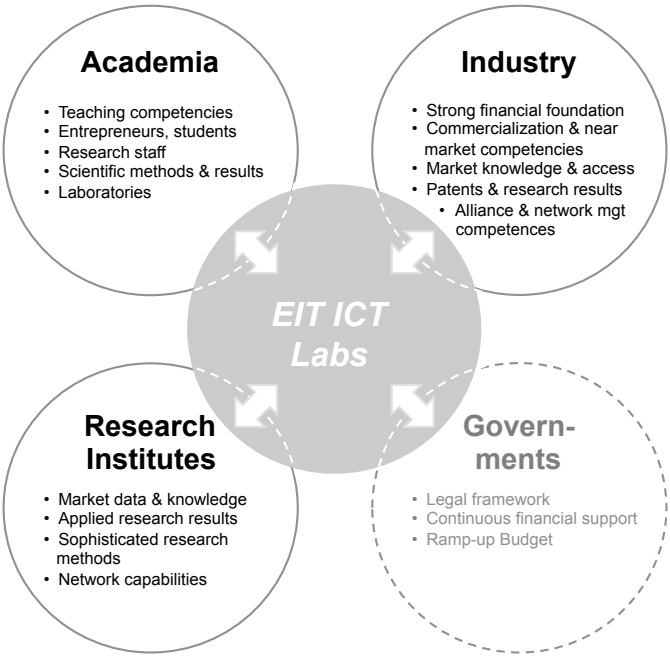

Figure 10: Complementary capabilities of academia, industry, research institutes and the backing of public authorities create the field of action for the EIT ICT Labs.

Compared to smaller, regional networks the EIT ICT Labs add support by a strong network of European innovation institutions from education, research and business. They provide highly qualified staff for the operations of the KIC and its national entities and access to thought leaders and political decision makers.

The EIT ICT Labs Germany provide office premises for co-located work to its partners in its so-called Co-Location Centre (CLC) in Berlin to support the partner organizations' aim to utilize cluster effects (Rohrbeck et al., 2009a) similar to those of Silicon Valley for ICT-related innovations (Saxenian, 1994) or Hollywood for motion picture development (Porter, 1998).

Finally, the EIT ICT Labs are a long-term initiative of all partners. Thus, they provide a stable institutionalized ecosystem to conduct collaborative innovation. They seek to promote the exploitation of research results subsequently to regular corporate or publicly funded research projects. In education, they aim at integrating state-of-the-art knowledge and entrepreneurship support into teaching activities of the academic partners. Thus, both channels are used for new business creation, start up creation and innovation in established companies.

Figure 11—based on reflections in (Heger & Bub, 2012c)—connects the core capabilities that the EIT ICT Labs Germany strive for. These five core capabilities reinforce each other and lead to a cyclic interconnectedness among them, facilitated by physical proximity, the backing of the national and European partner organizations, the other five national entities, and an institutionalized framework for the network.

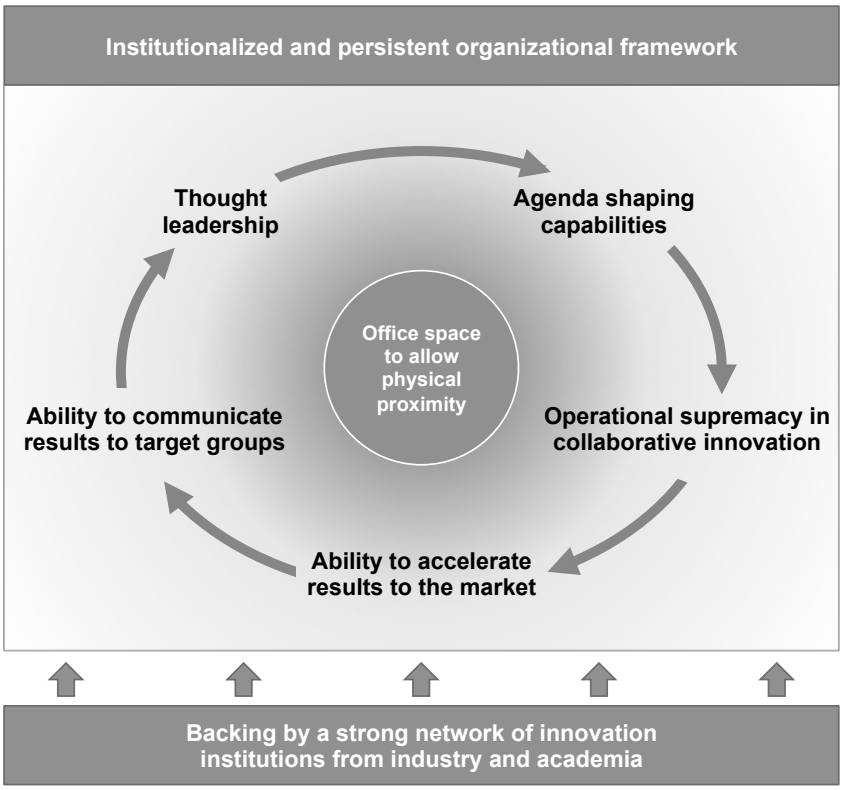

Figure 11: The capability profile and the supporting framework of the EIT ICT Labs in Germany [40].

The resulting ecosystem addresses each one of the previously mentioned challenges for corporate innovation (see 3.2.2). First, the broad network of partners covers various industries. Supported by methodological competences bundled in the 'catalysts', the *increasing complexity of products and services* is taken on. Second, the network integrates partners vertically and horizontally. Thus, *knowledge from various steps in the value chain* is at hand. Third, public authorities and all partners entered the EIT ICT Labs based on long-term commitments. Its ecosystem encourages collaborative R&D in remote fields of the partners' activities, thus *reducing costs and risks* for the individual partner. The Co-Location Centers facilitate *personal networks and the exchange of informal know-how* by providing office space and organizing events for people to meet and talk personally. Finally, *fast changing customer needs* will be addressed shortly by dedicated innovation instruments for user driven innovation.

3.2.5 Concluding remarks

In this introductory article to the EIT ICT Labs we have outlined the underlying motives for its foundation from the perspectives of industry, academia and society. We argued that the way of innovation to the market has changed drastically. Whereas companies innovated in closed R&D environments in the past, ignoring the potential that outside sources have, they opened up their innovation processes lately. The academic environment has changed as well, increasingly addressing near-market problems and seeking to exploit existing research results

commercially. Simultaneously, the ‘European Paradoxon’ prevails, i.e. research results are not efficiently transferred into products and ultimately economic welfare. Although the need for collaborative innovation in this context is widely accepted, ways to conduct and support collaborative innovation remain vague.

In 2008 the European Commission founded the European Institute of Innovation and Technology—the EIT. Therein, new ways to increase Europe’s and the partners' innovativeness are explored. One of the initial Knowledge Innovation Communities are the EIT ICT Labs. Therein, approximately 65 high profile partners from academia and industry are united.

Since the EIT ICT Labs are publicly funded by the EU, its mission is not only to address the imperative need of companies to innovate, but also to tackle the grand societal challenges such as the extensive and ever increasing importance of ICT in a huge number of products, the digitalizing energy environment, an increasingly urbanized society and advanced mobility and transportation systems. For this, the EIT ICT Labs aim at building up five core capabilities in Germany: *operational supremacy in collaborative innovation*, the *ability to accelerate results to the market*, the *ability to communicate results to target groups*, *thought leadership* and *agenda shaping capabilities*. Furthermore, the *institutionalized and persistent organizational framework*, including office premises that allow for *physical proximity*, and the *backing of the strong network of partners* provides the foundation for the creation of a leading European innovation initiative.

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3.3 Networked Foresight—The case of the EIT ICT Labs[12]

The objective of this article is to explore the value of networked foresight: foresight conducted in innovation networks for the benefit of the network and its partners with active contributions from the partners. Strategic management, specifically the dynamic capabilities approach and vast literature on corporate and strategic foresight argue that deficiencies like one-dimensionality, narrow-sightedness and myopia of closed corporate processes are remedied by incorporating external sources. A broad knowledge base promises to especially benefit foresight in multiple ways. Thus, we applied an analytical framework that integrates the dynamic capabilities approach with existing results on potential value contributions of foresight, enriched with existing findings in networked foresight and organizational design in the light increasing importance of interorganizational networks. We conducted a series of interviews and a survey among foresight practitioners in a network to explore the perceived value proposition of networked foresight for the network partners and the network itself.

The analysis is based on data drawn from the EIT ICT Labs network of large industry corporations, small-and-medium sized companies, and academic and research institutes. Our study shows that network partners use the results primarily for sensing activities, i.e. data collection and to a lesser extend activity initiation. More sensitive and fundamental organizational aspects such as strategy and decision-making or path-dependency are less affected. Especially SMEs may benefit substantially from network approaches to foresight whereas MNEs are more confident in their existing corporate foresight processes and results. The value for the network itself is substantial and goes beyond value creation potential for companies as discussed in literature. The development of a shared vision—relatable to organizational learning and reconfiguration capabilities—was identified as particularly valuable for the network.

3.3.1 Introduction

Maintaining competitiveness and corporate success in the long-term is the fundamental challenge that firms face and it is at the core strategic management research (Teece et al., 1997). Innovation has been identified as one factor that is vital for companies to become and remain at the competitive edge. For discovering and evaluating new technologies, concepts, trends and innovation opportunities companies frequently utilize corporate foresight

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instruments in the very early stages of the innovation process (Rohrbeck, 2011); often integrated into future-oriented departments like strategic planning, corporate development or innovation management (Becker, 2002; Rohrbeck & Gemünden, 2009; Vecchiato & Roveda, 2010). Foresight is commonly described as activities for scanning, sensing, interpreting, and utilizing internal and external signals for change: Further, the preparation for adequate organizational adaptations, the development of preparatory strategies to meet the challenges or even to influence the environment in a favorable way are part of foresight research. Corporate and strategic foresight limits the scope of research to firms (Rohrbeck, 2011; Slaughter, 1997).

Interorganizational cooperation in the form of innovation networks—here defined as co-operations of three or more organizations focusing on joint innovation activities—has emerged as a constant source of innovation in an increasingly complex and intertwined business world (Miles et al., 2010). Some authors, e.g. Miles et al. (2010), limit their discussion to 'multi-firm networks', a limitation that is deemed unnecessarily restrictive for this article. The substantially different resources and capabilities of firms and academic and research institutes increase the variety of assets available in networks (Lee, 2000). Complementary resources and capabilities of the partner organizations can be combined to create an integrated innovation basis—data, information, knowledge, capabilities, resources and other assets—for the benefit of the network and its partners (Cowan et al., 2007).

Foresight instruments that require a broad data basis appear to have the potential to greatly benefit from a network approach, especially from those with a heterogeneous partner structure. Thus, the emergence of 'networked foresight' as a new form of futures research appears to be imminent (Roveda & Vecchiato, 2008; van der Duin et al., 2014; Vecchiato, 2012). For example, van der Duin et al. (2014) explore the use of foresight in network settings based on three cases. They conclude that activities that could be characterized as networked foresight are already in use. However, this does neither happen necessarily consciously, nor is it managed adequately. Despite many similarities to corporate and strategic foresight fundamental questions seem to be unanswered for networked foresight, including, but not exclusively:

12. Why is a network approach promising for foresight?
13. Does networked foresight create considerable value?
14. If so, for whom: the network as organization itself or its partner affiliations?

In our analysis we understand networked foresight as being similar to corporate foresight but as conducted in interorganizational innovation networks with active contributions from the network partners and for the benefit for the network partners and the network itself. For finding first answers to these questions this article draws from research on strategic management and adjacent disciplines for the analysis. We use the dynamic capabilities approach as introduced by Teece et al. (1997) and advanced thereafter by several authors, e.g. Eisenhardt and Martin (2000); Helfat, Finkelstein, et al. (2007); Helfat and Peteraf (2009); Teece (2007); Teece et al. (2002); Zollo and Winter (2002), as basis for an analytical framework and cross-reference this with findings on value creation through corporate foresight, e.g. Rohrbeck (2012); Rohrbeck and Schwarz (2013); Rohrbeck and Thom (2010); Thom (2010); contributions on network approaches to innovation, e.g. Uotila, Mökimattila, Harmaakorpi and Melkas (2012), and research on organizational design for large-scale multi-party collaboration, e.g. Snow, Fjeldstad, Lettl and Miles (2010, 2011). The in-depth case study utilized for the analysis in this paper is the 'innovation radar' implemented by the EIT ICT Labs. EIT ICT Labs is a publicly funded European initiative of more than 100 partner organizations from academia and industry (Heger & Bub, 2012b). Its unique set-up and the foresight processes are described, followed by an in-depth analysis of these processes based on qualitative data that was collected in interviews, a survey among foresight practitioners that are linked to the EIT ICT Labs innovation radar and access to a wide range of documents and meetings of the network.

3.3.2 Theoretical foundation

3.3.2.1 Dynamic Capabilities

Strategy research in general and dynamic capabilities research in particular aims at understanding how firms can gain and sustain a competitive advantage over time (Teece, 2007). This includes identifying, responding to and creating environmental change, and it includes multiple levels of analysis such as information acquisition, managerial decision-making, organizational routines, competitive interactions and environmental change (Helfat & Peteraf, 2009). Dynamic capabilities research stems from the rationale that other research streams in strategic management such as the competitive forces approach emphasizing market power (Porter, 1985), the strategic conflict approach (Shapiro, 1989), or efficiency-based approaches such as the resource-based view (RBV) of the firm (Peteraf, 1993; Wernerfelt, 1984) do not adequately explain how and why some firms retain a competitive advantage in rapidly changing circumstances (Eisenhardt & Martin, 2000; Teece et al., 1997). The RBV provides reasonable explanations of the firm as a bundle of resources that may lead to sustainable competitive advantage in case a firm has resources that are valuable, rare,

inimitable, non-substitutable and allow for value-creating and hard to duplicate strategies. However, in case of rapidly changing competitive environments this has to be extended. Dynamic capabilities address integration, building, and reconfiguring internal and external competencies to act adequately upon identified changes (Eisenhardt & Martin, 2000).

Multiple approaches to the development of dynamic capabilities frameworks and definitions of dynamic capabilities exist, where four can be identified as being most influential (Di Stefano et al., 2010; Helfat & Peteraf, 2009). Teece et al. (1997) originally defined dynamic capabilities as 'the firm's ability to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments' (p. 128). Eisenhardt and Martin (2000) argue that dynamic capabilities alter a firm's resource base, which includes its physical, human and organizational assets whereas Zollo and Winter (2002) see dynamic capabilities acting on operational capabilities (Helfat & Peteraf, 2009). Helfat, Finkelstein, et al. (2007) extended the approach further by defining dynamic capabilities as 'the capacity of an organization to purposefully create, extend, and modify its resource base' (p. 4).

Although details in the approaches of the above-mentioned authors differ, the basic logic remains similar: dynamic capabilities involve processes that allow firms to obtain, integrate, and evaluate resources, leading to new combinations or reconfigurations of the firm's resource bases and eventually sustainable competitive advantage (Helfat, Finkelstein, et al., 2007). Core elements of the early framework for dynamic capabilities provided by Teece et al. (1997) are organizational and managerial processes, positions and assets, and paths (dependencies) of enterprises. Later, Teece (2007) specified the nature and microfoundations of dynamic capabilities further. Figure 12 shows the simplified chain of logic—or 'foundations of dynamic capabilities and business performance' as Teece calls it—of the dynamic capabilities framework (Teece, 2007; Teece et al., 1997). As Helfat and Peteraf (2009) explain, this is not in contradiction to the logic of the other defining articles named above, these rather specify dynamic capabilities further. For the creation of the analytical framework for networked foresight we proceed with the fundamental logic of dynamic capabilities as shown in Figure 12.

The core dynamic capabilities are 'sensing', 'seizing' and 'recombination and reconfiguration'. What Teece (2007) calls 'sensing' or 'opportunity identification' is referred to as dynamic capabilities that 'are related to the gain and release of resources' or 'for accessing outside knowledge' through alliancing by Eisenhardt and Martin (2000, p. 1108). Access to information is crucial to discover, develop and create new opportunities for the firm. It may lead to an 'effective combination of internally generated inventions; efficient and effective technology transfer inside the enterprise and between and amongst enterprises' (Teece, 2007, p. 1321).

It involves 'scanning, creation, learning, and interpretive activities' to 'scan, search, and explore across technologies and markets' (Teece, 2007, p. 1322). 'Seizing' then refers to the need to invest based on findings, i.e. actually acting on the insights to seize the opportunities (Helfat & Peteraf, 2009; Teece, 2007). According to Teece sensing and seizing lead to new positions and paths, eventually resulting in competitive advantages for the firm (Teece, 2007; Teece et al., 2002; Teece et al., 1997). Recombination and reconfiguration may then alter the assets of a firm in time. If this is a continuous capability it enables the firm to maintain its competitive advantage even in times of rapid change (Helfat & Peteraf, 2009; Teece, 2007). Figure 12 shows a synthesis of basic dynamic capabilities and its microfoundations according to above mentioned seminal contributions.

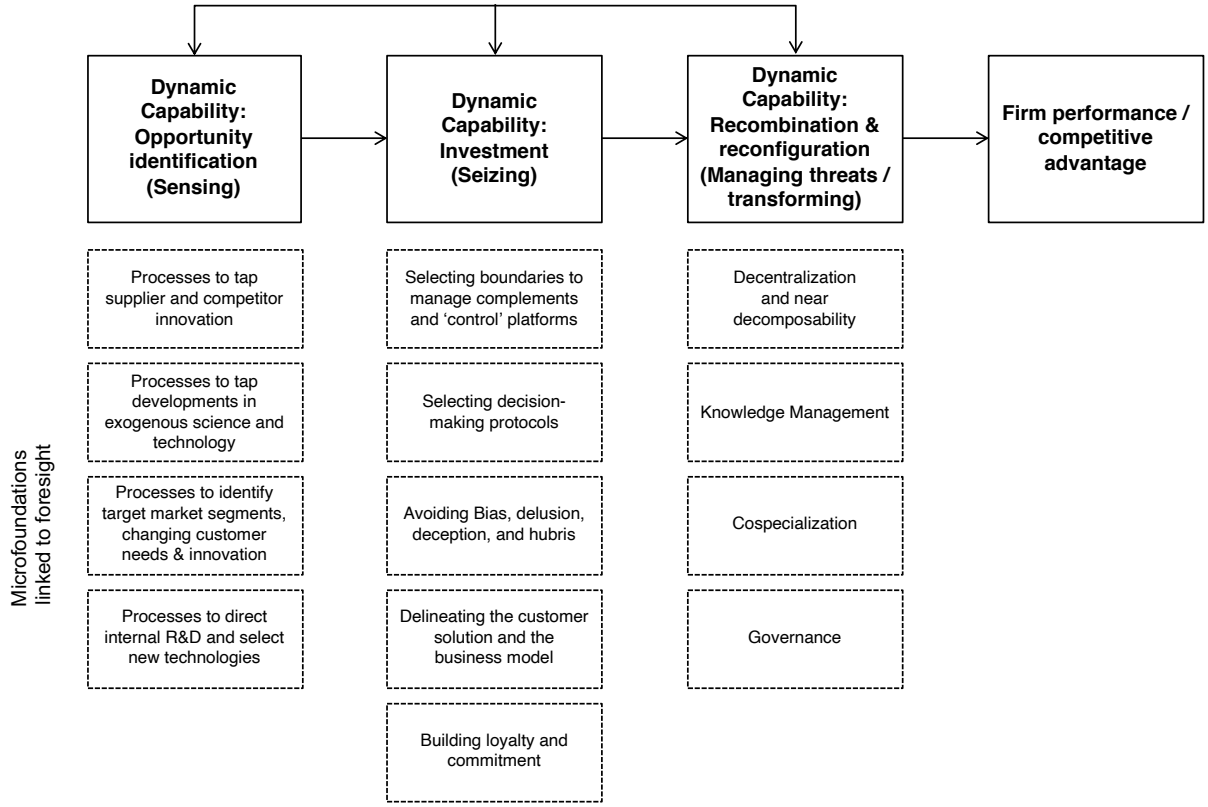

Figure 12: Basic Dynamic Capabilities framework and underlying microfoundations synthesized based on Helfat, Finkelstein, et al. (2007); Teece (2007); Teece et al. (1997).

3.3.2.2 Analytical framework: linking Dynamic Capabilities, foresight and interorganizational networks

Past research has generated profound knowledge on foresight. For example, the 'Strategic Foresight Issue' of Technological Forecasting & Social Change (volume 77, Issue 9) provides a collection of 24 articles related to foresight. Various aspects of foresight have been examined: the need for foresight, e.g. in Day and Schoemaker (2004), foresight processes and methodologies, e.g. in Becker (2002); Berkhout and Hertin (2002); Cuhls (2001); Tsoukas and

Shepherd (2004); Heger and Rohrbeck (2012); Rohrbeck (2011); Schwarz (2005); Slaughter (1997), and analytical and methodological improvements of foresight systems, e.g. in Becker (2002); Daheim and Uerz (2008); Rohrbeck (2011). Also, interest in collaborative foresight seems to be increasing as work on the topic starts to emerge, e.g. in van der Duin et al. (2014); Vecchiato and Roveda (2010).

We aim to contribute to the discussion on value creation through foresight, e.g. found in Burt and Van der Heijden (2008); Rohrbeck (2012); Rohrbeck and Schwarz (2013) and Vecchiato and Roveda (2010), specifically to value created through networked foresight: foresight activities conducted in interorganizational innovation networks. For this, we utilize the fairly continuous work about value propositions through foresight provided by Thom (2010), Rohrbeck and Thom (2010), and Rohrbeck (2012), lately added to by findings from Rohrbeck and Schwarz (2013). For our analysis we integrate these findings with the basic concept of dynamic capabilities provided by Teece and other authors (Helfat, Finkelstein, et al., 2007; Helfat & Peteraf, 2009; Teece, 2007; Teece et al., 2002; Teece et al., 1997). Further, we emphasize network aspects in this analytical framework based on Uotila et al. (2012), van der Duin et al. (2014), Vecchiato (2012); Vecchiato and Roveda (2010) and the special issue on organization design in Organizational Dynamics, volume 39, issue 2; particularly Snow et al. (2010).

In his dissertation on corporate foresight, Rohrbeck (2011) concludes that '[c]orporate foresight systems can be regarded as a dynamic capability that enables a firm to detect a need to renew its portfolio of resources' (p. 51). This article is based on the basic set of dynamic capabilities presented by Teece (2007). But we do not see this as contradiction to Rohrbeck's assessment, we rather understand his conclusion as an extension to Teece's work.

The analytical framework integrating the strategic management perspective with the emerging foresight perspective is shown in Table 9. This analytical framework can be applied on various organizational levels. In line with the focus of this paper on potential value creation on 1) the partner and 2) the network level, we utilize it for analyzing the results on these two levels in later sections of this article. In the immediately following subsections we elaborate on the assumed links between foresight value propositions and dynamic capabilities as shown in Table 9.

Table 9: Identifiable links of foresight value propositions, interorganizational networks and dynamic capabilities.

Value proposition group (VPG)	*No.*	*Value propositions (VP)*	*DC1: Sensing*	*DC2: Seizing*	*DC3: Recombination & Reconfiguration*
VPG1: Environmental scanning to enhance the knowledge base and trigger internal responses	ES1	Identification of relevant external change	NF		
	ES2	Early identification of competitor concepts and strategies	NF		
	ES3	Identification of new internal needs	F		
	ES4	Ensuring state-of-the-art innovation activities	NF	NF	
	ES5	Triggering new innovation activities		F	F
VPG2: Starting and facilitating strategic discussions to enable strategic change	SD1	Consolidation of opinions and triggering of discussions		NF	
	SD2	Challenge and change of existing mental models		NF	
	SD3	Initiation or moderation of strategic discussions		NF	
	SD4	Support for breaking away from path dependencies		NF	NF
	SD5	Creation of common view of things within organization	F*		
VPG3: Identifying and supporting acquisition of needed resources	AR1	Search, identification and evaluation of external resources	NF		
	AR2	Identification of new business models	NF		
	AR3	Support for make-or-buy decisions		F	F
VPG4: Additional value propositions	AV1	Support of organizational learning			F
	AV2	Shaping the future (e.g. by influencing other actors)	NF		

Table is based on Rohrbeck (2012); Rohrbeck and Schwarz (2013); Rohrbeck and Thom (2010); N. Thom (2010) for value propositions of foresight, Eisenhardt and Martin (2000); Helfat, Finkelstein, et al. (2007); Helfat and Peteraf (2009); Teece (2007); Teece et al. (2002); Teece et al. (1997); Zollo and Winter (2002) for integration into the dynamic capabilities framework and Berkhout and van der Duin (2007); Bouwman, Zhengjia, van der Duin, and Limonard (2008); Miles et al. (2010); Uotila et al. (2012) for deducing potential network impact.

3.3.2.2.1 Foresight and its link to Dynamic Capabilities

Foresight aims at sensing (ES1-ES5, AR1, AR2 in Table 9), explaining and interpreting (SD1, SD5, AV1), and utilizing signals for new developments to allow an organization to adapt accordingly (ES4, SD2-SD4, AR3). The reason for firms to implement foresight processes is that organizational decisions need to be made facing advancing uncertainty and increasingly complex and intertwined ecosystems. In fact, 'the global economy has become more open and

the sources of invention, innovation, and manufacturing are more diverse geographically and organizationally' (Teece, 2000, p. 1321). Accordingly, the developments to be covered by foresighting are very broad and include technological, political and societal trends, business discontinuities and potential disruptions, the rise of future business fields, etc. Krystek and Hahn (2000). Bringing together the knowledge from all these fields, foresight processes aim at providing a better understanding of future developments and at allowing a proactive approach to face the future (Becker, 2002).

A wide range of foresight methods and tools are available, e.g. roadmapping, scenario analysis, backcasting, s-curves or Delphi studies (Becker, 2002; Daheim & Uerz, 2008; Drew, 2006; Könnölä, Brummer & Salo, 2007; Mietzner & Reger, 2005). The application of these methods and tools can serve various specific goals such as developing new strategies in the light of new sociological, political, technological, environmental or competitive developments; testing these strategies, or identifying white spaces in the current portfolio (Rohrbeck & Gemünden, 2006).

However, organizations are in danger of becoming one-dimensional, narrow-sighted, myopic or even blind towards external trends and change over time (Day & Schoemaker, 2004). Thus, foresight processes are in danger of becoming ineffective due to a lack of relevant input. If not addressed adequately, organizational innovation potential and sensibility to change are weakened substantially and the long-term corporate survival is in danger (Könnölä et al., 2007). To work against this threat it is vital to incorporate external information and knowledge into the innovation and foresight processes for opening up new opportunities (Becker, 2002; Chesbrough, 2003a; Schumpeter, 1934; Teece, 2007).

The link between dynamic capabilities as described above and research streams concerned with the future orientation of organizations—environmental scanning, futures research, peripheral vision, and as integrative discipline corporate and/or strategic foresight—is recognizable in multiple ways. Key to the environmental scanning perspective is scanning for change in the environment (Hambrick, 1981, 1982). Building up adequate corporate scanning processes for identifying technological and market developments is addressed by research on peripheral vision (ES1, ES2, AR1, AR2) (Day & Schoemaker, 2004). Clearly, both potential value propositions are similar to 'sensing' as defined by Teece (2009): 'Management must find methods and procedures to peer through the fog of uncertainty and gain insight. This involves gathering and filtering technological, market, and competitive information from both inside and outside the enterprise, marking sense of it, and figuring out implications for action' (p. 16).

The futures research perspective is more focused on evaluating various possible futures and planning according to these possibilities (ES3, ES4) (Coates, 2004; Godet, 1979). Teece (2007) integrates 'interpretative activities' into 'sensing' while acting upon it (ES5, SD1-SD4, AR3, also ES4) is part of 'seizing' opportunities: 'Once a new (technological or market) opportunity is sensed, it must be addressed through new products, processes, or services' (p. 1326). Also, '[…] corrective strategies encourage change through two basic mechanisms: (1) designing organizational structures, incentives and routines, to catalyze and reward creative action; and (2) developing routines to enable the continual shedding of established assets and routines that no longer yield value' (Teece, 2009, p. 32).

Research on corporate and/or strategic foresight is broad and often addresses aspects from multiple or all the related research streams. It commonly aims at enhancing responsiveness towards change (Rohrbeck & Bade, 2012). Richard Slaughter defines (strategic) foresight as 'the ability to create and maintain a high-quality, coherent and functional forward view, and to use the insights arising in useful organizational ways. For example, to detect adverse conditions, guide policy, shape strategy, and to explore new markets, products and services. It represents a fusion of futures methods with those of strategic management' (Slaughter, 1998). Conceptual proximity to foresight value propositions ES5, SD4 and AV1 can be recognized as Teece (2009) states that '[a] key to sustained profitable growth is the ability to recombine and to reconfigure assets and organizational structures as the enterprise grows, and as markets and technologies change, as they surely will. Reconfiguration is needed to maintain evolutionary fitness and, if necessary, to try and escape from unfavorable path dependencies' (p. 34).

3.3.2.2.2 Dynamic Capabilities, foresight and interorganizational networks

Substantial technological breakthroughs usually happen outside of an organization. As Day and Schoemaker (2004) put it '[t]he key is to quickly spot those signals that are relevant and explore them further, filter out the noise, and pursue opportunities of the competition or recognize the early signs of trouble before they escalate into major problems' (p. 124). This can be associated to foresight value propositions ES1, ES2, ES4, AR1 and AR2 as listed in Table 9.

Chesbrough as a prominent representative of the open innovation paradigm states that 'firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as firms look to advance their technology' (Chesbrough, 2003b, p. 52). Several other studies came to the similar conclusion that organizations with complementary assets who cooperate will outperform those who innovate on their own (Edquist, 1997b; Gassmann, 2006;

Rigby & Zook, 2002). A the core of the open innovation paradigm is the importance of external search and integration of knowledge into an organization (Teece, 2007). Powell, Koput, and Smith-Doerr (1996), for example, provide empirical data that points towards a locus of innovation that lies within the network of incumbent and new firms, and research institutes in rapidly changing industries instead of internal developments (Chesbrough, 2003a; Teece, 2007). In the light of an increasingly intertwined world with constant change and the need for organizations to adapt to it, interorganizational networks with dissimilar but complementing partners, e.g. industrial and academic partners, bear the potential to provide necessary new knowledge and stimuli (Chesbrough, 2003b; Teece, 2007). Teece and Singh (1998) see collaboration-related capabilities as antecedent to competitive advantage. Teece et al. (1997), Helfat et al. (2007), Teece (2007), Rothaermel and Hess (2007) and Kathleen M. Eisenhardt and Graebner (2007) take the same line and constantly emphasize the importance of the ability to utilize and leverage networks to adapt to changes in multiple occasions in their research on dynamic capabilities. Inter-organizational networks can also provide access to resources that are otherwise, e.g. through mergers or acquisitions, hardly available (Gulati et al., 2000). A heterogeneous partner structure of the network brings along differing–at best complementing–knowledge, new or additional resources, new perspectives, new ways of doing things, and different priorities. Thus, interpretative activities (SD1 - SD4) that support seizing opportunities may benefit from network settings as well.

Research on corporate foresight focuses predominantly on Multi-National Enterprises (MNEs). However, the foresight needs of Small and Medium-Sized Enterprises (SMEs) differ significantly from those of MNEs as Jannek and Burmeister (2008) and Paliokaite (2010). Among other shortcomings, they show that SMEs should broaden their foresight horizons and should apply more sophisticated foresight instruments as they commonly do. In addition, they should draw from existing, external sources and adapt this knowledge to their own company and should seek involvement in networks as this is likely to trigger additional value associated with foresight.

When sourcing information from networks absorptive capacity becomes a key issue (Zaheer & Bell, 2005). Cohen and Levinthal (1990) originally defined absorptive capacity as ‘the ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends’ (p. 128). Zahra and George (2002) extend this definition by defining two types of absorptive capacity: potential absorptive capacity and realized absorptive capacity. The first refers to the acquisition and assimilation of external knowledge and enables the exploration of knowledge within networks. The latter refers to transformation of the collected knowledge securing the exploitation of knowledge. Uotila et al. (2012) emphasize ‘the role of

absorptive capacity as an important dynamic capability for an actor's success in carrying out innovation processes' (p. 30) and argue that an improved absorptive capacity improves the link of foresight processes and organizational innovation and learning activities. Moreover, they conclude that 'competitiveness-securing resource configurations have to be considered at the level of innovation networks—as individual actors are embedded in these networks. The capacity to absorb future-oriented knowledge in a dynamic fashion is seen as a crucial competitiveness factor for individual actors and innovation networks' (Uotila et al., 2012, p. 31).

In line with this argumentation both types of absorptive capacity are considered important for this article. First, potential absorptive capacity is crucial for actually identifying, collecting and especially interpreting knowledge that is won through foresight from the network. Second, the interpretative steps of foresight require realized absorptive capacities within the organization. At that, 'organization' can refer to both organizational types we include in our analysis: the partner organization of the network, and the network as organization itself. Both need to have absorptive capacity abilities to benefit from foresight processes.

When it comes to collaborative foresight some progress has been made recently. For example Jasner (2006) describes the foresight project 'Moonraker" initiated by the car manufacturer Volkswagen (VW). In this project, VW aimed at increasing the understanding of the US car manufacturing market. Success of foresight activities such as this was identified to depend on participation by a multitude of parties such as external experts, managers, decision makers, and other stakeholders (Daheim & Uerz, 2008; Paliokaite, 2010; Rohrbeck, 2011). Vecchiato (2012) discusses the roles a firm can seek in a multi-party ecosystem. He distinguishes two fundamentally different approaches. First, similar to Porter (1985) competitive forces approach in strategic management, organizations can adopt an exploratory approach aiming to position the organization in a mostly exogenous environment. Second, similar to the potential foresight value proposition AV2 as discussed by Rohrbeck and Schwarz (2013), firms can adopt a normative foresight approach. Here, the firm recognizes its (somewhat limited) influences on the ecosystem and proactively seeks to be involved in the development of the relevant environment. van der Duin et al. (2014) discuss the links of innovation networks and foresight from an innovation management perspective. Further, they explore the use of foresight in networks and applied instruments to some degree on an operational level and conclude that networked foresight is already in use in various forms, albeit neither necessarily consciously, nor managed adequately. Both shortcomings seem to be leading to a lack of utilization of the potential that networked foresight bears. Also on an operational level, Heger and Rohrbeck (2012) explore the collaborative use of foresight methods for early tasks in the innovation process, in their case business field exploration.

3.3.3 Study design

3.3.3.1 Research strategy

For exploring the use and value of foresighting in network settings this paper is based on a study of a single case: the EIT ICT Labs. A case study makes it possible to dive deeply into the phenomenon by using multiple data sources. The full richness of the focal phenomenon can be explored while also taking into account very slight twists and turns that might be of relevance for the study's objective. Thus, new meanings, different interpretations, and new theories, models and solutions can be identified and carved out (Dyer & Wilkins, 1991). For exploratory qualitative research characterized by little previous knowledge, case study research is therefore recommended (Eisenhardt, 1989; Yin, 2009, 2011).

For an optimal exploration of the alleged phenomenon 'networked foresight' a network with a large heterogeneous partner structure that focuses on innovation appeared to be suitable for several reasons: i) literature points towards benefits from a broad knowledge base that such a network has—see before –, ii) the implementation of foresighting processes involving several organizations of different types is more likely in large innovation networks than in other settings and iii) the potential use of foresight results in the network's partner affiliations is increased. Additionally, to suit the analytical framework as introduced before best it should be active in a rapidly developing industry such as ICT.

The EIT ICT Labs were chosen for this case study because it

15. has more than 100 partners from industry (small and large), academia and research institutes that potentially creates a huge knowledge base;
16. advertises a foresight process called Innovation Radar that aims at the 'identification of developments and trends in ICT and neighboring sectors' and the 'identification of innovation opportunities and commercialization potential' (Boman & Dunaj, 2012, p. 3);
17. seeks to apply this foresight process for 'achieving results through involvement of partners and making them available to partners' and 'creation of cohesion within […] and EIT by referencing to internal experts' (Boman & Dunaj, 2012, p. 3);
18. the study of van der Duin, Heger, and Schlesinger (2014) already identified it as a network that conducts foresight for the benefit of the partners and the network organization itself.

3.3.3.2 Data collection and sample

For data collection a series of 49 interviews and an online survey among foresight

practitioners in the network were conducted. Additional material was used to gain insights into organizational processes and observe use of the data firsthand.

3.3.3.2.1 Semi-structured interviews

The interview partners were chosen from different hierarchical levels within the partner affiliations and the EIT ICT Labs for minimizing biases and to allow for triangulation of results when associating them with other data sources. The interviews were semi-structured, meaning an interview guideline with a catalogue of questions was created (see appendix for details). The questions were selected depending on the role and function of the interviewee and context-specific. Of all 49 interviews 63 percent have been recorded and transcribed. In the remaining interviews the interview partners were hesitant to answer when being recorded, thus notes taken from memory after the interviews were compiled.

See Figure 13 for details of the interview partners' functions, Figure 14 for the distribution of types of partner affiliations. For the classification we defined MNEs rather broad as companies with annual revenues of more than 500m EUR and operations in more than two countries. SMEs are all companies that do not meet these criteria. Academic Institutes are universities and the like, i.e. institutes with a public teaching assignment whereas Research Institutes are Institutes focused on applied research without teaching assignments. At the time of the interviews, the CEO of the network organization was solely affiliated with the specially founded legal entity that is responsible for orchestration of the activities. Thus, although the number of interviews was 49, only 48 persons can be associated to partner affiliations. Anecdotal evidence has been cited for the purpose of induction, i.e. identifying or understanding new phenomena related to networked foresight.

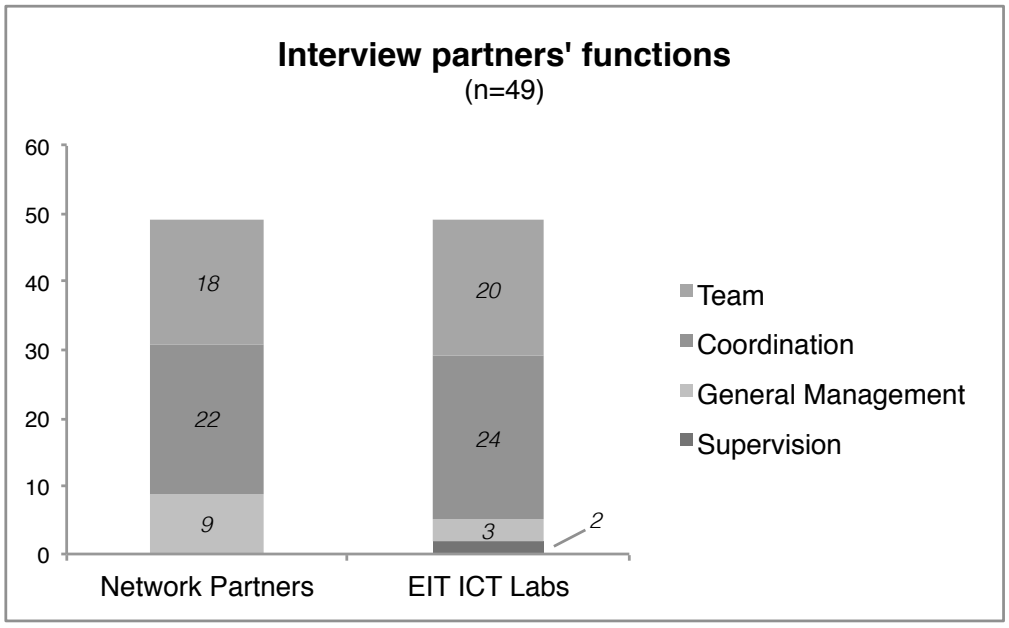

Figure 13: Interview partners' functions within partner affiliations and EIT ICT Labs.

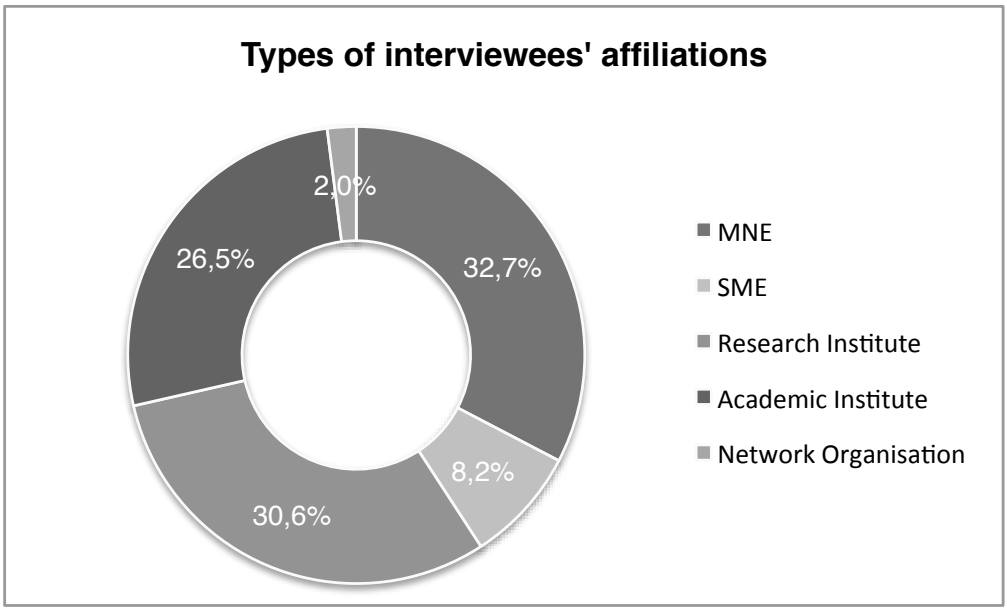

Figure 14: Interviewees' partner affiliations

3.3.3.2.2 Survey

The online survey was targeted at foresight practitioners that have or had access to results originating from the foresight activities in the network. For the development of the survey we relied on existing research on value propositions through foresight, in particular Rohrbeck (2012); Rohrbeck and Thom (2010); Thom (2010). Potential value propositions AV1 and AV2 were not included in the survey since they were introduced by Rohrbeck and Schwarz (2013) after the polling period. Still, the data allows drawing some conclusions for these potential value propositions. The method poll is based on the method collection and evaluation provided by Mietzner (2009).

From 110 invited persons that were provided by the lead of the Innovation Radar 54 completed the survey (response rate = 49,09%). See Figure 15 for the distribution of the survey participants' affiliation types (see appendix for questionnaire). SurveyMonkey[13] and the built-in possibilities for data analysis such as filters, cross-tabs and keyword-based text analytics were used for producing the enquete and for processing and evaluating the survey replies.

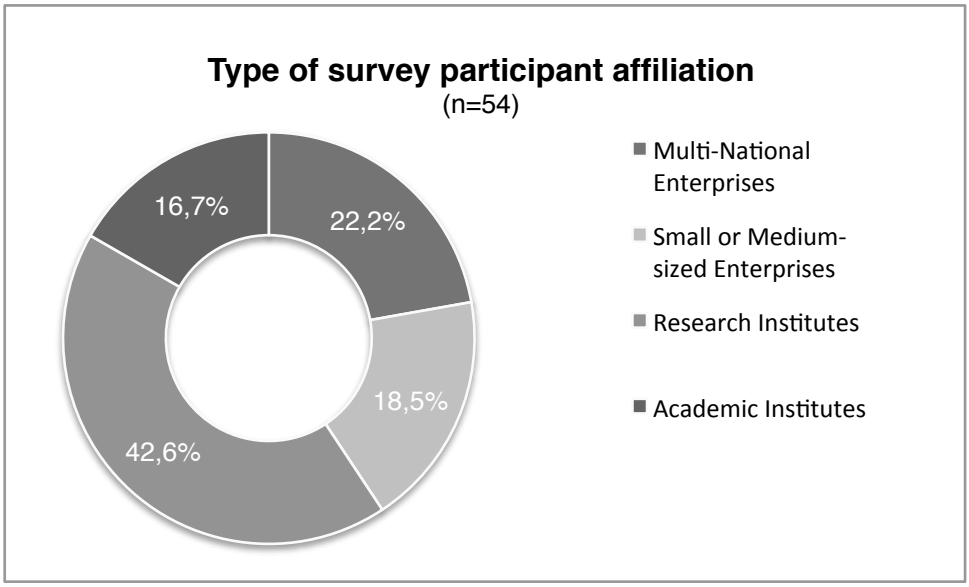

Figure 15: Distribution of survey participants' affiliation types

3.3.3.2.3 Additional data sources

Additional data that was utilized include access to key documents, such as internal strategy documents and participation in meetings, access to the network's intranet, presentations and meeting minutes, workshop material, and observations through participation in management meetings.

3.3.4 Case: foresight in EIT ICT Labs

3.3.4.1 EIT ICT Labs

The European Institute of Innovation and Technology (EIT) was set-up by the European Commission (EC) in 2009 as an independent body to drive innovation in Europe. For this, the EC has put out tenders for three Knowledge and Innovation Communities (KICs) through the EIT, each one focusing on one of the priority topics climate change and mitigation, sustainable energy, and information and communication technologies (ICT). The basic prerequisites for EIT funding were integration of partners from industry and academia, partners from at least three EU countries and credible concepts for increasing innovation in one of the three priority

[13] Fore more information see https://www.surveymonkey.com

topics (European Parliament and the Council of the European Union, 2008).

EIT ICT Labs, one of the three initial consortia, aims at turning Europe into a global leader in ICT innovation for driving economic growth and quality of life (EIT ICT Labs, 2012c). The facilitation of the partners' capabilities in the EIT ICT Labs is implemented along the generic innovation process of 'innovation, initiation and creation', 'transition' and 'acceleration' and within the two channels 'new business creation' and 'innovation in established companies' (Heger & Bub, 2012b, 2013). The organization was set up to embrace the 'open innovation' notion, to create an attractive environment of innovation for entrepreneurs, researchers, developers, and investors and to work closely with end-user communities. The regional 'nodes' operate physical 'Co-Location Centres' (CLCs), co-working spaces for the partners' staff and project teams to work collaboratively in seven European innovation hot-spots: Berlin, Eindhoven, Helsinki, London, Paris, Stockholm, and Trento. Further nodes are likely to follow shortly in Madrid and Budapest.

Technology transfer, innovation transition and acceleration are supported end-to-end by various methodologies and instruments operated by the EIT ICT Labs. One of these strategic instruments of the EIT ICT Labs is the Innovation Radar (IR). IR is a foresight instrument that was created for utilizing the broad information basis at hand (Boman & Dunaj, 2012).

3.3.4.2 Networked foresighting in the EIT ICT Labs

The EIT ICT Labs Innovation Radar is an instrument for creating business intelligence and leveraging on information, mapping the future of ICT and building scenarios for the future, identifying disruptions and discontinuous change, utilizing the network of experts, and disseminating foresight results among the network partners.

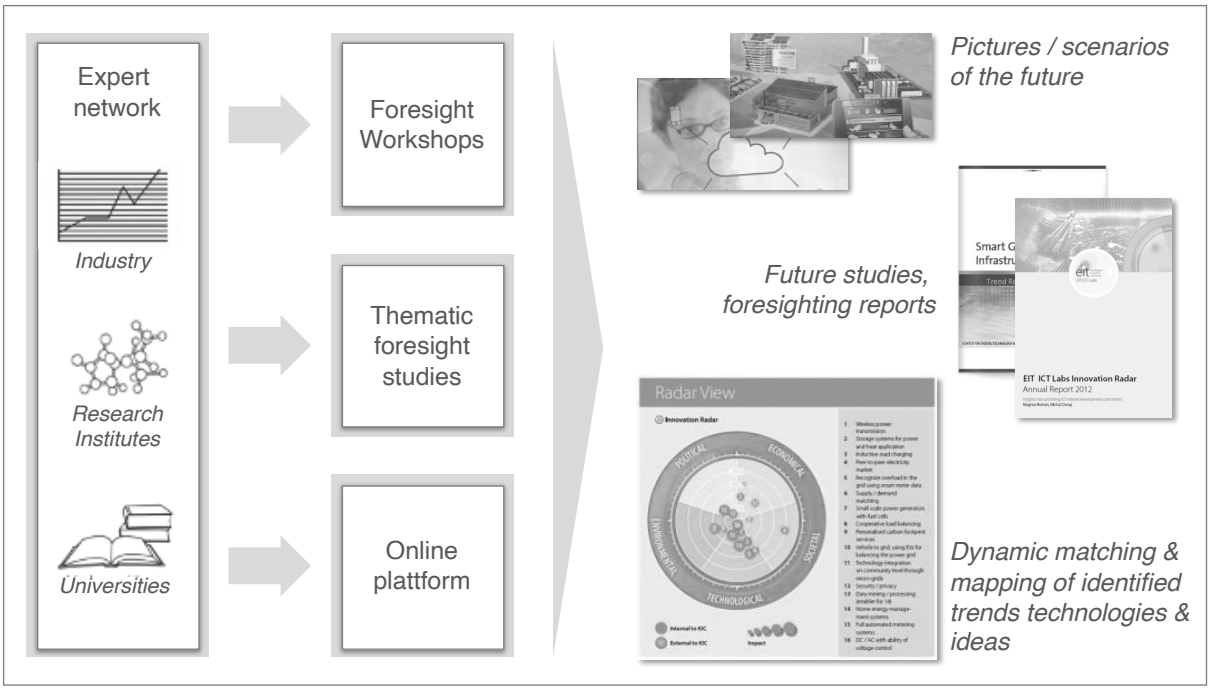

Figure 16: Foresight set-up in the EIT ICT Labs and expected deliverables.

When planning the EIT ICT Labs foresight activities a participative approach has been chosen (Thom, 2011a). Thus, for achieving the above objectives four basic streams were established: i) foresight workshops, ii) thematic foresight studies iii) white paper development and iv) an online platform, see Figure 16. Tangible output of these activities include future scenarios for selected topics, future studies and reports and a dynamic 'radar screen' that matches and maps identified trends, technologies and ideas. Figure 16 shows these streams and the results illustratively.

3.3.4.2.1 Foresight workshops & speedwriting

Foresight workshops are usually organized with the short-term goal to present material for a study, gather opinions on a specific topic and bring together the experts for this topic from the network partners. Besides common workshop formats such as brainstorming, speedwriting was adopted.

Speedwriting is more often employed in creative artistry, such as performance art or musical composition, than in management. Speedwriting as a tool for generating innovative ideas has as old roots as classical brainstorming (Lehrer, 2012), having been introduced already in 1948 by Osborn (1948). It usually starts with a radical way of formulating observations on innovation. Subsequently, it proceeds with a session for noting down trends, ideas, and new concepts within the theme and discussing them with the peers present during the sessions. Thus, potentially new information can float freely between the workshop participants, concepts are discussed and inherently a common understanding of the topics at hand is created. Based on

the group discussions and resulting clusters, writing groups are set up for each cluster that elaborate further on the chosen topic within a pre-defined timeframe.

The output of a completed speedwriting process is not a coherent report, even after editorial efforts. Typically, buzzwords, slogans, provisos, tacit assumptions, as well as shorter pieces of text are produced. That said, speedwriting output may serve as well as background- or inspirational workshop material.

3.3.4.2.2 Foresight studies

Foresight studies are an integral part of the foresight process in EIT ICT Labs. They provide deep technical and conceptual insights into new trends, ideas and technologies. Based on initial expert workshops the foresight foci are defined. Results of the workshops include clearly defined topics, Action Points, deadlines, and lists of relevant internal and external experts. For subsequent steps experts from the network are selected based on a competence repository that sports a profile of competencies and interests. Additionally, external experts might be invited if deemed necessary.

A designated researching and writing period follows the initial workshop. During this period the writing team is responsible for acquiring additional input from the known experts and their personal networks. The expert base at hand includes technical and thematic researchers, business experts, investment managers and executives from the partner organizations. Virtual meetings, e.g. through phone or video calls, Google Hangouts or other online tools, and physical meetings are arranged as part of this process. Foresight reports undergo a thorough quality check with a formal feedback form, an editing process, and professional publishing support is consulted before completion and publication of the reports. First, only EIT ICT Labs partners have access to the studies via the network's Intranet and digital circulation. After a grace period of around three months the studies are disseminated publicly. The time lapsed from study initiating to its public dissemination is less than one year. This is a constraint adopted to vouch for timeliness and beyond state-of-the-art analyses of disruptions and their associated challenges and opportunities.

3.3.4.2.3 White paper development

White paper development is a second formal foresight process within EIT ICT Labs. They have a broader scope and cover sociological, political and business aspects in addition to technical aspects. Middle management in the network that usually has deep thematic knowledge commonly initiates white paper development. Subsequently, the white papers are produced by writing teams consisting of experts from industry, research institutes, and academia and entrepreneurs from the thematic area. These teams are encourage to draw

information from additional sources that would usually not be available on this scale, e.g. corporate reports, scouts from multiple organizations or scouting material that is usually reserved for internal use but made available to network partners.

Sketches of the reports are subject to two peer-review rounds. In the first round, the reports are quality-checked by experts from within the same thematic area that may subsequently be involved deeply in the further white paper development process. Also, it incentives the reviewing efforts with involvement in the publishing process later on. In the second round, an editing team peer reviews the paper again, providing an additional fresh informant perspective helping to reduce possibly biases. At a deeper level, the online tool supports the dynamic nature of knowledge creation since experts at any time can login and update the digital material. Hence, the reports and the white paper become static reports of a dynamic knowledge acquisition and employment process.

3.3.4.2.4 Online platform

Due to the geographical distribution and the network's virtual character an online platform was recognized indispensable for supporting the collection and assessment of information in the networked foresighting efforts (Haegeman, Cagnin, Könnölä, Dimitrov, & Collins, 2011). The tool in use since 2012 is built upon Atlassian Confluence[14]. Its use is manifold as internal conferencing tool for expert discussions, repository for profiles including competences and interests of experts, sharing material within the network without being hampered by company restrictions on the use of other collaboration and sharing platforms such as Dropbox, Skype, Google Drive or Chat, etc., and displaying items (trends, technologies, products, services, etc.) related to thematic fields dynamically on a 'radar screen'.

The currently prototypical dynamic radar screen displays the items based on three criteria in three different ways: 1) six arcs of the virtual radar screen categorize an item into political, economical, sociological, technological, environmental and legal developments; 2) the distance from the centre reflects the immediacy of their occurrence or relevance and 3) the colour reflects the type of item, i.e. product, service, or other. Similar tools are in use in large enterprises, e.g. Deutsche Telekom (Rohrbeck, Heuer & Arnold, 2006). The prototype currently in use in the EIT ICT Labs online displays all information dynamically, i.e. upon change of an item the view changes immediately as well, see Figure 17 for an illustrative radar screen.

[14] For more information about Atlassian Confluence see www.atlassian.com/software/confluence/

Figure 17: Screenshot of prototypical dynamic radar screen

3.3.5 Early empirical data on networked foresighting

In the following sections early empirical data on networked foresighting in the EIT ICT Labs is shown and discussed in the light of the analytical framework provided before. Before the data for the analysis of the three key questions guiding the article is discussed, we discuss context information that was retrieved in the interviews and the survey.

3.3.5.1 Context

Context information is emphasized as important when describing and discussing management theories, e.g. by the contingency theory or, specifically for foresight systems, by Rohrbeck (2011, p. 73 et seqq.). In our study we take into account the foresight settings in the partner organizations, the preferred ways of processing foresight results and the openness of the partner organizations.

3.3.5.1.1 Foresight settings in partner organizations

The large majority of survey participants is aware of foresight activities in their partner affiliation (78.3%). The highest value comes from Multi-National Enterprise (MNE) participants. The lowest value, though still 68.4%, applies to research institutes (see Figure 18).

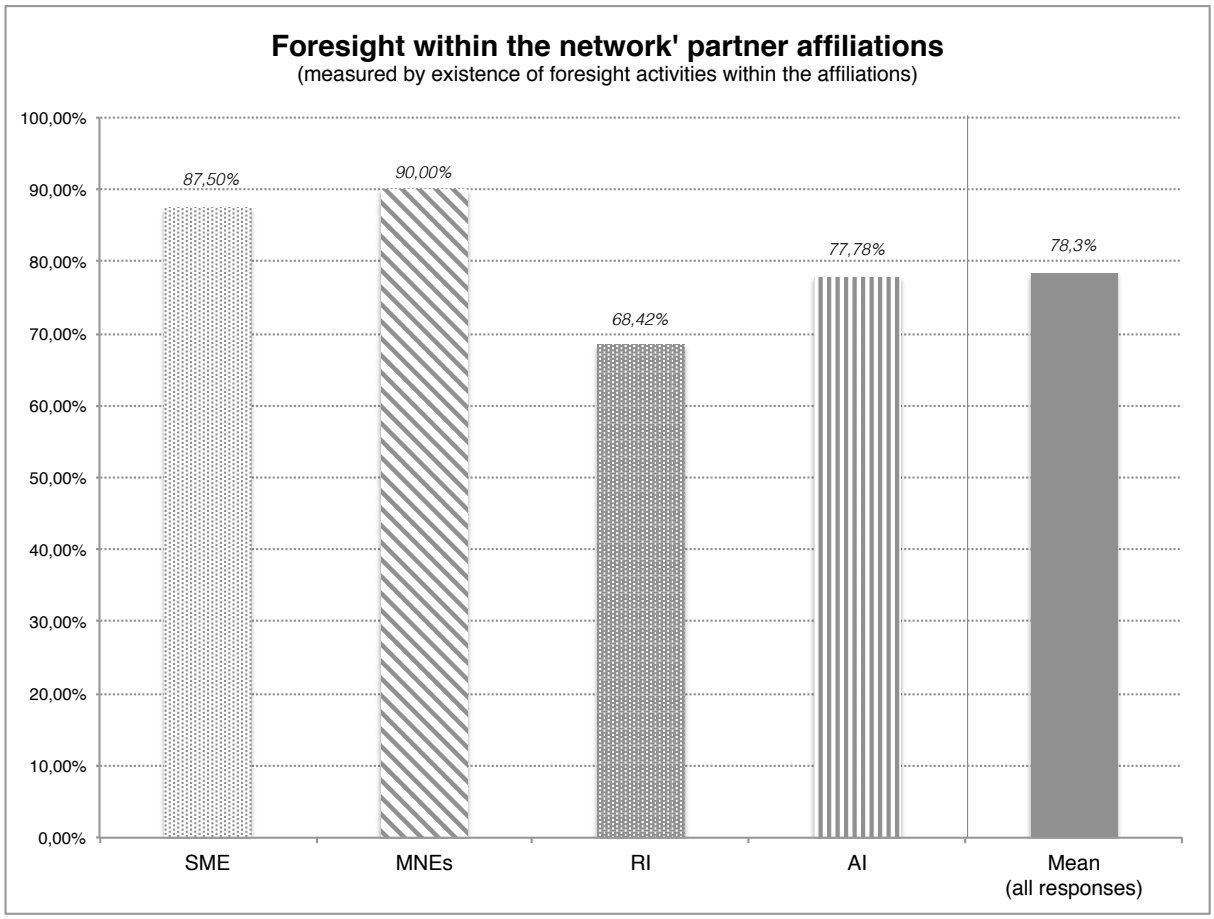

Figure 18: Foresight-awareness in EIT ICT Labs partner affiliations

The range of instruments applied as foresight instruments within the partner organizations is broad (see Figure 19). In total, research institutes (RIs) as a group have the broadest range of instruments applied for foresighting, whereas academic institutes (AIs) apply the most limited set of instruments. Single MNEs apply more instruments on average. Noticeably, methods based on quantitative data like trend extrapolation and patent or publication analyses are conducted more often by MNEs and research institutes. Sophisticated instruments—in terms of time, reach and thus costs (D. Mietzner, 2009)—like scouting networks and environmental scanning can be found mostly in MNEs. MNEs and Small to Medium-sized Enterprises (SMEs) value qualitative instruments like expert workshops and business modelling equally. SMEs avoid effortful instruments like trend extrapolation, patent & publication analysis and life-cycle analyses.

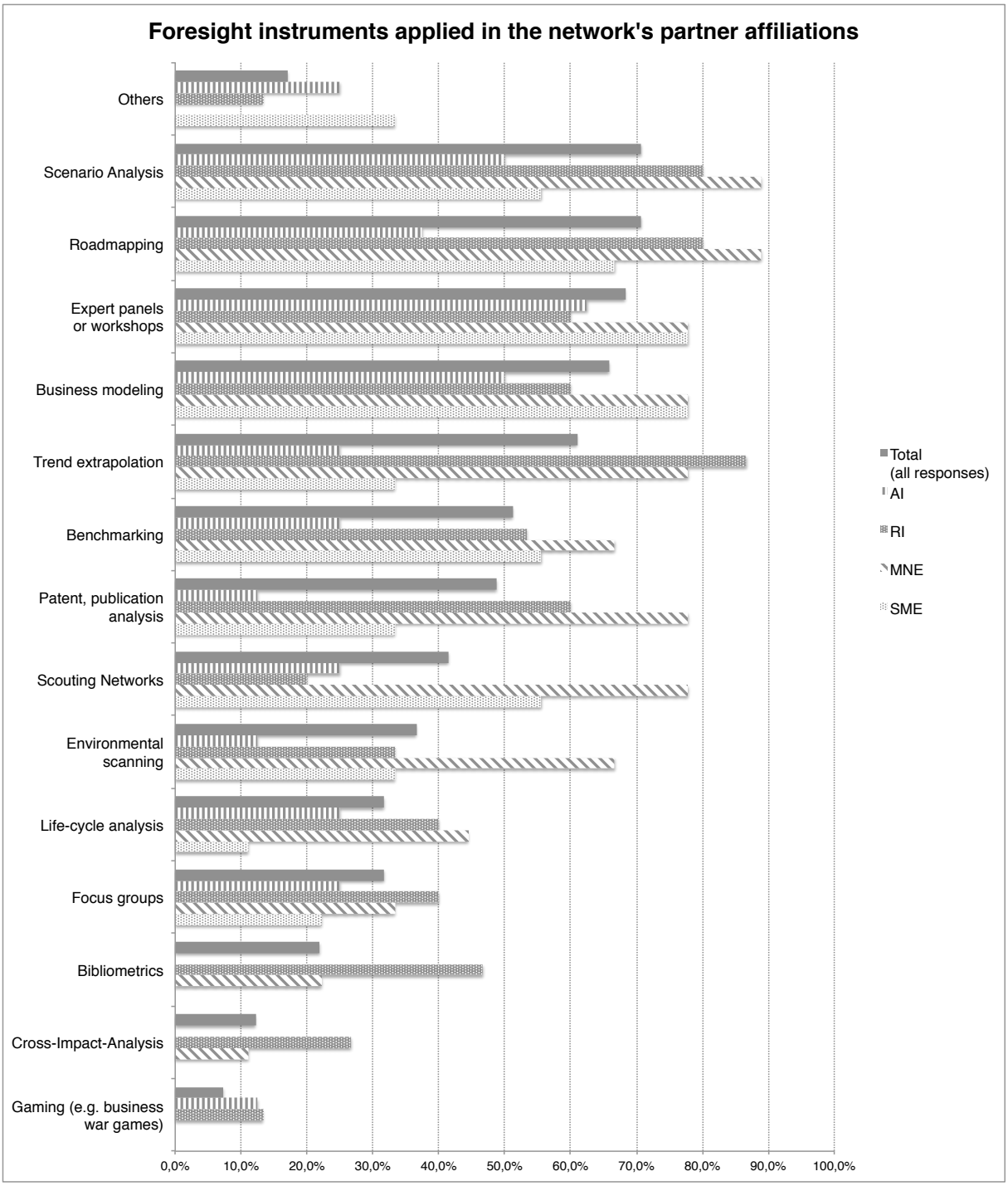

Figure 19: Instruments applied for foresighting, partner-specific

Conclusion 1: Multiple foresight instruments are in use in all four types of partner organizations. Whereas MNEs apply nearly all listed foresight instruments, SMEs are reluctant to apply sophisticated and thus costly methods like patent and publication analyses, trend extrapolation and environmental scanning. Thus, whereas all partners may benefit from improved foresight, the benefit may be especially high for SMEs.

3.3.5.1.2 Processing of foresight results

The core results of the EIT ICT Labs foresight activities include studies and reports, and dynamically and up-to-date displayed foresight information that is accessible at all times. One of the core differences of these two output formats is editing. Study and report development follows a similar approach to scientific publications. This means they undergo thorough editing and usually several feedback iterations with the involvement of methodology and thematic experts until a final version is approved, published and distributed (see 3.3.4.2.4 for the detailed process description). This process takes between several months and one year.

In contrast, experts also have access to the online platform and may enter new data anytime. As soon as new input is entered the data is integrated into the dynamic radar screen–providing up-to-date information at all times.

Figure 20 shows the partner affiliations' preferences for processing the foresight results. In total, 51.4% prefer studies, reports or similar professionally edited but static output. 48.6% prefer up-to-date online visuals that are mostly unedited but dynamic. Most strikingly, respondents from AIs favor the former, while respondents from SMEs and MNEs prefer up-to-date information.

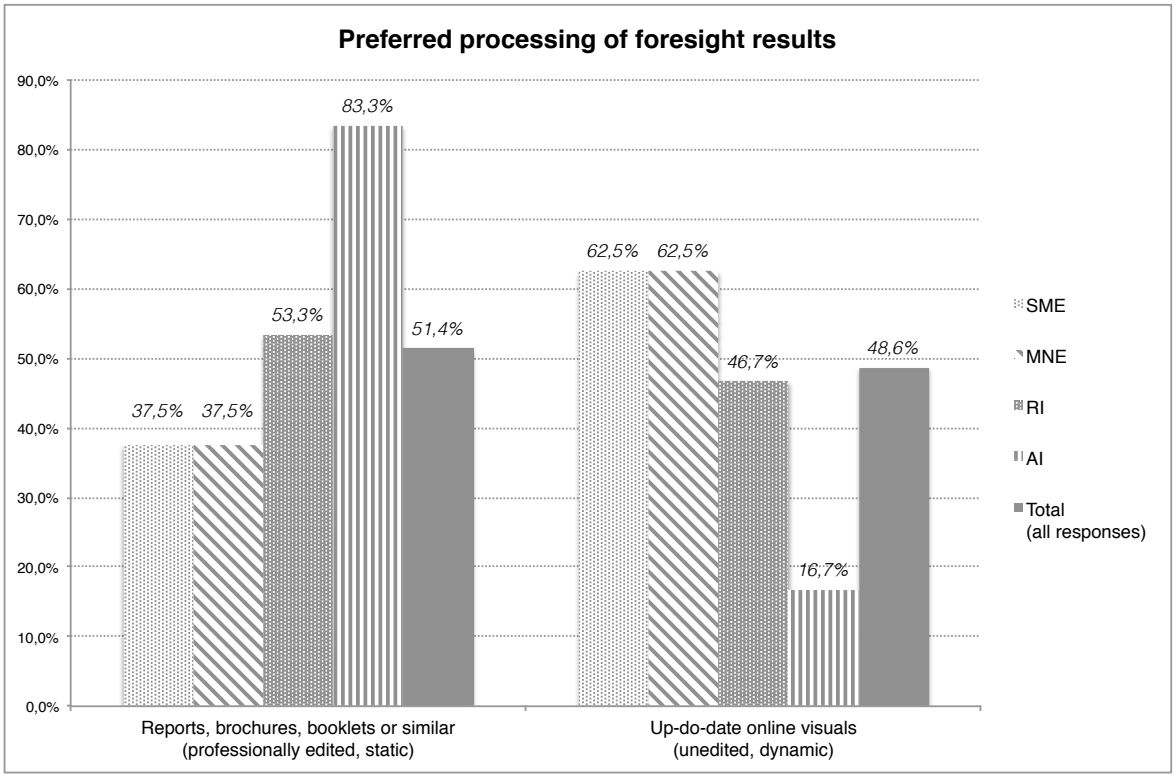

Figure 20:Prefered processing method for foresight results.

Conclusion 2: Reliable, edited, but static reports remain valuable and are especially important to the scientific ecosystem. In contrast, companies value dynamic, up-to-date, but unverified data due to their immediate applicability.

3.3.5.1.3 Openness

The EIT ICT Labs' mission is to 'drive European leadership in ICT innovation for economic growth and quality of life' (EIT ICT Labs, 2012b, p. 8). One of two pillars of the implementation of the EIT ICT Labs strategy is 'catalyzing open and collaborative ICT innovations strongly driven by perceived market opportunities' (EIT ICT Labs, 2012b, p. 8). A key part of this is sharing available foresight data with fellow network partners. Our data–both interviews and the online survey–indeed point toward an open attitude among the affiliations. One interview partner (Researcher & Technology Lead Innovation Management, R&D department, MNE) put it as follows:

> It was natural for [our organization] to join and use the EIT ICT Labs since we as organization embrace open innovation and the EIT ICT Labs are effectively an 'open innovation network'. … For the industry partners I expect the goal to be to actually practice open innovation instead of just propagating it. *Researcher & Technology Lead Innovation Management, MNE*

The survey provides more nuanced results (see Figure 21). 9.8% of all survey participants stated that their affiliation shares no information at all. However, of those that are sharing information a third selects the information to share and another third shares selected information with selected partners only. Thus, in total 68.3% differentiate when sharing information . In line with this is a statement from the interviews:

> Actually, they [the partners] don't want to do open innovation but they want to be involved somehow and be open in one direction only: outside-in. *Research Policy Director, RI*

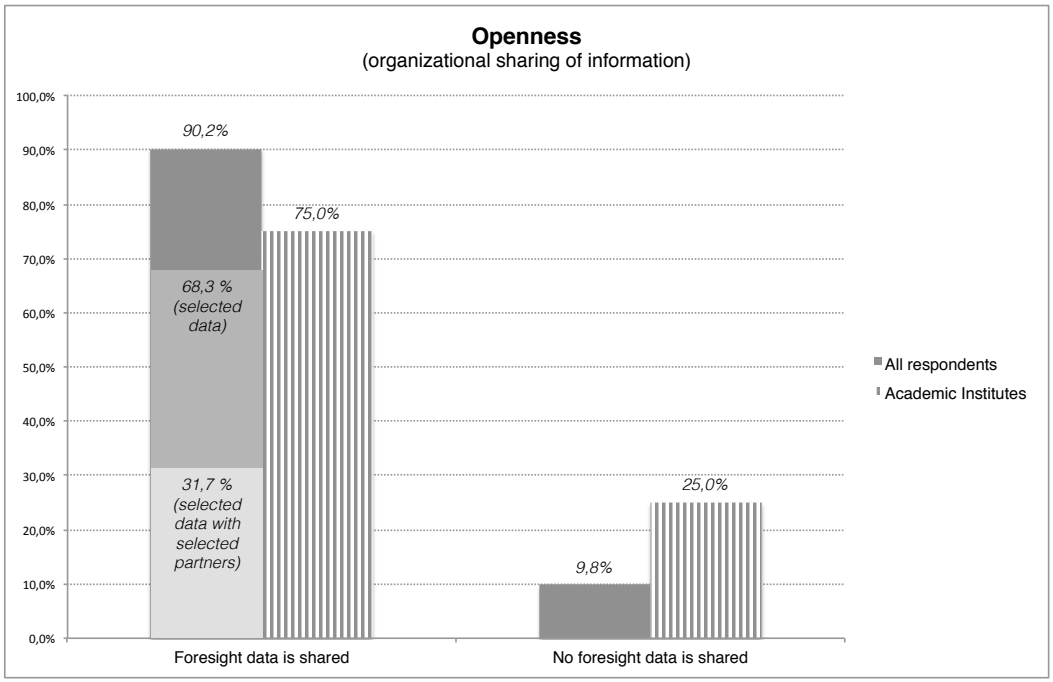

Figure 21: Openness of partners as indicated by organizational sharing of foresight data

When it comes to foresight in the network about two thirds (65.9%) of the respondents state that they make suchlike information available to fellow network partners, i.e. nearly all that make any information available at all.

Conclusion 3: Partners show a generally open attitude towards sharing some information. This was expected since only partners from within the network were part of the interviews and survey, thus they have already come to the decision to join this network with its core notion of open collaboration. This may be seen as backing for the choice of the case since our aim was to analyse networked foresight, openness for collaboration is a pre-condition for this.

Conclusion 4: Information is shared preferentially in a somewhat controllable environment. Noticeably, academic institutes are most reluctant while SMEs are most open. The reluctance of academic institutes comes rather unexpected since academic institutes increasingly adopt open access mandates ("ROARMAP: Registry of Open Access Repositories Mandatory Archiving Policies,")—a policy compelled to making publications freely accessible. It is explicable for unpublished data that lacks processing. The openness of SMEs is in line with conclusion 1 that already points to the high potential of networked foresight for SMEs.

3.3.5.2 Relevance of network set-up for foresight in the EIT ICT Labs

Before focusing on potential value propositions of networked foresight the general relevance of the network approach can be doubted, i.e. whether the network set-up has any recognizable effects on the results produced. The following two quotes indicate at least perceived effects of the network approach for the interviewees:

> Given the network and the different expertise and perspectives–industry, R&D, policy-makers–represented, ICT Labs is in a position to achieve a much better coverage than a single institution. *Area Head, RI*

> With a more differentiated set of participants in foresight studies, with their own expertise and inside knowledge, the foresight [results] will become more accurate and cover more ground. *Researcher & Teaching Assistant, AI*

One operational issue is how to share the information as one respondent remarked: '[We] don't know where to drop [the information]'.

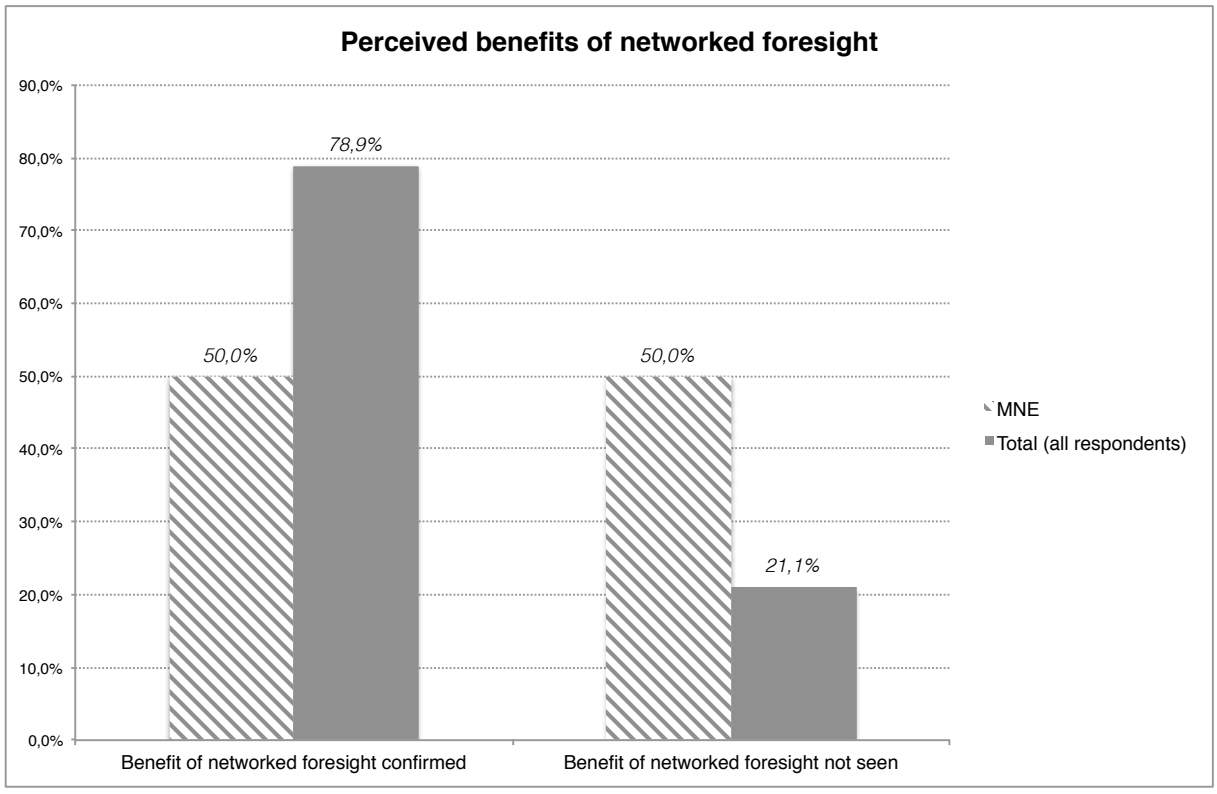

Figure 22:Perceived benefits of networked foresight as conducted within the EIT ICT Labs

78.9% of the survey participants indicated that the foresight results of a networked organization such as the EIT ICT Labs could potentially gain better foresight results than their own affiliation. A principal scientist of a RI takes the same general line of argumentation but qualified his statements when stating:

> Broader expert base, familiarity with a broader multiple perspectives (education, research, business) [are benefits]. On the other hand it may [prove] difficult to develop a common language and coherent ways of working. *Principal Scientist, RI*

As this statement indicates the picture changes slightly when analysing the results in depth. Whereas SMEs, RIs and AIs show very high confidence in the networked foresight results (100.0%, 85.7%, 83.3%) respondents of MNEs were more reluctant (50.0%), see also Figure 22. One of the MNE respondents put is as follows:

> [It] depends on the topic, but mostly activities that are done internally are more focused on the specific needs of the company. … We are also fully connected and more focused. *Strategy Consultant, MNE*

This comment and another comment from a MNE respondent—'the question is whether there are different results'—emphasize that MNEs (at least those of the respondents) have own foresighting activities and that its employees are confident in their results.

Conclusion 5: Data from our studies indicates that networked foresight provides richer and broader data than that within organizational boundaries, allows for additional perspectives and is especially relevant for data collection and activity initiation within the partner organizations. This points towards increased coverage, and accuracy of the results, allowing us to connect this to value propositions ES1, ES2, AR1 and AR2, i.e. sensing from a dynamic capabilities perspective. At the same time the data indicates that either i) our hypothesis that internal issues, i.e. internal needs, mental models and path dependencies (ES3, SD2, SD4), would benefit from a network approach is not sustainable or ii) the survey participants and interviewees fail to see the potential value for internal issues that we expect. This aspect is clearly in need of further research.

3.3.5.3 Value creation through networked foresight

The EIT ICT Labs do produce foresight output. In 2012, two foresight studies, three foresight technical Reports, an annual trend report, and four documented workshops with more than 100 participants in total were developed and published[15]. Nevertheless, the question whether this output created any value remains valid. In the case of foresight results originating from the network this question can be divided into at least two parts: i) was any value created for the network partners and if yes, what kind of value? ii) was any value created for the network itself and if yes, what kind of value?

[15] The documents are available through http://eitictlabs.eu/news-events/documents/

The EIT ICT Labs is by statutes and constituent conventions (EIT ICT Labs, 2012b; European Institute of Innovation and Technology, 2009; European Parliament and the Council of the European Union, 2008) an instrument for achieving the goals of the stakeholders. In the case of the EIT ICT Labs these are its industry partners, research and academic institutes, and the European Commission (EC) representing European society. For the former three partners question i) applies. The interests of society were prescribed in the terms for eligibility of a consortium to be funded by the EC (European Institute of Innovation and Technology, 2009; European Parliament and the Council of the European Union, 2008). Thus, they are at the very core of the network's strategy and are enforced by its management, thus making question ii) valid here.

3.3.5.3.1 Partner perspective

In the literature review we summarized the known potential value propositions of foresight and linked these to the dynamic capabilities framework. In our survey we were able to poll for the value that EIT ICT Labs foresighting created for the partner organizations based on the value proposition groups 1—3 (VPGs) of our analytical framework. As result, we were able to rank our data according to the perceived value of the foresight results emerging from the network for the partner affiliations.

Table 10: Ranking of potential value propositions of networked foresight based on its acknowledgement by the partners.

*Rank**	*VP*	*Dynamic capability*	*Potential Value Proposition (VP)*	*% of partners acknowledging value creation through foresight for VP …*	
				Regulary	*Irregulary*
1	ES4	*DC1*	Ensuring state-of-the art innovation activities	81.58 %	97.37 %
2	SD1	*DC2*	Consolidation of opinions and triggering of discussions	78.95 %	94.74 %
3	ES5	*DC2, DC3*	Triggering new innovation activities	65.79 %	92.11 %
4	ES1	*DC1*	Identification of relevant external change	56.41 %	94.87 %
5	SD3	*DC2*	Initiation or moderation of strategic change	53.85 %	92.31 %
6	SD5	*DC1*	Creation of a common view of things within the organization	50.00 %	90.00 %
7	SD2	*DC2*	Challenge and change of existing mental models	41.03 %	89.74 %

8	ES2	*DC1*	Early identification of competitors' concepts and strategies	35.90 %	79.49 %
9	SD4	*DC2, DC3*	Support for breaking-away from path dependencies	30.00 %	70.00 %
10	AR2	*DC1*	Identification of new business models	28.95 %	84.21 %
11	ES3	*DC1*	Identification of new internal needs	25.00 %	80.00 %
12	AR1	*DC1*	Search for, identification and evaluation of missing resources	*23.68 %*	71.05 %
13	AR3	*DC2, DC3*	Supporting make-or-buy decisions	15.38 %	64.10 %

* The ranking is based on % of partners acknowledging regular value creation for the stated item

97.37% of all respondents stated that data originating from foresighting within the network is reused within their affiliation and that it creates value at least on an irregular basis. Noticeably, the lowest ranks are all directly linked to internal activities such as make-or-buy decisions, searching for missing resources, and identifying internal needs. These items are closely bound to organizational characteristics, are strategy-related and are commonly strictly confidential information.

Conclusion 6: Network partners predominantly see value originating from networked foresight in the EIT ICT Labs for sensing and seizing dynamic capabilities whereas little value is seen for activities that involve internal matters (by less than 50% of all respondents on a regular basis). This result appears to be in line with conclusion 5 and points towards a need for further studies.

In several interviews and descriptive responses in the survey a general doubt about the reintegration of information into the affiliation's context was implied. For this, multiple reasons are possible: 1) low quality or a lack of accuracy of the results, see for example Tsoukas and Shepherd (2004); Schwarz (2005); 2) missing fit of the results, see for example Rohrbeck (2011, p. 151 et sqq.); 3) a lack of incentives and involvement of relevant people, see for example Rohrbeck (2011, p. 156 et sqq.; 170 et sqq.;); and 4) a lack of absorptive capacity—the organization's 'ability to recognize the value of new information, assimilate it, and apply it to commercial ends' (Cohen & Levinthal, 1990, p.128). More precisely, in this case the adoption capacity might not be designed for or not be mature enough or for this kind of information.

Conclusion 7: Exploitation, absorption and adoption of networked foresight data in the network partner organizations is not yet clear and needs further investigation.

3.3.5.3.2 Network perspective

In addition to the value creation through foresight activities for the partner affiliations as described above, the interviews and survey responses point to several aspects that are related to the network itself, not the partner organizations.

First, *shaping and driving the* ecosystem. In the case of the EIT ICT Labs the network was initiated to improve welfare of European society by driving European leadership in ICT innovation (European Institute of Innovation and Technology, 2009; European Parliament and the Council of the European Union, 2008). One capability that a network needs to posses for achieving this is shaping the innovation agenda to actually set the topics for the future instead of reacting to it, corresponding to AV2. For being able to set the innovation agenda a fundamental acceptance and reputation in the focal topic is essential. Also, the possibilities to have any effects on the environment appears to be higher in networks. Accordingly, the organization needs to be known for contributing highly valuable and novel input to the ecosystem, i.e., thought leadership needs to be achieved (Heger & Bub, 2013; Rohrbeck, 2011). As an R&I Director (MNE) stated networked foresight helps '[l]eading the innovation front in EIT', a Project Manager (RI) directly mentioned '[s]hape the innovation agenda' as one of the benefits of networked foresight. The statement 'to provide evidence on new innovation opportunities to its ecosystem' of the COO of a research institute implies the underlying assumption that networked foresight in the EIT ICT Labs might shape the environment. Likewise, a Senior researcher (MNE) stated that to '[c]ontribute to and initiate development in the ICT area' is one of the benefits of foresight activities of the network.

Influences on the ecosystem as value proposition for the network partner (AV2) can be caused in various ways, e.g. through exploitation of market power, i.e. considerations according to the competitive forces framework (Porter, 1980b) or by provoking reactions through competitive moves based on game theoretical assumptions (Shapiro, 1989), or by working collaboratively with other actors to shape influencing factors and other actors in a beneficial way as possible in the EIT ICT Labs. Thus, this value proposition seems identifiable on the partner level and the network level—assumed the goal of the network is in line with this.

Second, *generation of external visibility for the network*. Visibility is not considered a value in itself but may act as enabler for shaping and driving the ecosystem, AV2. This aspect could be classified as secondary benefit. Still, multiple interviewees and survey respondents identify visibility explicitly—i.e. by naming it—as benefit, e.g. a Research & Teaching Assistant (AI),

the Head of Technology Exploration (SME) cited above, a Project Manager (RI), and a Business Accelerator (AI).

Conclusion 8: Respondents emphasize the possibility to shape and develop the ecosystem through the network. This value proposition is identifiable on the network partner and the network level—assumed the network's aim include shaping the environment. Increased visibility for the network through the foresight activities was pointed out several times but is considered as important support for shaping the ecosystem only since visibility is not a value in itself in this context.

Third, *development of a shared vision*. For example a Principal Scientist (RI) identified 'shared visions and reference frames' as key benefit for the network. A Business Development Manager (RI) mentioned 'helping planning future activities', and a Management Consultant (MNE) stated that 'better alignment' is an important aspect of networked foresight for the network organization. The aspect is somewhat linked to the item AV1 'support of organizational learning' and 'support for breaking away from path dependencies'. Emphasis by the respondents was put on shared vision not learning, thus differentiating these two aspects. As for path dependencies Teece et al. (1997) noted '[w]here a firm can go is a function of its current position and the paths ahead. Its current position is often shaped by the path it has travelled' (p. 522). The value of a shared vision might be ambiguous in the light of this finding. From a backwards-looking point of view in the future the development of a shared vision in the presence might have limited the paths ahead. On the other side, the development of shared visions might serve to drive internal change in the network organization. For example, scenarios development was found to create emotional capacity, which—in turn—is regarded as vital for driving internal change especially in rapidly changing environments (Huy, 1999; Rohrbeck & Schwarz, 2013).

Conclusion 9: The data points towards the development of a shared vision for the network as potential value proposition. In the light of our theoretical framework a shared vision can be related to the recombination and reconfiguration dynamic capabilities via the collaborative development process that is the basis of a shared vision.

Finally, for initiating, conducting and driving innovation in a certain field the best possible partners need to be brought together. The availability and backing of a strong partner network from different fields (different industries, types of partners) is necessary to enforce the ambitious goals of the network (Heger & Bub, 2012b, 2013). In line with this, a Strategist (MNE) mentioned 'bringing together many experts from Europe' as value. The Head of Technology Exploration in an SME identified the activities as 'basis for partnering' just as a Scientific

Director (RI) did by stating that to 'identify right actors or partners' is a key value of the foresight activities in the network. Teece et al. (1997) relate partnering directly to (inter-)organizational learning (AV1): '[t]he concept of dynamic capabilities as a coordinative management process opens the door to the potential for interorganizational learning. Researchers (Doz & Shuen, 1990; Mody, 1993) have pointed out that collaborations and partnerships can be a vehicle for new organizational learning, helping firms to recognize dysfunctional routines, and preventing strategic blindspots' (p. 97).

Conclusion 10: our data supports the general findings of partnering as vehicle for organizational learning specifically for networked foresight.

3.3.6 Discussion

The aim of this study was to determine the advantages of a network approach to foresight and to explore the value this approach might create. As discussed in the theory section, the analysis of value creation can be applied on multiple levels. We focused on the network partner level and the network organization itself for our analysis. The analysis of the alleged value proposition of networked foresight on these levels was not easy due to three reasons. First, the phenomenon is not yet formalized and clearly defined and even less the activities that may be categorized as networked foresight activities. Second, available research on potential value propositions of foresight focuses on firms, mostly MNEs. Thus, we expect that our collection of value propositions for research institutes and especially academic institutes is incomplete and thus the conclusions we may draw at this time as well. Third, although foresight that could be characterized as 'networked foresight' appears to be in use, in practice this may go unmanaged or even unnoticed (van der Duin et al., 2014). This meant that it was not possible to create a comprehensive comparable study of multiple entities that run networked foresight processes. Thus, for our study we relied on an explorative, qualitative study of the EIT ICT Labs as a network that created a foresight process with the clear intention to i) work in a multi-party, network setting, and ii) use the created knowledge for the network itself and to make the information available to its partners—even those that do not participate in the process (Boman & Dunaj, 2012). If the use of networked foresight spreads and its characteristics are defined clearly we expect that it becomes possible to create larger samples that could then be utilized for quantitative research allowing statistical evaluations and coming to generalizable statements.

Our data is based on data from semi-structured interviews with people that are involved in the EIT ICT Labs to some degree and a survey among foresight practitioners that were involved in the EIT ICT Labs innovation radar. Thus, an unwanted bias in favor of networks will be

present weighing into the very high values for some VPs. We still see support for the hypothesis that networked foresight creates value since the respondents are predominantly aware or involved in foresight activities in their partner affiliation, allowing the assumption that basic knowledge about foresight is present.

By design the study does not create generalizable results. Still, we hope to raise awareness for the phenomenon and have been able to add to knowledge of what organizations, including the network organizations themselves, may and may not expect when involving in foresight in a network set-up.

3.3.7 Conclusions

The aim of this article was to explore and better understand the use and potential value creation of foresight in networks, in this article referred to as networked foresight. Potential value contributions that were identified in the literature review were based on and categorized according to Rohrbeck, Schwarz and Thom's research (Rohrbeck, 2012; Rohrbeck & Schwarz, 2013; Rohrbeck & Thom, 2010; Thom, 2010) and cross-linked to Teece's dynamic capabilities approach (Helfat, Finkelstein, et al., 2007; Helfat & Peteraf, 2009; Teece, 2007; Teece et al., 2002; Teece et al., 1997). This not only helped to prepare the analysis of the alleged networked foresight phenomenon but also to ground the study in strategic management. It also helped to understand the two levels of analysis that were considered for this study—the network organization and the network partners. We analysed the Innovation Radar of the EIT ICT Labs in detail, i.e. 49 persons with different functions in the network and the partner affiliations were interviewed and a survey with foresight practitioners that are linked to the network was conducted.

Evidence for potential effects of a networked approach to foresight can be found in literature and in our empirical data. First, research on foresight frequently highlights the importance of sourcing information from external sources, e.g. in the special issue of Technological Foresight and Social Change in 2010 (volume 77, issue 9). In the recent past, research specifically aiming to explore collaborative or networked foresight gained traction as well. Second, the dynamic capabilities approach highlights the importance of partnerships, alliances and involvement of external partners from its beginnings. Finally, we draw from research on multi-party cooperation and organizational design that recently covered interorganizational networks in a special issue in Organizational Dynamics (volume 39, issue 2). In general, our empirical data backs our assumptions that networked foresight creates value. More specifically, it points to a larger value creation potential for SMEs. In the EIT ICT Labs partner network, SMEs were found to hesitate to apply sophisticated, complex and thereby expensive foresight tools. Thus,

in a network that conducts comprehensive networked foresight they may benefit overproportionally compared to MNEs.

When it comes to value creation for network partners our data emphasizes the broadened knowledge and asset base that becomes available through a network approach. Summarized based on our two-dimensional analytical framework, the data shows that the networked approach seems to be valuable for the value propositions that are grouped under the dynamic capability sensing–spreading through three groups from a foresight point-of-view. Specifically, all activities that relate to scanning, identification and searching for new information and external change ranked high. Substantial value contributions to internal organizational settings, internal needs and decision-making seem to be out of scope. This contradicts our expectation based on the literature review and points to additional research needs. Finally, our findings for the potential value proposition shaping the future are twofold. First, statements indicate the network setting is valuable for partners since they may actively engage in shaping the future and the ecosystem. Second, respondents suggest it as valuable for the network organization as well, supported by increased visibility of the network through networked foresight. However, this might be attributed to the overall goal of the EIT ICT Labs as an instrument to shape and drive innovativeness in Europe.

When considering the EIT ICT Labs network as organization itself the development of a shared vision was emphasized as value that is created through the EIT ICT Labs innovation radar. In terms of our theoretical framework development of a shared vision can be related to the recombination and reconfiguration dynamic capabilities via the collaborative development process that is the basis of a shared vision.

Several items in our study were identified as in need of further investigations. First, the differences of potential value propositions for the different types of partner organizations need further research, specifically the differences between MNEs and SMEs remain vague. Second, our data is conflicting to theoretical deductions concerning the potential value for internal use of foresight insights won through networked foresight. While theory let us believe that this is clearly a value proposition of networked foresight, our empirical data indicates otherwise. Likely related to this is the impact of absorptive capacity for foresight information from a network. We believe that there are substantial differences in the absorptive capacities of partners between information that is generated in an internal foresight entity to information that was generated in a network—even if internals were involved in the network.

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3.4 Strategic foresight for collaborative exploration of new business fields

To ensure long-term competitiveness, companies need to develop the ability to explore, plan, and develop new business fields. A suitable approach faces multiple challenges because it needs to (1) integrate multiple perspectives, (2) ensure a high level of participation of the major stakeholders and decision-makers, (3) function despite a high level of uncertainty, and (4) take into account interdependencies between the influencing factors. In this paper, we present an integrated approach that combines multiple strategic-foresight methods in a synergetic way. It was applied in an inter-organizational business field exploration project in the telecommunications industry.

3.4.1 Introduction

In the past decades, much knowledge has been generated of how to conduct foresight activities. In the 1960s, scholars started to study national foresight programs. They aimed to identify future technologies that would generate the largest potential for economic welfare (Cuhls, Beyer-Kutzner, Ganz, & Warnke, 2009). In a corporate context, foresight activities have been employed to make better long-term decisions (Eto, 2003; Marchau, Walker, & van Wee, 2010), support innovation activities (Rene Rohrbeck & Gemünden, 2011) and strategic planning by identifying alternative trajectories (van Bree, Verbong, & Kramer, 2010) for emerging technology (Coccia, 2005) trends and creating future scenarios (Aligica, 2005). As a result, we now have a rich body of knowledge of methods that can be used to address specific management challenges.

In our literature review, we argue that more knowledge is needed to successfully apply strategic-foresight techniques to complex planning tasks such as exploring new business fields (Gordon, Glenn, & Jakil, 2005; Rene Rohrbeck, 2010; Voros, 2008). From a company's perspective, new business fields are characterized by a multi-dimensional uncertainty (Makridakis & Taleb, 2009) that results in typical planning questions such as: Is there an underserved demand? If yes, how much are customers willing to pay? How can the demand be satisfied? Should we address the market with a product, a service, or a hybrid product that combines both a physical product and a service? Which (emerging) technologies should be used to build the product and service? How will we produce? Is the business opportunity financially interesting?

This multi-dimensional uncertainty translates into the "chicken or egg" dilemma: if the firm does not know which technologies it should employ to build a certain product, it will not be able to define the properties of the final product. If the product properties are unknown, it cannot ask

its potential customers how much they are willing to pay. If the willingness to pay is unknown, so is the business potential. This will make it impossible to take the required investment decisions. This dilemma results in a dual planning challenge: (a) dealing with uncertainty, and (b) dealing with the interdependencies between the multiple aspects of the new business fields.

Our point of departure is the expectation that strategic-foresight methods could help to reduce the uncertainty and that the challenge of interdependencies can be met by integrating multiple methods. More specifically, we expect that strategic foresight could help in (1) combining an external trend analysis with an internal analysis (Vecchiato & Roveda, 2010), (2) facilitating the strategy-formation process (Chermack, van der Merwe, & Lynham, 2007; Daheim & Uerz, 2008; Daim, Rueda, Martin, & Gerdsri, 2006), (3) supporting strategic decision-making (Eisenhardt & Martin, 2000; Ruff, 2006), and (4) moderating innovation planning (Phaal, Farrukh, & Probert, 2004; Rene Rohrbeck & Gemünden, 2011).

Based on strategic-management frameworks and strategic-foresight methods, we have developed such an integrated methodology that is designed to support collaborative business field exploration. In this article, we report on the application of the methodology in a pilot project that aimed to explore the new market for intelligent and adaptive management of broadband networks. This is a potentially large market that enables the delivery of high-quality services over the Internet such as Internet Protocol-based Television (IPTV), multimedia services that build on high-quality video streaming, or broadband-intensive cloud-computing applications that require reliable connections. It is also a new business field in which multiple parties need to work together to jointly create a market and come up with solutions. In our case, a consortium of nine partners from academia and industry came together to conduct the project collaboratively.

3.4.2 Literature review

In the following literature review, we show why strategic planning of new business fields is particularly challenging and why we expect that those challenges can be met effectively with an integrated strategic-foresight methodology.

3.4.2.1 The challenge of exploring new business fields

When Jeffrey Immelt says that ‘Constant reinventing is the central necessity at GE...We’re all just a step away from the commodity hell’, he emphasizes the need to continuously create new products and move into new business fields (IBM Global Business Services, 2006). This has also been discussed in strategic-management literature; it is concluded that companies need to master two roles: the first role is to improve processes and incrementally improve their

current portfolio of products and services. The second role is to continuously explore new business fields (Levinthal, 1992). Companies that are good at both roles are called ambidextrous organizations (Andriopoulos & Lewis, 2009; Tushman & Oreilly, 1996).

Companies such as Nokia have shown how moving into new business fields can be done successfully. In its 150-year history, Nokia has changed from a pulp-and-paper company and from producing rubber boots and tires to becoming the world's leading manufacturer of mobile phones (Stadler, 2011). Nowadays, Nokia is at the brink of becoming a service company, which would be the third major transition and the third time that the company has moved into a totally new business field.

However, many companies continue to struggle to move into new business fields for multiple reasons:

- Information on *emerging business fields is not detected* by corporate sensors who are directed towards the current business (Day & Schoemaker, 2004), foresight could help by proactive scanning.
- Top management suffers from an overflow of information and *lacks the ability to access the economic potential* (Burgers, Van Den Bosch, & Volberda, 2008; Lesca & Caron, 1995), particularly if faced by multi-dimensional uncertainty. In this case, foresight could show the interdependency between the signals from different perspectives (competitive environment, emerging technologies, customer needs, etc.).
- Information on business potential is *filtered by a middle management* which fears that the new business may cannibalize current business (Chandy & Tellis, 1998; Huy, 2002). This means that foresight should ensure to reach or, even better, integrate top management in the exercise because participation is the best way to lay the basis for decision-making and taking action (Rene Rohrbeck, 2010).
- Complexity of company structure that triggers *inertia* and prevents companies from seizing business opportunities because they are too slow to react (M. Godet, Monti, & Roubelat, 2004; Kinra & Kotzab, 2008). This increases the need to reach top-level management with foresight results and include not only top management, but also other relevant internal stakeholders (Henry Mintzberg, 1994).

That means that in order to support business-field exploration with foresight activities, companies need to be able to *integrate multiple perspectives*, *integrate stakeholders throughout the process* of the foresight exercise, and ensure top-management visibility or, better, *top-management participation*.

3.4.2.2 Planning new business fields

Planning new business fields has many similarities with strategic planning, it

- concerns the *long term*, in which the investment is expected to pay off (Roney, 2010),
- aims to create a *synthesis* of what should be achieved and how the firm can achieve it (Huy & Mintzberg, 2003; Mintzberg & Ahlstrand, 2009),
- involves *looking ahead* and, to a certain extent, forecasting and anticipating possible futures (Henry Mintzberg, 1994; Vecchiato & Roveda, 2010),
- requires *integrating stakeholders* to tied planning to execution (Huy & Mintzberg, 2003), and
- needs to *encourage* strategic thinking and *support* the strategy formation/new business-field exploration process (H. Mintzberg, 1994).

We can therefore tap into the much larger pool of knowledge that has been created in the field of strategic management to define what should be done in a new business-field exploration project. In particular, we want to use three groups of frameworks as guides to the relevant questions and aspects in a new business-field exploration project:

- Porters 5 Forces help to grasp the extent of competition in a (new) market (Porter, 1980).
- Business-modelling frameworks direct the analysis towards the major elements of a viable new business field (Konnertz, Rohrbeck, & Knab, 2011; Osterwalder & Pigneur, 2010).
- Business-planning frameworks ensure that all important aspects of founding a company are taken into account (Adams, 2003).

For our new methodology for business-field exploration, the elements of all three frameworks were considered as potentially relevant aspects for our analysis. Table 11 shows how the elements of the three frameworks match with the elements of our analysis.

Table 11: Elements for new business-field exploration

Our foresight project		*Elements of guiding frameworks*		
Dimension of analysis (method)	*Targeted elements*	*Porter's 5 Forces*	*Business modelling*	*Business planning*
Product properties (use-cases, target-costing pre-phase)	• Value proposition • Relative product advantage • Product positioning • Targeted market segment • Strategic fit • Customer		• Value proposition • Customer segments • Key activities • Key resources	• Technology plan

	expectations			
Competitor analysis (Value Network and MACTOR*)	• Up- and downstream partners • Industry growth and profitability • Competitors' strategies • Rivalry, competitive-ness and new competitors • Power structures • Convergences and divergences of interests	• Rivalry among existing competitors • Bargaining power of buyers • Bargaining power of suppliers • Threat of new market entrants	• Key partners	• Competition • Strategic position
Market analysis (scenario analysis)	• Environmental conditions (political, regulatory, and sociological) • Market and technology trends and drivers • Future market configurations	• Threat of substitute products and services		• Industry analysis and trends • Target market • Risk assessment
Financial analysis (target-costing)	• Production costs • Customers' willingness to pay • Sales estimates • Revenue estimations • Market potential		• Revenue stream • Cost structure	• Financials

Elements that have not been adopted from the guiding frameworks:

Business modelling—customer relationships, channels

Business planning—company description, marketing and sales plan, operations, management and organization, community involvement and social responsibility, development, milestones, and exit plan

* MACTOR stands for Matrix of Alliances and Conflicts: Tactics, Objectives, and Recommendations [62].

In the first phase of the analysis, *product properties* are clarified. Particularly, we address the product's value proposition, its uniqueness or relative advantage over competing offers, its positioning against competing offerings, and a clearly defined target-market segment and its match with corporate strategy. Additionally, a first evaluation of the customers' needs, wants, and expectations is conducted.

Concerning the *competitive environment*, it needs to be clarified how to deal with up- and downstream partners, i.e., in particular whether there may be shifts of power in the value chain and identification of potential new suppliers and buyers. Taken together, these aspects have also become known as the value network (Broring & Cloutier, 2008; Porter, 1985). In this network, it needs to be clarified whether there are potential alliances or latent conflicts that would favour or prevent a successful market entry.

The *market analysis* includes an analysis of the environmental conditions (political, regulatory, and sociological factors), identification of market and technology trends and drivers, and an analysis of the development of possible future market configurations. The latter serves as basis for strategy development later on in the process.

In the last dimension of our analysis—*the financial analysis*—, the insights from the first three areas are used. Complemented by an estimation of the customers' willingness to pay for the new product, it allows a first evaluation of the commercial attractiveness of the new business fields. A preliminary forecast of the market potential is often needed to convince decision-makers to support the decision to move into a new business field.

In the first two chapters of the literature review, we have seen why exploring and planning new business fields is particularly challenging. Overall, it can be said that there are two major challenges: (1) ex-ante uncertainty about a wide range of aspects of the business fields and resulting business model, and (2) interdependencies between the aspects that make cooperation between corporate departments and decision-makers necessary. In the next two chapters, we will discuss why a combination of strategic-foresight methods can be expected to help when facing these challenges.

3.4.2.3 Strategic foresight to deal with uncertainty

Strategic foresight in a corporate environment is concerned with reducing the domain of the unknown and helping to account for uncertainty in the decision-making process (Gordon et al., 2005; Ratcliffe, 2006). In the French tradition, strategic foresight (prospective) is even seen as a learning process through which the future (in our case new business fields) is invented and created (Coates, Durance, & Godet, 2010; Michel Godet, 2010; Ratcliffe, 2006).

The most popular method of strategic foresight is scenario analysis. It has been shown to be able to create a structure that allows managers to take a higher number of arguments into account and grasp the systemic nature of the decision (Burt, 2007; Ringland, 2010). At the same time, it can be used as a platform to ensure participation of relevant stakeholders and decision-makers (M. Godet & Roubelat, 1996) and can also have an impact on the perceived quality of the strategic decision-making (Chermack et al., 2007).

In practice, it can be expected that methods have to be chosen (Lichtenthaler, 2005; Rene Rohrbeck, 2010) and tailored to fit the task (Vecchiato & Roveda, 2010). Strategic-foresight methods are expected to make a company aware of its environment (Neugarten, 2006; Patton, 2005) and make strategic decisions more robust to future change by integrating wild cards (i.e., future events that are singular, sudden, surprising, and shattering) in the analysis (S. Mendonca, Cunha, Ruff, & Kaivo-oja, 2009).

We know that companies are increasingly using strategic-foresight methods (Daheim & Uerz, 2008; Schwarz, 2008). But it is also suggested that more research is needed on how strategic-foresight activities are embedded in decision-making processes and what value they generate

for companies (Sandro Mendonca & Sapio, 2009). Some studies have identified potential value contributions (Roney, 2010); other studies supply first evidence about the impact of strategic-foresight activities (R Rohrbeck, 2011; Thom, 2010). In addition, studies have shown that some companies rely on complex strategic-foresight systems (Gruber & Venter, 2006; Vecchiato & Roveda, 2009) to increase their innovation capacity (R. Rohrbeck, 2010; Rene Rohrbeck & Gemünden, 2011; Veugelers, Bury, & Viaene, 2010) and resilience against external (disruptive) change (Ansoff, 1975; Lesca & Caron, 1995; Madjdi & Huesig, 2011). For example, some companies use the systems to assess the coherence between future trends and their strategy and product portfolio (Battistella & De Toni, 2011).

3.4.2.4 Method integration for dealing with interdependencies

The idea to combine foresight methods has a long history. In 1988, Flores and White proposed to structure literature on combined forecasting methodologies along two tracks: (1) "selection of the base forecasts" which determines which forecasts to include—qualitative, quantitative, or both—, and (2) the "selection of the method of combination" which is concerned with the approach to combine them, i.e., systematically, or in an intuitive way (Flores & White, 1988).

Armstrong (Armstrong, 1986) proposes to select methods based on their advantages and disadvantages, for example by combining quantitative and qualitative approaches. This view is shared by Dryample and Filde. In their study, they give recommendations when to apply quantitative or qualitative methods (Dryample, 1987; Fildes, 1991). Instead of discussing quantitative and qualitative approaches, Ulrich argues that the focus should be on the difference between objectively existing aspects and interpretations and perspectives (Ulrich, 1983).

Prior to Clemen's review of literature on combining methods (Clemen, 1989), research on this topic centred on proving that combining methods does in fact increase accuracy. Metcalfe et al. (Mackay & Metcalfe, 2002; Morrison & Metcalfe, 1996) propose to select methods solely based on multiple perspectives. They specifically argue that using different groups of stakeholders—thus leveraging their differing perspectives, opinions, and backgrounds—increases accuracy and the understanding of possible futures. Linstone (Linstone, 1984) promotes a similar approach on a larger, national level. Based on empirical data, he shows the usefulness of considering technical, organizational, and personal perspectives.

Tseng, Cheng, and Peng (Tseng, Cheng, & Peng, 2009) developed a model that combines a scenario analysis, the technological substitution model, and Delphi to provide market-

penetration assessments. They argue that, in the end, the value of the common combination of a technological substitution model and a scenario analysis is often limited by a lack of available data on latest-generation technologies and quantifiable data. To overcome this problem, they integrate current opinions of seasoned experts to make a more holistic forecast. Their model generates market-share predictions based on the scenario analysis and technological-substitution model, with both based on and supported by the results of expert estimations.

Kameoka, Yokoo, and Kuwahara review Delphi-Scenario Writing (DSW) (Kameoka, Yokoo, & Kuwahara, 2004). In contrast to other combinations of Delphi and scenarios, DSW starts with Delphi and uses the scenarios to clarify the interrelationships between items that were identified during the Delphi forecast. Based on the results, adequate strategies can be developed.

Scholars have also reported on combinations of scenario analyses and roadmapping (Drew, 2006; Lizaso & Reger, 2004; R. Rohrbeck & Thom, 2010; Wells, Phaal, Farrukh, & Probert, 2004). These combined methodologies usually start with an environmental analysis to identify key influencing factors and end with the development of differing scenarios that provide the basis for the interpretation and selection of the most favourable scenario for the company. During the development of a roadmap towards the favourable scenario, key events that need to take place to arrive at this scenario are identified and described. Finally, a tracking system can be set up to help to monitor the development towards the favourable scenario.

Petrick and Echols (Petrick & Echols, 2004) introduced a heuristic method consisting of a combination of supply-chain management and technology roadmapping that heavily relies on IT (information technology) support. According to their argumentation, sustainable decisions in new-product development can only be made when the differing perspectives can be considered in an integrated way.

In conclusion, we have shown that combining foresight methods has been advised to (1) reduce deficiencies of the individual methods, (2) tailor the methodology to the task, and (3) integrate differing perspectives. Based on the first two chapters of our literature analysis, we like to add the objective to combine methods to (4) create a holistic view of a new business field that takes into account the interdependencies between the differing aspects of the analysis.

3.4.3 Description of our case

3.4.3.1 The market of providing quality of experience

Telecommunication network operators are confronted with an increasing need to reduce costs while increasing network capacity. New Internet services such as video streaming have led to a steep increase in network traffic. This results in the need to make network usage and management more adaptive and intelligent (Casier et al., 2008). More specifically, the main trends that drive the need for better network management (Bryant & Oliver, 2008; Commission of the European Communities, 2008; Inouyem, 2006; Latré et al., 2008; Van den Berghe & Latré, 2008) are:

- Increase in *rich-media consumption*, particularly online videos. The increasing availability of IPTV offerings leads to additional network-traffic peaks, especially in the early evening hours.
- Increase in *personalization of online service*. This includes VoD (video-on-demand) services that replace linear television. On the network level, this implies a change from broadcasts with rather low network-capacity usage to unicasts which require separate connections for each user.
- *Media consumption independent of time, place, and device*. Future media offerings will allow watching any video content at any time on all devices. This implies that videos, for example, will be streamed increasingly through mobile networks with unicasts.
- Rise of *end-users' quality expectations*. The quality expectations rise after years of dominance of low-quality video content on the Web. The latter is of special importance for IPTV services since the minimum requirement for IPTV is a perceived quality level similar to that of conventional TV reception.
- Aim to *increase network efficiency*. At present, bandwidth assurances are given based on overprovisioning, i.e., greatly over-dimensioned networks have to ensure functionality, even in peak times. Network operators increasingly seek to increase network efficiency to downscale overprovisioning and save costs.

The expansion of fibre networks—which will greatly increase network capacity—is currently underway, e.g., with FTTH (fibre-to-the-home) or FTTCab (fibre-to-the-cabinet) roll-outs (Fijnvandraat & Bouwman, 2006). However, fibre networks require massive investments in infrastructure and are expected to only postpone the impending problem of congestion (Monath, Elnegaard, Cadro, Katsianis, & Varoutas, 2003). Additionally, massive overprovisioning through fibre connections means that, most of the time, network load is nowhere near a network's full capacity (Degrande, Laevens, De Vleeschauwer, & Sharpe, 2008; Van den Berghe & Latré, 2008). Thus, intelligent mechanisms to increase network efficiency remain of interest, even if the fibre network roll-out is complete.

Finally, advanced network mechanisms as analysed in RUBENS have the potential to open up new business fields for telecommunications operators who seek to regain their dominance in the ICT market by moving into the service market (Jakopin, 2008; van Kranenburg & Hagedoorn, 2008).

3.4.3.2 Selection of the appropriate team

When selecting an appropriate team for a strategic-foresight activity, multiple aspects are important. It has been suggested that an ideal foresighter has six characteristics: he is (1) curious and receptive, (2) open-minded and passionate, he has (3) broad knowledge, (4) deep knowledge, (5) a strong external network, and (6) a strong internal network (Rene Rohrbeck, 2010). In our project, most of the participants had a background in research and development as well as some experience in a business- or marketing-related position. In addition, it was important to find people who were intrinsically motivated to engage in a future-oriented project.

For a new business-field exploration project, it is also essential to involve people who can provide differing perspectives. In our case, that translated into the need to have participants with knowledge of the core network, access network, and end-user service domain. Inviting experts to specific workshops and interviews further strengthened the interdisciplinary character of the team. The external experts ensured that all relevant aspects were taken into account and that the perspective or lack of knowledge of individual team members did not bias the results of the analysis.

It is also important to directly involve decision-makers to build trust in the results of the analysis (Bezold, 2010) and middle managers to ensure their commitment to implementation and prevent organizational inertia (Huy, 2002; Lucas & Goh, 2009). In our case, both groups were not only present at regular steering-board meetings, but also, and more importantly, actively participated in workshops, which created commitment.

3.4.3.3 Combining multiple foresight methods for new business-field exploration

Within the RUBENS project, the potential new business field was explored along four strata. These were guided by four key questions:

- Q1: what are the key *product properties* (including the question whether services should be included and a hybrid product should be offered)?
- Q2: who are the relevant *actors in the value network*, what are their interests, and how will they behave in the new market?
- Q3: how will the *market* of the new business field evolve? What are the trends and the

barriers?

- Q4: has the new business field the potential to become *financially viable*?

These questions were used to structure the project, define the project tasks, and coordinate the participating organizations.

Throughout the process, various tools were used, for example workshops, reports, or our own desk research. Table 12 provides an overview of the main field of application of the various tools and a brief description why and how we used them.

Table 12: Fields of application and description of the tools used.

Main field of application	*Tool*	*Description*
Data collection *(primary sources)*	Questionnaire	Survey to collect new and unique information that is not available in other sources
Information gathering *(secondary sources)*	Reports, studies, etc.	Gathering of scientific or other high quality information
	Project documentation	Gathering of information available in other work-packages of the project
	Desk research	Gathering of universally valid information and public information
Generation and discussion of results	Workshops	Moderated and interactive face-to-face meetings to generate input from and results by the project team
	Panel discussion	Moderated face-to-face meetings to present and discuss controversial (intermediate) results: one presenter, multiple discussion partners in the panel, and the tool of choice to integrate external experts
Information presentation	Meetings	Face-to-face meetings without moderator where either information from the team members is gathered or results are presented
	Mailing lists	Send-out of project documentation for validation
	Conference calls	Clarification of project progress, discussion about minor issues or intermediate results

The project was divided into five phases. Before the first phase, an initial collection of input laid the basis for the following analysis (phase 0). Phases one to four addressed the four guiding questions mentioned above and phase five prepared the conclusions and developed recommendations for decision-making. An overview of the project execution is shown in Figure 23.

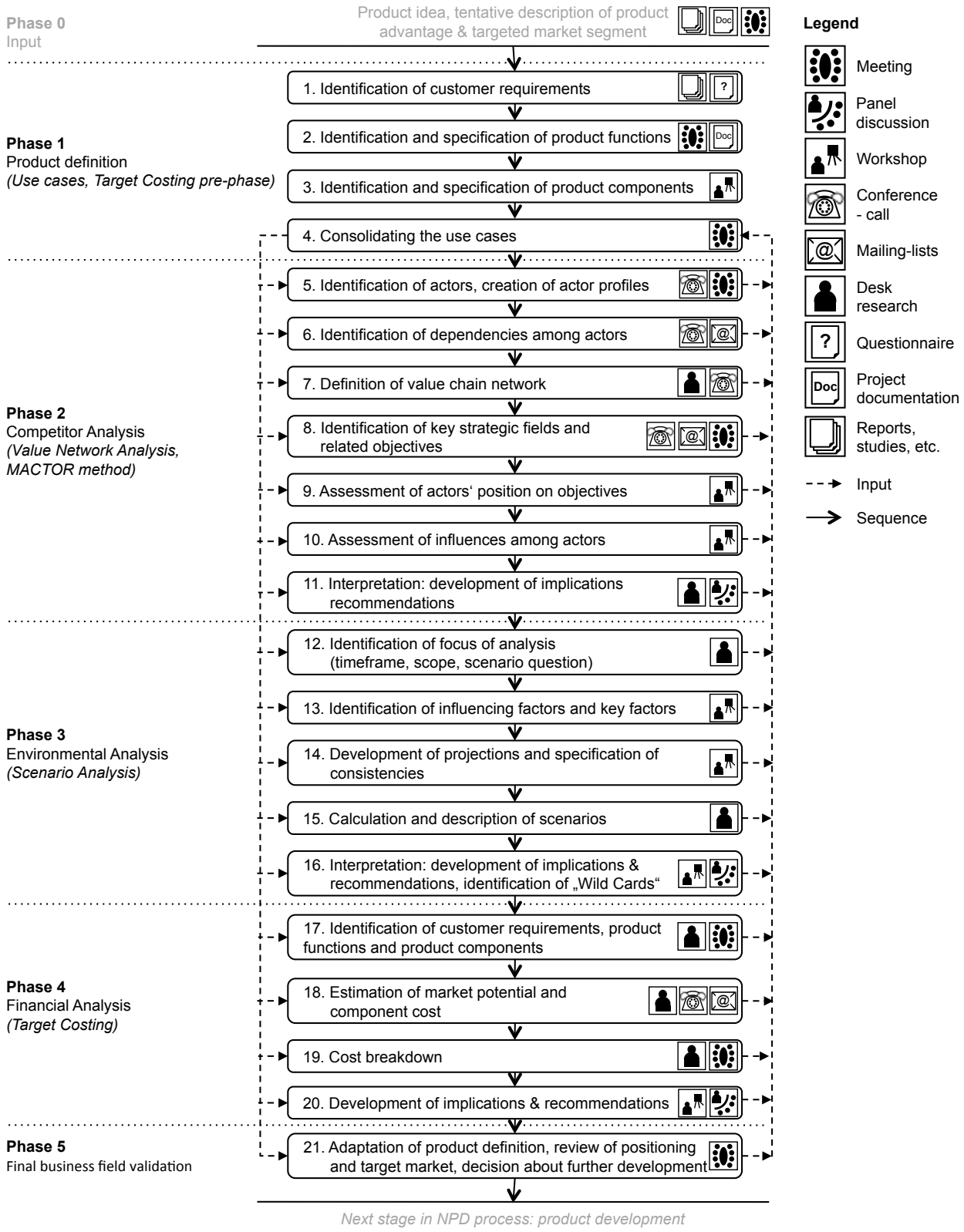

Figure 23: Project structure to explore a new business field.

3.4.3.3.1 Phase 0: input collection

At the start of the project, input for the analysis of the new business field was collected

from several sources:

19. The documentation of base technologies
20. Publications in scientific journals
21. Reports and studies published by research institutes and public institutes
22. Internal studies that were conducted by the project partners
23. Articles in non-scientific journals and newspapers

3.4.3.3.2 Phase 1: product definition (use-cases)

To operationalize product properties without predefining how the product should be built or which technologies should be used, the product was defined through use-cases. A use-case is an iterative process in which experts with a technological perspective (including technology foresighters who supplied future-oriented information) gave recommendations on the long-term perspective and experts with a market perspective were consulted on current and emerging customer expectations. From a customer's perspective, these use-cases describe how the product is used, what benefit is generated, and how it interacts with the telecommunication network. These use-cases were developed by (1) defining the customer requirements, (2) defining the specific product functions, (3) clustering the functions into product components, and (4) the consolidation of the first three steps into use-case descriptions.

3.4.3.3.3 Phase 2: competitor analysis (value-network analysis, MACTOR method)

The second phase started with the creation of a generic value network consisting of relevant roles and interfaces. These were developed on the basis of expert input and existing models (step 5). The value-network perspective becomes pertinent due to the increasing complexity of products and services [82, 83]. This was followed by the identification of actors that were relevant in the targeted market segment (step 6). Basic information about each actor was collected in "actor profiles", one-page summaries of basic information and relevant activities (step 7). To fill the profiles, they were distributed among the team members to search for relevant information in a two-week period. In order to ensure relevance and similarity of results in this research activity, a template was created and distributed to all team members.

The actor profiles contained information about:

- the organization's *roles* in the value network,
- its main *objectives* in regard to quality of experience,
- basic *company data* to indicate the size of the organization (revenue, number of

employees),

- trends and disruptive technologies that posed substantial *threats* to the organization,
- own *influencing power* over other actors, and
- *exposure to influencing power* from other actors.

The actor profiles helped to consolidate data on the various actors and provided a structured way to gather preliminary input data for the MACTOR method (Matrix of Alliances and Conflicts: Tactics, Objectives and Recommendations). The MACTOR method is one of the few multi-actor issue analyses [84]. These analyses are applicable in situations that are difficult to foresee, in which multiple actors are involved and varying interests, perspectives, and options collide. We specifically chose MACTOR because it also recognizes differences in the power distribution in the value chain (Arcade, Godet, Meunier, & Roubelat, 1999).

In step 8, key strategic fields—such as content, services, and devices—were identified and concrete objectives were derived that could be assigned to individual actors. Consistent with Godet's original approach (Arcade et al., 1999), the strategic position of each actor on these objectives (their opinion of the objectives) was rated on a scale from -4 to +4, where -4 indicates total opposition to the objective and +4 indicates a complete match between the objective and the corporate strategy (step 9). In the next step, the data on the influence between actors was used to calculate the relative influences between the actors in the value network. The influences were weighted on a rating scale as well. The lowest value, indicating total independence was 0, whereas the highest value, 3, indicated a very high degree of dependence (step 10). Based on both the data from the opinions of the actors and their relative influences on each other, it is possible to map actors in a convergence and divergence diagram. Here, harmony and hostility between actors are identified. This is the basis for identifying strategic fields where alliances and collaborations may be possible and where conflicts have to be expected. This allowed us to give recommendations on cooperation: with whom to collaborate, in which relationship conflicts have to be expected, and, based on the objectives, how to mitigate the conflicts by giving in to certain objectives of an adversary (step 11).

3.4.3.3.4 Phase 3: market analysis (scenario analysis)

The goal of phase three is to consolidate all relevant perspectives and answer the question how the new business field may develop in the future. The central method is scenario analysis; its particular strength is the ability to integrate a high number of influencing factors (M. Godet, 2000).

Before starting the scenario analysis, a further specification was made concerning time horizon, scope, and actor perspective, i.e., the role for which we want to generate insights and recommendations. The latter was a particularly tricky part because the new business field implied that the network operator might be well advised to extend his role portfolio in the value network (step 12).

In a one-day expert workshop, the most important political, sociological, economic, and technological influencing factors were collected and consolidated into 12 key factors (step 13). For each key factor, future projections were defined, i.e., the state of an influencing factor in the future. For each projection, the working group estimated its likelihood (step 14). Following this initial workshop, the consistency among all projections was assessed. That meant answering the question whether future state A of influencing factor 1 can occur with future state A of influencing factor 2 (step 15). With the help of scenario software, all possible scenarios and their inherent consistency were calculated. For five consistent yet very different scenarios, a detailed analysis and thorough description was created (step 16). To illustrate the meaning of each scenario, supporting images were added to the description.

In a second expert workshop, the resulting scenario descriptions were presented. After all participants had had sufficient time to familiarize themselves with the scenarios, implications and resulting recommendations were developed (step 17). In addition, so-called wild cards were identified. Wild cards represent events that have a major impact on the object of analysis, but occur suddenly and unforeseeably. For that reason, wild cards are not modelled into scenario analyses as influencing factors, but are taken into account after the scenarios have been generated. After identifying them, their importance and impact on the QoE (quality of experience) market and likelihood were rated.

3.4.3.3.5 Phase 4: financial analysis (target-costing)

From the preceding stages, a deep understanding of the competitors in the potential market for QoE was achieved. In the financial analysis, the aim is to quantify the market potential and generate first estimations on cost, revenue, and profit. It was decided to use a target-costing approach. Here, inverse accounting is leveraged instead of traditional cost-plus methods. The price that the customers are willing to pay is taken as upper limit for the retail price and all steps of value creation are optimized to achieve the allowable retail price [85]. Business-field exploration activities are the beginning of a new product or service, thus the possibilities to significantly engineer value-creation activities are given; target costing can be applied optimally.

From phase 1, a first product definition already existed. For target-costing, it is required to particularly detail customer requirements and product functions and components. Product functions are descriptions of functionality that a product will deliver, e.g., video and audio quality, video-on-demand functions, or simultaneous multi-TV access. Product components, on the other hand, are the physical components that are necessary to realize the before-mentioned functionality, e.g., CPE (customer premises equipment) or CAS (control and application servers). The set of customer requirements and product functions and components was identified by desk research and validated and extended with a questionnaire that was developed and distributed to a panel of 19 industry experts (step 17).

With the succeeding step 18, two things were done: an estimation of the market potential followed by an estimation of the expected component cost. For the market estimation, the project focused on six countries (Belgium, France, Germany, the Netherlands, Spain, and the United Kingdom). As is often the case when assessing new markets, there was no data available that directly addressed the customers' willingness to pay, in this case for IPTV quality enhancements. Therefore, the strategy for estimating the market potential was to work through analogies with available market data—here: online video services, conventional TV, and IPTV—and derive a reasonable willingness to pay from these. To estimate the number of potential customers, data on population, number of households, age distribution, broadband-access penetration, and weekly TV and Internet consumption was leveraged. On the cost side, the input data came from aggregated real-cost data from the participating equipment manufacturers and network operators.

Within the target-costing phase, we had two goals: first, to check if the market for the one product in question could be profitable overall and second, to identify components for which the costs have to be reduced to ensure product profitability. The latter was done by comparing the willingness to pay and the cost for a certain component (step 19). This allowed us to identify components that were in need of cost optimization, in our case the DSLAM (digital subscriber line-access multiplexer) and those that required additional investments for improvements, in our case the service platform. Overall, the financial analysis confirmed that the product had the potential to become profitable (step 20).

3.4.3.3.6 Phase 5: final business-field validation

Overall, the project resulted in a positive assessment of the new business field, insights on drivers, barriers, showstoppers, and recommendations on how to enter the new market:

- The use-cases provided a firm ground to build a portfolio of products within the new market. This was the answer to question 1 mentioned above.

- The competitor analysis showed the need for alliances to successfully create and exploit the new market. This was the answer to question 2.
- The scenario analysis allowed us to identify the antecedents for the market creation such as network congestion. For example, it was revealed that the new market will only emerge if overprovisioning is declining, either because of a reluctance of network operators to invest in the extension of network capacity or an increase in data traffic through increasing demand for personalized high-quality video services or cloud-computing applications. This was the answer to question 3.
- For one product, the financial viability was demonstrated through financial analysis. This was the answer to question 4.

Collaborative market exploration was also the basis for further investigation within the participating organizations. Having participated in the collaborative effort allowed them to add to their own view the perspectives from other companies that play different roles in the value network. Thus, the reliability of the results was increased. In addition, they explained that the personal interaction in the workshops and team and steering-board meetings increased their confidence that results and recommendations could be trusted.

3.4.3.4 Process overview

In this case study, the aim was to use and combine foresight methods to explore a new business field. **Fehler! Verweisquelle konnte nicht gefunden werden.** summarizes the approach. In our pilot case, the project was started to evaluate whether newly developed technologies could provide a basis for a new market. In other cases, the starting point may also be a product idea or the initial idea of an important product advantage.

After the initiation of the new business-field exploration project, four major phases were identified. These phases followed the four guiding questions that are shown in the centre of Figure 24.

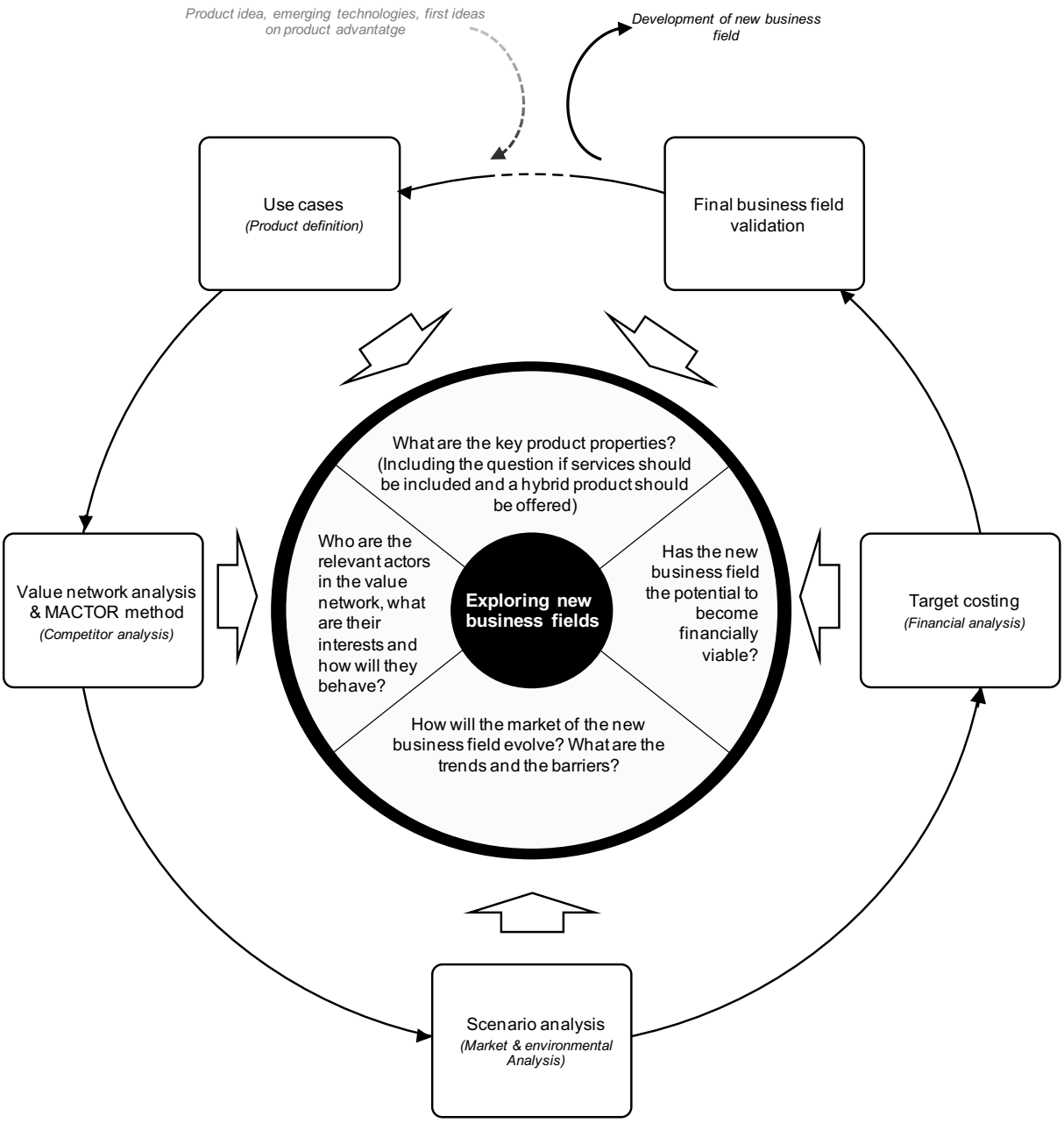

Figure 24: Key questions and methods for exploring a new business field.

To answer the questions, four methods were used:

- Use-cases were used to define the product properties without having to imply a certain technical solution. They define the product only through a description of how the customer will interact with the product.
- A value network was modelled and the MACTOR analysis was applied to model the interests of the relevant actors in the value network. This allowed us to identify potential conflicts of interest with other actors, predict the level of rivalry in the market, and identify potential alliances.

- A scenario analysis was used as the primary integrating method that allowed us to integrate observed trends from the technology, competitor, customer, and political environment. The result was a good understanding of the barriers to successful business-field development.
- Through a target-costing analysis, the qualitative insights of the previous phases were quantified and the overall financial viability was checked.

On the basis of this analysis, the consortium of organizations concluded that it was worth it to further pursue the QoE business field. The company that was the primary objective of our analysis held a top-management workshop that used the project output to define a roadmap for the development of the new business field.

3.4.3.5 Methodological synergies

As shown in Table 13, the integration of methods exploited synergies in the data collection and evaluation.

Table 13: Synergies created by the method integration.

Information	*Processed by method*										*To develop*
	Originally collected for					*Re-used for*					
	UC	*VN*	*M*	*SA*	*TC*	*UC*	*VN*	*M*	*SA*	*TC*	
• Value proposition	X						X		X	X	Product properties
• Relative product advantage	X										
• Product functions	X						X			X	
• Target market segments	X								X		
• Customer expectations	X								X	X	
• Market potential	X									X	
• Product positioning	X								X		
• Strategic fit	X										
• Up- and downstream partners		X						X	X	X	Competitor analysis
• Interdependence among actors		X						X	X		
• Industry growth and profitability		X									
• Competitor strategies			X						X		
• Rivalry, potential market entrants, and competitiveness			X						X	X	
• Power structures			X						X	X	
• Convergence and divergence of interests			X						X		
• Environmental conditions				X							Market analysis
• Market and technological drivers				X							
• Future market configurations				X							
• Strategies to meet				X							

Information	*Processed by method*										*To develop*
	Originally collected for					*Re-used for*					
	UC	*VN*	*M*	*SA*	*TC*	*UC*	*VN*	*M*	*SA*	*TC*	
future market configurations											
• Production costs					X						Financial analysis
• Allowable retail price					X						
• Sales and revenue estimates					X						

UC: use-case method, VN: value-network analysis, M: MACTOR, SA: scenario analysis, TC: target costing.

Note: The crosses in the "re-used for" column show the synergy effect of the method integration.

In the first step, the definition of use-cases—the identification of customer expectations and product functions—creates a sound basis for the following steps of the methodology. The successive value-network analysis provides the foundation for the analysis of power structures, potential alliances, and conflicts that result in the development of strategic options in the competitive environment within the new market. The scenario analysis benefits strongly from the high degree of market knowledge that is established in the preceding steps. Finally, the target-costing analysis uses the insights from the product definition, customer needs, and market conditions as well as the knowledge of the power balance in the value network.

3.4.3.6 Strategies to facilitate collaboration

When exploring new business fields, we are dealing with an analytical problem that is characterized by a high level of *uncertainty* and *interdependency* between the sub-issues (i.e., what product features should be offered, what technologies should be used, what technologies are affordable given a certain set of features, etc.).

To ensure that we kept everyone informed about overall progress, to which extent uncertainty had been reduced, and aware of interdependencies, we

- provided enough *time to brief and re-brief participants* on what had been achieved in the past and what was expected as a result from the task at hand,
- held regular *face-to-face meetings* and at least bi-weekly *conference calls,*
- had two major *team-building events*, one at the start and one halfway through the 12-month project duration, and
- *visualized the project progress*, including the status of individual contributions (this also helped to put pressure on team members to deliver quality on-time).
- Concerning the challenge of a high number of participants in project meetings, we

- distributed *preparatory homework* one week prior to the meetings,
- used *pre-structured questionnaires* to effectively collect data,
- supported discussions in the workshop with *templates* that had to be filled out collaboratively, and
- held *panel discussions* to reduce the number of participants discussing simultaneously.

In addition, collaboration beyond meetings needed to be organized in a way that allowed team members to build on each other's results while providing progress transparency. For that purpose, various IT-based tools were employed:

- *Wikis* (websites that can be changed in real time by all project participants) to document project results
- *Forums* to discuss the different sub-issues
- Online *mind-mapping* tools to collaboratively structure new topics during telephone conferences
- *Instant messaging* to facilitate direct interaction

Foresight projects in particular also rely on the knowledge, experience, and openness of its participants. An interdisciplinary team is also recommended to ensure that trends are sufficiently challenged, and conclusions are validated from various perspectives. In our project, this was achieved by inviting academic researchers, industry engineers, and business analysts to join the team. With respect to industry participants, it is advisable to cover all relevant actors in the value network, but this is often difficult to achieve. In our case, project partners included network-equipment manufacturers and network operators. Insights from the perspective of media companies or end-user device manufactures had to be brought into the project by interviewing external experts and other sources.

3.4.4 Conclusion

In our literature review, we have argued that more research is needed to understand how foresight activities can be successfully applied in a corporate context. When companies wish to explore and develop new business fields, they are faced with a particularly challenging task that is characterized by (1) the need to integrate *multiple perspectives*, (2) a *high level of uncertainty*, (3) *interdependencies* between customer needs, technological capabilities, competitor behaviour, legislative contingencies, production cost, etc., and (4) the need to *involve a high number* of external experts and internal *stakeholders*.

We have discussed that it might have a merit to combine multiple foresight methods and shown that there are documented approaches that aim to combine foresight methods to (1) make them more reliable, (2) integrate qualitative and quantitative data, and (3) integrate different perspectives. In this paper we have described the application of an integrated methodology to explore a potential future market in the telecommunications industry. Therein we attempted to answer the following four guiding questions:

- What should the key product properties be?
- Who are the relevant actors, what are their interests, and how is power distributed among them?
- What are the barriers and drivers for the business field?
- Has the new business field the potential to become financially viable?

The sequence of the complementary methods exploits methodological synergies. Results and data that are only intermediate results from analyses used early on in the methodology are often re-used in later stages. Additionally, the methodology is highly interactive and fosters integration of cross-functional team members and calls for the involvement of external experts. Achieving optimal results with the proposed integrated methodology requires an iterative process. This, however, is difficult to realize due to time pressure and resource limitations in the exploration phase of new business fields.

It should be noted that not all new business fields can be explored with foresight and planned ex ante. In the absence of planability, companies have to rely on serendipity, i.e., start multiple business-field development initiatives and wait and see which will produce promising results. Therefore, companies will need to rely on corporate venturing schemes to move into new business fields through an entrepreneurial push (René Rohrbeck, Döhler, & Arnold, 2009) in addition to foresight activities.

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3.5 A relational view on the Maturity Model for Future Orientation

The *Maturity Model for the Future Orientation of a Firm* (Rohrbeck, 2011) provides a comprehensive and empirically derived framework for corporate foresight whereas the larger part of research in the domain focuses on methods, tools or specific aspects of foresight systems (Jissink, Huizingh & Rohrbeck, 2014b). In the following section, insights from the previously described cases are used to discuss the Maturity Model for corporate foresight from a relational view, including three supplemental interviews that were not included in previous publications about the EIT Digital case. Two perspectives are considered. First, the contribution of networked foresight to corporate foresight efforts, i.e. ultimately benefits that individual network partners may gain from relational foresight activities. These can occur between any kind of organizations, including network organizations (arrows i and ii in Figure 25). I argue that interorganizational relationships have not been considered sufficiently in the discussion on corporate foresight. Thus, I discuss each dimension of the original model for corporate foresight against this backdrop and suggest changes to the model.

Second, I discuss the model for assessing practices, capabilities and contributions in and to the network organization itself, i.e. within the *Network Organization* in the center of Figure 25. I argue that—despite different origins and objectives—foresight conducted in networks can be discussed and benchmarked similarly to corporate foresight. Albeit, changes to the model are required. Suggestions for these changes are presented and discussed in section 3.5.3.

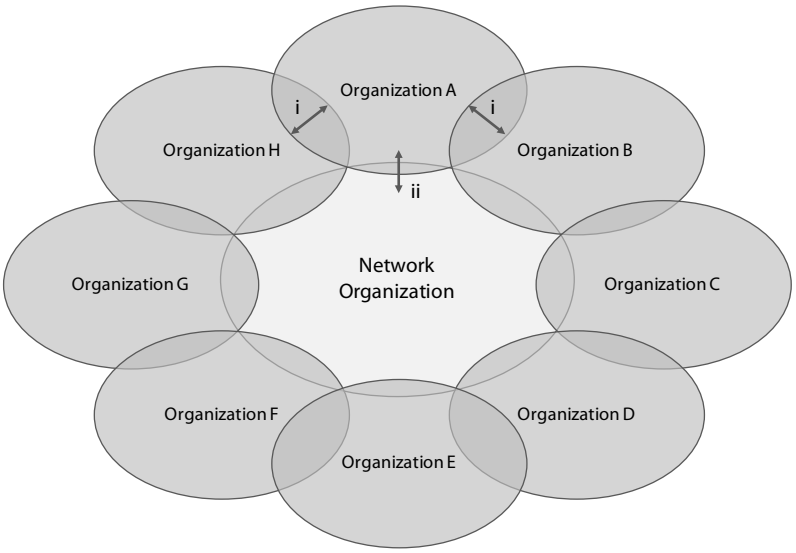

Figure 25: Schematic of relational links in corporate foresight

3.5.1 Revisiting the Maturity Model for Future Orientation of a firm

The Maturity Model as introduced by Rohrbeck (2011) is a comprehensive conceptualization of the organizational ability corporate foresight. Rather than a process-oriented understanding of foresight as advocated by some scholar such as Becker (2002); Horton (1999); Müller (2008), Rohrbeck defines corporate foresight as an ability, thereby following the definition of several prior authors (Tsoukas & Shepherd, 2004; Krystek, 2007; Slaughter, 1998). Specifically, he defines corporate foresight as a system that integrates multiple organizational capabilities instead of analyzing single techniques, activities, methods, or other single structural elements (Jissink et al., 2014b; Rohrbeck, 2011). The model was developed based on qualitative case studies with multiple firms that have foresight systems in place, and has been applied in further studies, including theory-testing works (Rohrbeck & Schwarz, 2013; Paliokaitė & Pačėsa, 2015; Rohrbeck & Kum, 2018; Rohrbeck et al., 2018).

Rohrbeck argues that corporate foresight can be considered a *resource* in the logic of the resource-based view (RBV) and a *dynamic capability*; conclusions 11 and 12 in Rohrbeck (2011, p. 50) in the dynamic capabilities school of thought. Both underlying management theories are based on the assumption that resources belong solely to a single organization. While I do not question that both conclusions—CF as a resource according to the RBV and CF as a dynamic capability—remain valid in network settings, I argue that considering interorganizational relationships [16] as introduced by Teece and Singh (1998) and may contribute to the discussion of corporate foresight in an increasingly interlinked and complex world. In their view, the key difference is that interorganizational relationships and organization-spanning resources are *not* under control of a single organization but have nevertheless become vital for understanding competitive advantage and firm performance. Thus, they should be represented in a model depicting a domain as depended on knowledge from in- and outside of an organization as corporate foresight. In its original version, network factors are mostly reflected in the model's element *external network* in the dimension *people & network*. Based on findings and insights of this research I propose a deeper integration of network routines into the Maturity Model of corporate foresight.

The model is structured with three major parts: 1) *context*, 2) *capabilities*, and 3) *impact* (Rohrbeck, 2011). Six *context* factors are used in the model to judge a company's needs for corporate foresight and to derive recommendations for designing corporate foresight systems: the company's 1) *size*, 2) *strategy nature*, 3) *corporate culture*, 4) *sources of competitive advantage*, 5) *environmental complexity*, and 6) *industry clock-speed*.

[16] I understand interorganizational relationships as a broader set of relationships than Dyer and Singh's inter*firm* relationships, i.e. including those to other organizational forms than firms, e.g. universities, research institutes, and/or governmental organizations.

Five *capabilities* at the core of the model are used to evaluate the focal firm's foresight system and provide normative recommendations for improvements: 1) *Information usage* describes the type of information that enters the system and reflects the firm's capability of sensing weak environmental signals. 2) *Method sophistication* describes the methods used to interpret and filter the acquired information, such as using structured methods to process data and information. 3) *People and networks* capability reflects employees' and networks' characteristics that benefit the foresight system. 4) *Organization* describes the formal methods and routines to gather, interpret, and utilize information in the company's foresight system. (5) *Culture* reflects the degree of organizational support for foresight activities.

Finally, *impact* reflects the value contributed from a foresight system. The original model structures 12 impact assessment criteria into four categories: 1) the *reduction of uncertainty*, 2) *triggering actions*, 3) *influencing others to act*, and 4) *secondary benefits*.

In the following section the original Maturity Model is used as model to guide the discussion of networked foresight and the relational perspective on corporate foresight. As result, smaller changes and adjustments to the original Maturity Model are suggested to reflect the relational aspects in corporate settings. Further, the application of the model for network organizations is discussed and suggestions for changes in these particular settings are brought forward in section 3.5.3 as well.

The structure of the following sections is as follows. In section 3.5.21 the original model is discussed and additional or revised elements in the light of increasingly important interorganizational relationships are proposed. In section 3.5.2 a similar structure is followed for discussing foresight in networks. In this case, some elements are revised, several are introduced, and few are proposed to be dropped due to the change of perspective in a network organization.

To summarize the discussion each section contains a table with the following columns:

- *Element*: name of the element discussed, where necessary changed from the original
- *Status*: shows whether the element is newly introduced (n), adjusted (a), unchanged (u) or not applicable / inapt (na).
- *Description*: short description of the element
- *Comment*: comment on changes and/or applicability in network settings

3.5.2 Introducing interorganizational constructs to the Maturity Model

3.5.2.1 Context

The original model follows the contingency theory scholars' argument that the context in which management practices are applied are important to consider (Donaldson (1999, p. 66). Accordingly, six elements are used to capture relevant context factors: 1) company size, 2) nature of strategy, 3) corporate culture, 4) source of competitive advantage, 5) complexity of environment, and 6) industry clockspeed. Rohrbeck adopted elements 2), 5) and 6) from prior research when designing his model. Corporate culture (3) builds on past insights but has been adapted to emphasize the power of individuals. The source of competitive advantage (4) builds on past findings but has been reformulated to describe the primary driver of success in the company's market as indicator for relevant scanning areas. A relational take on the model does not induce changes to these items.

3.5.2.2 Capabilities

Five *capabilities* are at the core of the model. 1) *Information usage* describes the sources and characteristics of any information entering the system. 2) *Method sophistication* describes the methods used to interpret and filter acquired information, i.e. the use of structured ways to process data and information. 3) The *People & Networks* capability reflects characteristics of employees and networks that are beneficial for the foresight system. 4) *Organization* describes formal ways and routines on information gathering, interpreting and utilizing in the company's foresight system. Lastly (5), *culture* reflects the degree of organizational support for foresight activities. In the following, each dimension is revisited from a relational view.

3.5.2.2.1 Information usage

The capability dimension *information usage* is used to assess the kind of information that enters the system. It reflects the capability of sensing weak signals in the environment and feeding them into the foresight system (Rohrbeck, 2011, pp. 74-76). Applying the relational view induces reconsidering the elements *reach* and *source.* An updated overview of the dimension's elements is given in Table 14.

Table 14: Updated elements of capability dimension *information usage*. Based on table 4.2 in Rohrbeck (2011, p. 75).

Element	*Status (n/a/u/na)**	*Description*	*Comment*
Reach	a	Describes how deep a company scans current business, adjacent business (ties / no ties) and / or white spaces	Updated understanding of *adjacent business*: split into *adjacent business with direct link* and *adjacent business with no links to*
Scope	u	Describes how broad a company scans	–

		(technology, socio-cultural, customer, competitors and political environment)	
Time horizon	u	Describes the time horizons of foresight activities (ranging from near future up to 30 years)	–
Source	a	Describes the information sources; differentiated into internal vs. network vs. external sources and formal vs. informal sources	*Network sources* introduced as intermediate level between internal and external source

**new / adjusted / unchanged / not applicable*

Reach was originally defined as describing 'the depth to which companies scan their environment' (Rohrbeck, 2011, p. 74); differentiated into current business, adjacent business and white spaces. The element and its definition may remain very similar to before, holding true to Krystek and Hahn (2000) findings that corporate foresight processes need to span across a multitude of disciplines, including trends and developments that lie outside of the organization's focus (Heger, 2014). However, integrating interfirm relationships changes the understanding of *adjacent business*. No specific definition for adjacent business was given in the original model but it was implied that it is business that is perceived as relevant and related to current operations (Rohrbeck, 2011). When differentiating between partners to which ties have been already established through a network and those with no ties to, *adjacent business* can be split into two parts: *adjacent business with ties to* through existing networks and *adjacent business with no direct or indirect links* to whatsoever. The statement 'one decided to cover some core topics just to have an ear to the ground' made by a senior researcher and section head of an institute for applied research during the interviews points to the potential that a network such as the EIT Digital may provide. It can be argued that an organization is more likely to realize the importance and act on signals in the business fields of close partners than in those business fields with easy access to knowledge.

These minor updates imply no changes for most mature companies in this regard. They scan at all depths—current business, areas of interest, adjacent business and white spaces—thus the sublevel is not effective. It is, however, applicable for less mature companies that strive for higher reach, e.g. by differentiating *adjacent business with links to* and fields with no links to. One respondent explained the increased reach through the EIT Digital network as:

> The partner network is already a huge audience but with our [the network's] relationship to the European and National politics we have the possibility to reach out to important decision makers [..].

The same respondent explained that he expects 'guidance for future investment and strategic decisions' through the network, another one expects 'guidance for own activities'. One

respondent explained the link between activities conducted in the network and new business field exploration activities of his organization:

> […] A second point is the partner network, especially the European one, that provides easy access to industry partners and other research institutes and may initiate new projects that are not even part of the network.[17]

Based on this, it can be argued that *network* as pool of experts should be added to the list of known information *sources,* see table 4.13 in Rohrbeck (2011, p. 99). Positioning experts on a continuum ranging from external to internal, those acquired through the network can be considered as lying somewhat between these two. Depending on the formality of the network either informal ties or formal, contractual ties exist to these experts. Similar to external and internal experts or scouts, these *network experts* may provide insights into the political, technological, competitive and consumer environments but might have a deeper understanding of the focal company than external ones. The Innovation Director of the R&D department of an MNE summarized their dilemma with internal and external scouts as follows:

> We tried many times [to use internal scouts], we didn't find it very helpful but we still made some good use of it. The way that we found [best] is expensive: in the end we have to assign one or two people fulltime to work with the community and get some input.

Scouts and/or experts from the network might be helpful here. In case of proper incentives for these experts, valuable insights for the focal company may be drawn from the network. The information would still be coming from outside but from a trusted source - therefore qualifying as source for validation of own data. The deputy director of an SME summarized it as follows:

> It is especially about the network, more than the money. The fact that there are high quality research institution and top industrial partners, that's what we see as the advantage of participating in ICT Labs [EIT Digital].

The maturity levels of the element *sources* are linked to the accessibility of information and to the competitive advantage that they provide, whereas especially the latter is hard to define (Rohrbeck, 2011). Respondents throughout the interviews indicated that sources from the network are considered differently and that a network such as the EIT Digital may yield a substantial competitive advantage. *Source*-related statements were made 97 times throughout

[17] Translated from German by the author. Original quote: 'Der zweite Punkt ist das Partner-Netzwerk, also gerade auch das Europäische, dass einfachen Zugang zu Industriepartnern und zu anderen Forschungspartnern schafft, möglicherweise, um auch Projekte zu machen, die gar nicht Teil der EIT ICT Labs sind'.

the interviews and open questions in the survey, see Section 3.3 for a related evaluation, giving additional support for *network sources* as new source.

Respondents' statements mention the importance of network relationships in the context of their own scanning activities through 'access to many experts, insights from different types of organizations and industries […], higher likelihood of turning insights into action', 'broader expert base, familiarity with broader set of contexts, multiple perspectives', 'new insights and other points of view', 'a broader scope of competences', and 'easier access to content'.

3.5.2.2.2 Method sophistication

Method sophistication is a key dimension contributing to an organization's ability to interpret information adequately. The dimension's focus is on the overall method portfolio and systematic selection of appropriate methods for a given context and problem rather than individual methods. Data from our survey showed that a vast variety of methods are applied within the different organizations partnering in the EIT Digital, see Figure 20 in section 3.3. for details. With regards to the elements *match with context* and *match with problem* the Innovation Director of an R&D unit of an MNE stated exemplarily:

> So at the end there is a different focus [in the network], a little bit. When we are searching in the areas of smart energy [in the network] it's different than typical smart energy searches [within the interviewee's employer]. When we search around focus areas like smart cities, it's again different than smart cities for [the interviewee's employer]. So [my employer] defines the things along its portfolio and competencies. But because EIT ICT Labs [EIT Digital] is a conglomerate or an entity which is influenced by partners which have different motivations and setups, academia and so on, there will be divergence.

Nonetheless, the phenomenon is suitably covered with the elements *match with context* and *match with problem* in the original model.

Further, our survey revealed split opinions on edited but static insights vs. unedited but dynamic and instantly accessible information, see Figure 21 in section 3.3. The original element *communicative capacity* can be interpreted to cover this aspect. Its importance is emphasized by the Innovation Director cited above:

> They [managers, politicians and other stakeholders] read the report, they know about it and I don't mean that they call me and say: 'Please come and explain me this trend.' Not in this way, but it is this opinion shaping. You can support shaping the strategic innovation agenda with this.

The importance of the *integration capacity* was emphasized by several respondents. For example, the managing director of an SME stated that

> absorptive capacity is the biggest issue, i.e. how a unit really can integrate innovation, the transition from a research or development unit into business units. Many business units just can't integrate innovation due to many reasons, e.g. political reasons, budget reasons, operational expenditures, the lack of willingness to integrate proprietary developments […]. These are multifaceted barriers that may tip the balance, not just stubbornness of individuals.[18]

By summarizing her role as 'try[ing] to distribute all the information that we receive [from the network] among our institutes that are active in the network'[19] the coordinator of EIT Digital activities within a research institute points towards importance and difficulties of integrative capacities within her organization.

In sum, the original elements and maturity levels for the *method sophistication* capability dimension as introduced by Rohrbeck (2011, pp. 76-77; 98-102) cover interfirm relationships adequately despite additional aspects as shown above. The original elements are reproduced in Table 15 for completeness.

Table 15: Elements of capability dimension *method sophistication*. Reproduced from Table 4.3 in Rohrbeck (2011, p. 77).

Element	*Status (n/a/u/na)**	*Description*	*Comment*
Match with context	u	Describes how deliberate the method is chosen, given a certain context	–
Match with problem	u	Describes how deliberate the method is chosen, given a certain problem	–
Integration capacity	u	Describes how useful the method portfolio is for integrating different information	–
Communica-tive capacity	u	Describes how useful the method portfolio is for communicating insights internally and externally	–

**new / adjusted / unchanged / not applicable*

3.5.2.2.3 Culture

The capability dimension *culture* describes to what extent the organizational culture encourages foresight efforts. At this, the model's elements are restricted to cultural aspects

[18] Translated from German by the author. Original quote: 'absorbtive capacity ist das größte Problem, also wie denn eine Einheit dann auch wirklich diese Innovation aufnehmen kann. Also wirklich dieser Übergang aus dem Forschungslabor oder aus dem Entwicklungs-, sagen wir mal, aus einer Entwicklungseinheit in die Produktion. [...] Aus verschiedenen Gründen. Politische Gründe oder Budgetgründe, man möchte auch/ Also Opexgründe kann es auch geben, man möchte keine Eigenentwicklungen haben […]. Also es sind vielfältige Barrieren, es muss nicht nur die Sturheit der handelnden Personen sein, sondern da gibt es viele Barrieren, die dann sehr ausschlaggebend sein können.

[19] Translated from German by the author. Original quote: 'Also, ich versuche die [...] ganzen Informationen, die man bekommt, an die anderen Institute zu streuen, die da noch mitmachen."

with a direct influence on the foresight capability (Rohrbeck, 2011). Culture in a wider sense is captured in the *context* part of the model. With regard to interfirm relationships, a new element *willingness to share across organizational boundaries* is proposed below. Additionally, the elements *informal diffusion of insights* and *attitude of the organization toward the periphery* are proposed to be revised slightly. An overview of all resulting elements is shown in Table 16.

Table 16: Updated elements of capability dimension *culture*. Based on table 4.6 in Rohrbeck (2011, p. 81).

Element	*Status (n/a/u/na)**	*Description*	*Comment*
Willingness to share across functions	u	Describes the degree of openness and inclination to share information across functions.	–
Willingness to share across organizational boundaries	n	Describes the degree of openness and inclination to share information across organizational boundaries	–
Readiness to listen to scouts and external sources	u	Describes the openness and inclination to listen to external information sources.	–
Informal diffusion of insights	a	Describes the role and effectiveness of informal communication for the diffusion of future insights.	Now referring to whole network as target of communication.
Attitude of the organization toward the periphery	a	Describes the level of curiosity of the top management towards the periphery	Updated understanding of periphery, now split into *inner periphery* linked through a network and *outer periphery*.
Willingness to test and challenge basic assumptions	u	Describes the degree of willingness of top management to challenge underlying assumptions	–

**new / adjusted / unchanged / not applicable*

The results of our survey among EIT Digital partners show that the readiness to share information with outside partners differs substantially, even within the large but closed partnership, see Figure 22 in section 3.3. for details. Linking the readiness for organizational sharing of organizations to the perceived benefit of foresight activities in a network–see Figure 23 in section 3.3.–leads to the suggestion of introducing a new element *willingness to share information across organizational boundaries* for assessing a company's cultural abilities in this regard. The focus of this element then is on the organization's willingness to share inside-out. This is a clear differentiation to the element *readiness to listen to scouts and external sources*, which focuses on outside-in information acquisition (see Gassmann and Enkel (2004) for inside-out / outside-in process conceptualization).

The *readiness to listen to scouts and external experts* has been emphasized by Rohrbeck (2011) and others, e.g. Miles et al. (2010, p. 101) when stating that 'global sourcing of products and ideas also requires the firm to understand business practices and cultures in a variety of environments'. In this regard, an Innovation Director of an MNE summarizes their classic split between internal and external scouts and processes as follows:

> We have external scouts who scout for the topics, then we have internal expertise which is filtering, selecting. Then we run iterations [to] have a digested or prioritized list of important opportunities or facts.

Further, I propose to update the element *informal diffusion of insights* slightly to reflect interfirm relationships. The above-cited Innovation Director emphasizes the importance of a mixture of formal and informal diffusion of insights by stating:

> I think you need workshops, you need to get people together and talk. But if you don't publish any report … you cannot not publish reports, [because] you cannot communicate about the outcome and opinion without them.

Instead of limiting the view on diffusion of insights within the focal organization this should be broadened to include external organizations. As discussed by Rohrbeck, major value created through foresight is the ability to influence others to act, including other companies and policy makers (Rohrbeck, 2011)—data from our sample validate these findings for the network setting.

Shaping and driving the ecosystem has been emphasized as a major value created through foresight in the EIT Digital network. A General Director emphasized the collective power of a network in this regard as follows:

> [A main benefit of the network is] a greater impact on the European level, our influence on European policy making, to give you an example. By speaking in a unified voice together with the other EIT ICT Labs [EIT Digital] partners.

In addition to formal ways of distributing information, *informal diffusion of insights* plays a major role at this, especially when formalized processes are not in place.

I propose to update *attitude toward the periphery* slightly as well. Considering interfirm relations allows splitting the periphery into inner and outer periphery. The following statement of a research institute's management team explains the role of a network such as EIT Digital compared to outside parties as facilitator. Being a facilitator, a network can be expected to increase readiness to listen to externals at the same time.

> I think a lot of companies and universities […] are in need to determine what will be the vision in ten years and to determine the [future] technology and to determine how to

> cooperate between academia and industry in the upcoming years. And this is, I think, where EIT ICT Labs [EIT Digital] is a good facilitator.

Also, the data from the survey showed that organizations clearly differentiate between associated partners and further periphery when sharing and receiving information, see again Figure 22 in section 3.3.

3.5.2.2.4 Organization

The *organization* capability dimension of the original Maturity Model aims at capturing the ability of an organization to identify, process and interpret, and act upon insights systematically (Rohrbeck, 2011). When extending the view to a relational one, the existing aspects of the model are not in need of changes but can be complemented with a new element *formal diffusion of insights externally*.

Table 17: Updated elements of the capability dimension *organization*. Based on table 4.5 in Rohrbeck (2011, p. 80).

Element	*Changes (n/a/u/na)**	*Description*	*Comment*
Mode	u	Describes how companies engage into foresight activities. Differentiated into top-down vs. bottom-up continuous and issue-driven.	–
Integration with other processes	u	Describes to what follow-up processes the foresight activity is linked.	–
Formal diffusion of insights internally	u	Describes the role and effectiveness of formal communication to transfer future insights internally.	Equals the element of the original model, renaming only.
Formal diffusion of insights externally	n	Describes the role of formal communication to transfer future insights to partners.	Extends the observations to insight-sharing with external partners.
Accountability	u	Describes the extent to which employees are responsible for detecting and acting on weak signals.	–
Incentives	u	Describes if rewards or bonuses are awarded to encourage future orientation and wider vision.	–

**new / adjusted / unchanged / not applicable*

The original element *formal diffusion of insights* is renamed to *formal diffusion of insights internally.* Its focus remains on describing the role and effectiveness of formal communication of foresight insights within the focal organization (Rohrbeck, 2011, p. 80).

Additionally, introducing the new element *formal diffusion of insights externally* to capture mechanisms for distributing insights with partners and the environment. The argument to add

this element is based on the value contribution dubbed *shaping and driving the ecosystem* (see Table 10 in section 3.3.) which is closely related to *influencing others to act* in Rohrbeck's original work (Rohrbeck, 2011). Multiple interview partners mentioned 'shape the innovation agenda' as benefit of engaging in networked foresight, just as 'provid[ing] evidence on new innovation opportunities to its ecosystem', implying that collaborative foresight activities might shape the environment. Further, it was stated that to '[c]ontribute to and initiate development in the ICT area' is one of the benefits of the network (see table 10 in section 3.3.).

To be able to drive the ecosystem, efficient ways to share knowledge need to be in place. These can be informal and formal—in the *organization* capability dimension the formal diffusion is captured. Informal ways are part of the *culture* dimension described before. Table 17 reproduces the original, unchanged elements complemented by the new one.

For *formal diffusion of insights externally,* i.e. to the environment, formal channels can be established. The entry point for many could be publishing some of their insights to a wider audience, e.g. through white papers, newspapers or journal-like publications, newsletters and/or trend or hype curves as for example DHL does with the regularly published DHL Logistics Radar[20]. For influencing outside activities more pro-actively, insights from corporate foresight can, for example, be pushed into interorganizational activities. For driving partnerships or conglomerates in a more targeted way, organizations need to push their insights not only to projects and activities but to the management of the partnerships, e.g. through their members of steering boards. At the most advanced level, a foresight unit of the focal organization should be able to actively bring future insights into decision-making boards of interorganizational partnerships and/or network management team meetings, backed by corporate steering board members.

Often, tool support is discussed in this context as well. The Innovation Director of an MNE R&D unit comments that:

> You cannot find a tool which is useful for everybody and for all the needs. And there are many needs in big organizations. So we will never have one fit for all. So if you want to have a communication bus into the community, you need to find something which supports this. You need some kind of analytical engine behind it, so you can pick out some trends from what people talk about. Still, you need to invest one or two or three FTEs who just make it a living platform. That's costs and you need to have these people who will run it. It will not just [work] just because of people having some interest, never. That's empirical.

[20] see https://www.logistics.dhl/global-en/home/insights-and-innovation/insights/logistics-trend-radar.html

Foresight support tools can in many cases be used as means for formal diffusion of insights, both internally and externally.

3.5.2.2.5 People & network

The original capability dimension *people and networks* describes the organizational ability to capture information and channel it to adequate recipients. Besides the characteristics of involved persons, personal internal and external networks of these persons are key to achieve a high maturity level in the original model (Rohrbeck, 2011, pp. 77, 103). Additionally, formal and informal ties on the organizational level can further foster identification and translation of identified potential into value, see e.g. research on Open Innovation by Chesbrough (2003a), Gassmann and Enkel (2004), Gassmann et al. (2010) and others.

The element *characteristics of foresighters* subsumes the most desired characteristics of individuals, i.e. deep and broad knowledge, curiosity and receptiveness, open-mindedness and passion, and personal internal and external networks (Rohrbeck, 2011).

The network on the company level is captured by the elements *internal network* and *external network* in the original Maturity Model. However, the depth of analysis of interorganizational ties can be increased substantially through the introduction of two new elements: *extend of the company's network*s and *types of partnerships*.

The *extend of the company's partner network* can be captured with two attributes (Kontos, 2004, p. 27):

- *Number of partners* to provide an indication of the complexity and interconnectedness of the focal company's partner network. This attribute shall capture formal, contractual ties for foresight purposes in a broader sense only. Level 1 organizations would be expected to have none to few formal ties. In contrast, level 4 organizations would be expected to be formally tied to many partners not only from their core industry, but also adjacent and remote ones in multiple ways. These links would increase credibility of internal foresight results through direct and indirect validation, nurture the focal organization's innovation activities and increase chances of desired but coincidental detection of new opportunities. With regard to the latter two aspects, one interviewee stated that

  > [by] being involved [in EIT ICT Labs], we get additional content, new perspectives, whatever you call it. So we learn something new from partners that are there. […] We can leverage what we bring in by what we get out of it.

- *Range of partner organizations' size* to provide an indication of the scope and efficacy

of partnerships, i.e. ranging from startups and small companies to medium-sized companies and eventually MNEs.

The *type of partnerships* can be described with three attributes (Kontos, 2004, p. 27 et. seqq.):

- *Centralization* to allow differentiating between partnerships that are coordinated by one central partner (often referred to as hub organization) and those that are coordinated equally by all participating parties (flat / poly-centric organization). In flat partnerships decision-making is moved to lower organizational levels to leverage the broad information basis that is available (Kontos, 2004, pp. 4-5). The partners have more autonomy when implementing individual parts of larger activities, thus output can be driven to fit the needs of the focal organization within these activities. When discussing decentralized aspects of EIT Digital a respondent stated that

  > 'EIT ICT Labs [EIT Digital] is a conglomerate, an entity which is influenced by industrial partners which have a different motivation and setup [than the interviewee's employer], including academia and so on, so there will be divergence. And the interpretation of the topics will also diverge, because we don't talk to telecommunication experts only, we also talk to EIT ICT Labs [EIT Digital] action line leaders [resembling section or business unit managers in companies, comment from the author]'.

  Additionally, he mentioned 'the economical leverage, so we are able to run the [internal] foresight by being also budgeted for this'. Partnerships driven by one hub-organization are more autonomous organizations themselves, often with own mission statements, strategy, and workforce. Mature companies will build own networks, will have active roles within decentralized networks, and will hold key roles within hub organizations—e.g. through board level positions. Typically, decentralized partnerships are reciprocal structures, i.e. partners exchange resources and coordinate in functions. Centralized partnerships are typically also redistributive, i.e. resources are bundled in a resource pool and activities are implemented collaboratively. Highest benefits in redistributive settings for the focal organization can be achieved if a central role can be taken. This way, resource selection from the other partners can be influenced, activities can be defined, etc.

- *State of relationships*: relationships can be potential, latent or active. Especially in the early phases of a new network many potential relationships exist, i.e. contact, interactions and trust have yet to be established. In active relationships interaction takes place at the given time, mutual trust is being build up. Relationships become latent once no active interaction takes place but trust and contact has been

established (Evers (1998, p. 49 et seqq.) cited in Kontos (2004, p. 28)). Mature companies will constantly build potential relationships, have a large pool of latent partnerships and be actively involved with multiple partners at a time.

- *Direction*: depending on the involvement of suppliers, customers, competitors and adjacent or completely detached organizations, a network's direction is horizontal, vertical or diagonal (Boucke & Deutsch, 1997, p. 33; Kontos, 2004, p. 26). Potential richness of information, the possibility of identifying white spaces and potentially disruptive developments in a product- and service landscape increase in vertical and/or diagonal partnerships. Mature companies will constantly nurture and maintain partnerships in all directions.

The resulting elements of the capability dimension *people & networks* are summarized in Table 18.

Table 18: Updated elements of the capability dimension organization. Based on table 4.4 in Rohrbeck (2011, p. 78).

Element	*Changes (n/a/u/na)* *	*Description*	*Comment*
External network	u	Describes extent and intensity of external ties of both, the company and the employees, and encouragement for building these up.	–
Internal network	u	Describes the extent and intensity of ties of employees to other units and functions within a company, and the encouragement to build and maintain these.	–
Characteristics of foresighters	u	Describes the capabilities of foresighters in terms of network, knowledge, passion, open-mindedness and curiosity for the new	–
Extend of the company's network	n	Describes the extend of the companies network in terms of number and range of partners	–
Type of partnerships	n	Describes the predominant types of partnerships in terms of centralization, state of the relationships and directions	–

**new / adjusted / unchanged / not applicable*

3.5.2.3 Value contributions and impact

Empirically derived insights about the relationship of corporate foresight and performance remain scarce; mostly as a result of expectable and measureable effects in the long-term only and a lack of clear success factors (Iden et al., 2017). Still, substantial progress

has been made in the past years in understanding the value contribution and the impact of corporate foresight on the firm. Initial hypotheses have been analyzed in multiple qualitative studies and first components and results from theory testing research have emerged, e.g. in Rohrbeck et al. (2015), Amanatidou (2014), Boe-Lillegraven & Monterde (2014), Heger and Boman (2013), Jissink et al. (2014a); Rohrbeck (2012), Rohrbeck & Kum (2018), Rohrbeck et al. (2018), Rohrbeck & Schwarz (2013) and Vecchiato (2014).

For discussing potential value contributions of semi-open networked foresight activities to individual partners' performance I change from a capabilities point-of-of-view to a process-based discussion. Links of foresight, the RBV, dynamic capabilities and the relational view have been presented, see for example 2.2 to 2.4. Hereafter, I use a most fundamental foresight process made of the process steps 1) perceiving change, 2) sensemaking, and 3) transforming insights into action as antecedents to firm performance—a process closely related to Teece's dynamic capabilities framework used before in section 2.3 (Teece, 2007; Teece et al., 1997) and put forward by Rohrbeck and Kum (2018). Contributions to these three fields are complemented by the category 4) *secondary value contributions* for discussing aspects that have an indirect effect.

3.5.2.3.1 Perceiving change

Perceiving change is a prerequisite for preparing, taking decisions and ultimately increasing organizational performance. A fundamental capability that is required to increase future orientation is detecting relevant information and sensing weak signals, trends, technological developments, and any other changes in the environment across time horizons. Impact of corporate foresight systems to this category has been reported in prior research, e.g. in Rohrbeck's dissertation and succeeding research in this research stream (Jissink et al., 2014a, 2014b; Rohrbeck, 2012; Rohrbeck & Kum, 2018; Rohrbeck et al., 2018; Rohrbeck & Schwarz, 2013).

Respondents in our survey within EIT Digital showed high expectations for value contribution from networked foresight activities especially for individual firms' *perceiving* practices. Among the top-ranking value propositions were those that are tightly linked to scanning. Specifically, *ensuring state-of-the-art innovation activities* and *identification of relevant external change* ranked high, i.e. those focusing on broadening the data and information base, see Table 10 in section 3.3. *Knowledge exchange among organizations* and *search for missing resources* rank likewise high. Interviewees' statements, e.g. as quoted below from a Research Manager of an MNE and the Head of Technology Exploration of an SME, allow ascribing this to the vastly broadened availability of information sources, experts and competences.

> Knowledge exchange among partners, complementing each other and creating a long-term view - that is about it [my expectation, comment of the author], yes.[21] (Research Manager, MNE)

> Guidance for own activities, basis for partnering and showcasing competence, […] access to many experts, sharing of existing knowledge (Head of Technology Exploration, SME)

Other interview partners explicitly mentioned 'in-depth understanding of changes in the ICT field', 'pertinent and updated knowledge and not [just] information', a 'broader scope of competences', 'multiple perspectives (education, research, business)' and 'extending capabilities in the technological portfolio'[22]. A professor involved in multiple EIT Digital activities observed 'I believe that companies look for fresh air that they require to not become less important over time'. A deputy managing director and manager of a regional hub of EIT Digital claimed that:

> If value chains change, new technologies […] obviously are an important influencing factor […] and whole industries are disrupted, then it is of utmost importance to search for information outside of your own company and industry, and to partner up with other companies.

Besides broadening the body of information by partnering, *validation* through the many available interdisciplinary, international and diverse experts is an expected core contribution of networked foresight. The Head of the EIT Digital Innovation Radar particularly stated:

> So they [network partners, comment of the author] tell me: "we would like you to set up a workshop. We don't want infrastructure companies, we don't want the tel-cos, we're not interested in [a particular company mentioned by name, comment of the author] showing up. […] If you can get an historian of technology, social anthropologists, sociologists and people that understand the way that user needs sort of evolve and come up." [It] is actually something that they don't have in house at [company name], they don't have it among their activity leaders.

In contrast to corporate foresight conducted by internal analysts and experts, networked foresight as defined here bears the advantage of being close and based on a common understanding and shared language, yet still an outside source that management accepts for validating own analyses. An Innovation Director of a German MNE put it as follows:

21 Translated from German by the author. Original quote: 'Der Wissensaustausch zwischen verschiedenen Partnern, dass an sich da einfach ergänzt und auch eine long-term sicht mit reinkriegt. Das sind so ungefähr die Punkte, ja.

22 Translated from German by the author. Original quote: 'Erweiterung der Fähigkeiten für das technische Portfolio"

> […] we use it as information source, of course. It makes sense […] and it also helps to refer to the EIT innovation radar because that's a third party. In [our company] it has some reputation … it's an institution and it has a certain role and appearance. So people validate or appreciate this external source differently and need them also for validation of internal resources.

Other interviewees hinted at aspects that are widely known as competitive intelligence as propagated by Porter (1980b), i.e. the identification of competitors' moves and strategies, but refrained from explicitly mentioning it as goal they pursue within the EIT activity.

The data shows that interviewees and survey respondents see potential for contributions from sensing activities within the network to their organizations. However, once competitive fields and company-internal aspects come into play suspiciousness and thus reluctance seems to prevail and halt partners from openly sharing and discussing their insights.

3.5.2.3.2 Sensemaking

Information detection is a first step towards increased future preparedness of organizations. However, detected information needs to be interpreted and processed to become insight which can then become a basis for taking action—sense needs to be made out of mere information.

Corporate foresight has been found to contribute to interpretative steps in several ways, among others by *consolidating opinions and triggering of discussions*, and *initiation or moderation of strategic change* (Rohrbeck, 2011; Rohrbeck & Schwarz, 2013). In the survey within EIT Digital, these two value propositions were acknowledged for networked foresight activities by more than 50 % of the respondents. A Group Manager of an MNE shared his observations about the potential role of the network to provide guidance for strategy-making—in this case for research institutes and stated:

> I assume that all research institutes are interested in the view of the industry and their exploitation possibilities to provide some guidance for them. [… And in] knowledge exchange among the different partners that are complementary to create a long-term view [on the industry].[23]

An Innovation Director of an MNE further explained the step after detecting information within the network as follows:

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[23] *Translated from German by the author. Original quote: „Also ich nehme mal an, dass die Industrie / die Forschungsinstitute sind natürlich generell interessiert an der Sicht der Industrie, an der Verwertung, um denen praktisch die Richtung [...] zu zeigen."*

> It's not only to be the discoverer, to be in this analytical part, [and to] find out what's going on but also to comment, interpret and set the innovation agenda through being active, through (...) analyzing and trying to understand the trends [collaboratively].

Further referrals were made by a strategist from an MNE and an MNE Group Manager to 'other points of view', 'complementing insights' and the introduction of 'long-term views'.

Within sensemaking practices independent, rich, and external views that result from foresight activities within the network were emphasized as particularly relevant.

3.5.2.3.3 Transforming insight into action

As shown above, members of the EIT Digital were particularly confident that perceiving and sensemaking can be facilitated through the network. However, when it comes to facilitating action within individual organizations one would assume that reservations come to the fore. Whereas perceiving and organization-agnostic sensemaking benefit from access to many sources, perspectives, and competences, deriving consequences and considering action within individual organizations may change the competitive landscape and are thus considered highly sensitive and confidential. Thus, caution and reticence of organizations can be expected. And in fact, interviewees referred positively on multiple occasions to better alignment within the industry, visibility and the possibility to influence others in some way but were skeptical about support through the network for developing their own strategies.

Exemplarily for several persons one Deputy Country Manager of the EIT Digital hub organization referred to societal and regional value that can be created:

> I truly believe that we can capture, shape and co-determine industrial, societal and economic upheaval in Germany and Europe caused by the inevitable digital transformation.[24]

A Managing Advisor of an industry hub added with regard to visibility for the overarching topic 'digitalization':

> So we still need attention form governments on this topic [digitalization, author's note]. And what I think EIT can manage to do is at least to get it on the European agenda and even keep it, more importantly, on the European agenda.

Whereas knowledge facilitation and information exchange is recognized as a benefit created through the network setting, results from our survey support expectations that the value propositions ranking lowest in importance in this kind of setting are those that involve sensitive

[24] Translated from German by the author. Original quote: „Ich glaube tatsächlich, dass wir eben die industrielle Umwälzung, gesellschaftliche und wirtschaftliche Umwälzungen, die durch den IT-Bereich kommen, bearbeiten, aufgreifen und mitbestimmen können in Deutschland, in Europa.

information close to the partners' core business and actual decision-making that is found to be relevant in the competitive environment.

3.5.2.3.4 Secondary value contributions

Besides value directly related to organizational perception, sensemaking and from transforming insights into action, network settings create 'enablers', i.e. secondary and often indirect value. Specifically, consulted respondents during this research emphasized i) networking opportunities and ii) visibility, public relations and brand building.

While not directly creating monetary results, networking is seen as one of the core benefits that reaches beyond activities within the network. It can arguably be linked closely to building active or latent partnerships from potential ones. A university professor and head of a research department of a Dutch research institute put it as follow:

> So I mean, these contacts, they are starting to grow. And did I not know DFKI [Deutsches Institut für Künstliche Intelligenz, author's note]? Yes, I did, but I didn't know this specific group. So these contacts are starting to materialize.

A dozen other interview partners mentioned networking explicitly, e.g. a department manager of a major MNE who stated:

> Independently from EIT-funding, in these meetings alone, where you meet a similar group of persons on multiple occasions regularly, you build up contacts and you build up trust. Here lies value to a certain extent.[25]

The Head of the EIT Digital Innovation Radar explained in more detail that

> […] this is actually not wasting anybody's time, it's saving them time. A, because they bump into these people that are either part of the organization or someone that they can just exchange business cards with and they are on a level with face time with these people. And the workshop brings people together. You get fairly close in these workshops, because you are honest, you are free of your corporate burden, you are there more or less as a private person. When you express opinion, it's your opinion. Hopefully you get the feeling that you are among friends. So this means that some of my workshop participants, they bond socially afterwards, they keep in touch on LinkedIn or emailing or whatever. And this has a value too, both for recommending EIT ICT Labs to other people not part of the KIC yet and also contributing towards this overarching goal on becoming a thought leader on ICT in Europe […]

[25] Translated from German by the author. Original quote: „Und da steckt auch, unabhängig von dem ganzen EIT-Funding, also allein in diesen Treffen, wo man doch immer wieder mit einer Gruppe von Leuten, zu denen man zunehmend auch Vertrauen und Kontakt gewinnt, zusammen kommt, da steckt schon auch ein Stück Wert.

An executive board member of an Italian industry-backed institute for applied research illustrated with an example:

> Only because of this collaboration we could have access to the people in Siemens that work on the foresight studies, otherwise I didn't even know about the existence of the department, so I think the ICT Labs [EIT Digital] have opened a number of doors and facilitated the collaboration with some key people in the industry, for example.

A project manager of an SME goes further by stating that value lies in

> the partner network, especially the European one. Easy access to industry and other research partners, possibly to realize projects that are not part of the EIT and having access to people.[26]

Another researcher within an MNE does not only formulate this as a goal but states that multiple project ideas have emerged and are being followed-up at the time of the interview.[27] Specifically, joint activities that are funded by the hub organization not only create networking opportunities but also allow the formation of new teams that can be put to test in small interorganizational projects.

With regards to visibility, the above cited executive board member stated that

> the main benefit is to be able to have the international visibility. And by involving a number of partners in this network to achieve a greater impact of our research, what we do.

While not contributing to firm performance directly, network partners explicitly emphasized value contributions through networking and visibility, public relations and brand building.

3.5.3 Applying the Maturity Model to network configurations

In the following, the applicability of the Maturity Model to network organizations and public-private partnerships is discussed based on the EIT Digital case. The applicability of the Maturity Model to these constructs was assumed based on their quasi-firm character (Colombo, Pirelli & Piva, 2006; Rohrbeck & Pirelli, 2010), the relevance of such constructs in general based on 'the increasing interest to develop highly complex innovations requiring multiple firms/actors to collaborate, such as electric mobility, where car companies, energy utilities and road/petrol station providers need to act in an orchestrated fashion to develop effective innovations.' (Rohrbeck et al., 2015)

[26] Translated from German by the author. Original quote: „… das Partner-Netwerk, also gerade auhc das Europäische, einfacher Zugang zu Industriepartnern und zu anderen Forschungspartnern, möglicherweise, um auch Projekte zu machen, die gar im EIT sind, … mit den Leuten da in Kontakt zu kommen.

[27] Originally, the interviewee answered a question for activities resulting from EIT networking with: „Ja, das kann ich sagen. Wir haben Kontakte geknüpft. Ich möchte jetzt keine Namen nennen. Daraus haben sich auch Projektideen ergeben, die wir gemeinsam verfolgen.

In the *context* part, the two elements *company size* and *nature of strategy* need to be reconsidered due to their original focus on companies instead of network configurations. In the following sections, the rational for adding the network specific context elements *network culture*, *size of the network type*, *type and characteristics of partnerships* are set forth.

Similarly, changes to the original five *capability dimensions* of the model are proposed and discussed. Particularly affected are the dimensions *organization, culture, and people & network.* Differences in the *organization* dimension result from the inherent nature of most partner-driven networks: steering instruments based on hierarchy can hardly be applied for managing people in networks. Projects, tasks, and processes need to span multiple organizations and/or integrate with existing ones within the network partners. Accountability of people blurs, and incentive systems cannot be set-up as in single organizations. When it comes to *culture*, I argue that the importance of mindset and openness of people increases further. Sharing information and knowledge across organizations become a fundamental requirement in foresight systems that span over multiple organizations, the basis for this is *trust* and *network cohesion*. Significance of *internal* and *external networks*—part of the *people & network* dimension—increases.

Finally, I discuss additions to the *impact* part of the Maturity Model that result from the different objectives of foresight within network configurations compared to corporate foresight. *Corporate* foresight takes a firm perspective, thus focusing on firm characteristics and goals. In his definition of corporate foresight Rohrbeck (2011, p. 11) described the goal of a CF system as '[…] formulating effective responses to ensure the long-term survival and success of the company'. Key to this definition is the *company*, clearly putting the company's performance—profitability, market valuation, revenue and growth—at the centre. As for *networked foresight*, the goal and targeted impact is not as clear. The manager of the networked foresight activity within the EIT Digital commented:

> I find myself using this phrase over and over again, that networked foresight is the sort of foresight useful not just to the partners of an organization, but also to the organization as a whole. Meaning that there is some sort of systemic value on top of all the value for each partner. So the sum is larger than just adding up all the parts, so to speak.

It seems valid to claim that each profit-oriented company engages in networks and collaborative activities to achieve their ultimate goal of increasing financial performance. However, from the central network point-of-view—meaning considering the whole network that might include other types of organizations than companies, particularly universities and research institutes—collaborative foresight activities have to be managed in a way that leads to substantial overlap of interests of involved partners. This changed configuration has multiple

ramifications, e.g. search fields that cannot be defined analogous to business fields as they can in corporate settings, differing time horizons that have to be taken into account, the impact of cultural differences among organizations, diverging assessment of signals by partner organizations, and varying performance measures, likely not solely based on financial performance.

3.5.3.1 Context

The context part of the original model aims at describing the broader setting of the focal organization Rohrbeck (2011, p. 73). In network settings, the set of factors that need to be taken into account has to be reconsidered and broadened compared to the original Maturity Model.

Company size and *source of competitive advantage* become obsolete due to their inherent focus on companies. The element *company size* can be replaced by *size of the network*. The context elements *complexity of environment* and *industry clockspeed* remain unchanged as they refer to markets and not specific organizations.

Nature of strategy in the original model referred to Day and Schoemaker's (2005) categorization into *differentiation strategy*, *cost leadership* and *focus strategy*. This classification is not suitable for a broad set of networks, e.g. partnerships focusing on pre-competitive product development stages. Instead, the *nature of strategy* in networks can be classified into *exploitation networks*, *exploration networks* or a combination of both, see e.g. Ahlert and Evanschitzky (2003), Bogenstahl (2009), Lethmathe (2001), Eisenhardt & Schoonhoven (1996), Gulati et al. (2000) and Ritter & Gemünden (2004).

People acting in the network need to be empowered to share information across boundaries, reaching out to people outside of the employing organization, and getting the attention of network coordinators and decision-makers. Openness becomes a precious precondition for success, so does transparency and empathic, target group specific management and communication. One Manager of European Innovation in an applied research institute explained that

> EIT ICT Labs [EIT Digital] is a collection of partners who all have their sensibilities, sensitivities [...]. You have to manage that. [...] the process could be very simple for a small activity, [for example:] decision done by someone. But the impact of doing it like that could be detrimental, because it would not be understood. Or it could be criticized [and wrong conclusions be drawn].

At the same time, active people in the network face a multiple-agency, multiple-principal working environment (Child & Rodrigues, 2003). Harris (2003), for example, examined problems induced by a lack of a clear strategy for collaborative working and wrong assumptions about co-workers' goals within a collaborative setting that can be tracked back to the multiple-agency phenomenon. Thus, instead of *corporate culture* the *network culture* becomes crucial in network settings. It needs to reflect the set of separate cultures in its entirety and the potential difficulties that are caused as a consequence thereof. An element within the model seeking to reflect this should cover individual empowerment and reach within the network, as well as openness, transparency and loyalty to the network.

Further, the *size of the network* as indicator for the potential benefits but also the complexity should be taken into account. The exemplary statement of a professor from an academic partner shows the danger of highly complex networks:

> The time that I invest and waste for bureaucracy is exactly the time that I would have liked to have as free time due to a flexible model. I am very disappointed with this aspect. However, I believe that is something that has to be hold against the parent organization EIT. They are not flexible enough and fall back to old guidelines whereas the original planning aimed at being more flexible and very much improved [compared to past European guidelines].[28]

As discussed before, the *size of the network* can be captured with two attributes:

- The *number of partners* as an indicator for complexity and interconnectedness of the partner network. This attribute captures formal, contractual ties for foresight purposes (in a broad sense). The resulting links increase reliability of foresight results provided by individual partners, they can nurture the partners' innovation activities and increase chances of desired but coincidental detection of new opportunities. One Innovation Director of the central R&D unit of a MNE stated:

  > [By] being involved [in EIT Digital], we get additional content, new perspectives, whatever you call it. So we will learn something new from partners that are there […]

- The *partner organizations' size*, ranging from startups, small companies and institutes to medium-sized organizations and eventually MNEs. It seems safe to assume that links to outside parties, and integration, recognition and importance within the industry will increase when renown and/or large organizations are part of a

[28] Translated from German by the author. Original quote: „Die Zeit, die ich da rein investiere und mit Bürokratie und Ähnlichem verschwende, das ist eigentlich genau die Zeit, die ich gerne Freiheiten gehabt hätte durch ein besonders flexibles Modell. Also an der Stelle bin ich sehr enttäuscht. Und [...] das muss man letztlich, denke ich, dem EIT als Mutterorganisation ankreiden, dass es da nicht flexibel genug ist und nicht, und doch wieder auf alle alten Regeln zurück fällt [...] während die Ursprungsplanung, denke ich, da eine deutlich bessere und flexiblere war.

network.

The *type of partnership,* captured with four separate attributes has significant influence on the implementation possibilities of any collaborative activities.

- *Centralization* allows differentiating between partnerships that are coordinated by one central partner, implementing a certain level of hierarchy in networks—often referred to as hub organization, e.g. the EIT KICs (Knowledge and Innovation Communities) such as EIT Digital and 7 other KICs—and those that are coordinated equally by all participating parties (flat / poly-centric organization), e.g. the blade.org community as discussed by Miles et al. (2010). They argue that in case of 'capable actors who have knowledge, information, tools, and values required to set goals and assess the consequences of potential actions for the achievement of those goals do not need mangers. […] Together, these core organizational mechansims enable large groups of actors to collaborate in the pursuit of opportunities, or the solution to problems, with minimal use of hierarchical mechanisms' (Miles et al., 2010, p. 101). Still, in the EIT Digital case actors appear to not recognize this potential. For example, a professor and section manager commented:

  > Do you need an organizational entity to organize this? I think the answer is yes, that's why I said I wouldn't know how else to organize it, you need something to organize the distribution of the information and the knowledge. […] Whether you could organize it a different way, I don't know.

- *State of relationships*: relationships can be *potential*, *latent* or *active*. Potential ties are for example purely contractual ones, i.e. contact, interactions and trust have yet to be established. In active relationships interaction takes place at the given time. Relationships become latent once no active interaction takes place but trust and contact has been established, allowing for easy reactivation of the relationship (Evers (1998, p. 49 et seqq.) cited in Kontos (2004b, p. 28)).
- *Direction*: depending on the involvement of suppliers, customers, competitors and adjacent or completely detached organizations, a partnership's direction is *horizontal*, *vertical* or *diagonal*. A managing advisor from a research institute finds that:

  > […] you need to involve important companies, bigger or smaller, that complement the technological view, that can give the business insights.

  A Head of Department from an EIT ICT Labs industry partner qualified further:

  > A barrier [to cooperation] is when competitors collaborate. This works in case they have a common goal such as preparing a technology standardization because they know

that they cannot achieve it single-handedly. It does not work if each party tries to use the cooperation to drive development of an own idea or product-concept.29

- Finally, *partner mix* refers to the set of partners that aim to leverage complementary strengths for executing the network strategy, see e.g. Bogenstahl (2009) or T. Ritter and Gemünden (2003). With regard to the partner mix of a network one respondent from an industry partner of EIT Digital commented:

  The gravest obstacles are that the people that are assigned to the [collaborative] task are usually somewhat detached from core operations. Reasons for that are on the one hand that no one wants to reveal company secrets and on the other hand rivalry. I mean, here, people are collaborating that are fighting each other mercilessly on the market.30

Whereas the *type of partnership* describes the organizational set-up, the *characteristics of the partnership* can be captured with another set of three attributes, see e.g. Kontos (2004, p. 28):

- *Interdependencies & interactions*: Interdependencies result from the necessity to coordinate for collaborative activities and concomitant obligations (Hippe, 1997, p. 46 et seqq.). Interactions are the result of exchange of resources and adaption processes of partners.
- *Resource combinations* can be reciprocal or redistributive. In reciprocal resource combination structures, partners exchange resources and coordinate in functions. In redistributive resource combination partnerships, resources are bundled in a resource pool and activities are implemented collaboratively.
- *Redundancies*: high redundancies are a result of relative autonomy of cooperation partners and allow for flexibility and triangulation of information and insights.

Table 19: Proposed adjustments to elements of the *context* part. Based on table 4.1 in Rohrbeck (2011, p. 73).

Element	*Status (n/a/u/ na)*	*Description*	*Comment*
Company Size	na	Describes the company size by revenue and number of employees	Inapt in networks. Replaced by size of the network.
Nature of strategy	a	Original generic strategies for firms are not applicable. New classification into exploitation, exploration networks	-

[29] Translated from German by the author. Original quote: 'Eine Barriere ist, wenn Konkurrenten zusammen arbeiten. Das geht oft dann gut, […] wenn man zum Beispiel ein gemeinsames Ziel hat, eine Standardisierung vorzubereiten, weil man weiß, dass man das nicht alleine machen kann. Das geht dann schlecht, wenn das Projekt genutzt werden soll, um eigene Ideen oder möglicherweise Produk-Vorentwicklungen voran zu treiben."

[30] Translated from German by the author. Original quote: 'Also die größten Hemmnisse sind meistens, dass Leute drauf abgestellt werden, die sehr häufig vom Kerngeschäft etwas abgekoppelt sind. Das hat einerseits natürlich den Grund, dass keiner sich zu sehr in seiner Schatzkammer des Wissens gucken lassen will, also jetzt der Schutz von IPR's und Geschäftsgeheimnissen einerseits und andererseits natürlich der allgemeine Konkurrenzkampf. Ich meine, da arbeiten Leute zusammen, die sich auf dem Markt teilweise bis aufs Blut bekriegen."

		or a combination of both	
Network culture	a	Describes the culture of people active in the network in terms of empowering the individual initiative, transparency, openness and loyalty to the network.	Adjusted *Corporate Culture* item.
Source of competitive advantage	u	Describes the primary driver of success (e.g. technology or customer orientation) in the network's market(s)	–
Size of the network	n	Describes the extent and substance of the network. Size refers to no. of network partners and the partners' sizes.	–
Type of partnership	n	Describes the type of partnership. Differentiated into centralization (decentralized vs. hub organization/centralized), predominant state of relationships (potential, latent, active), cooperation direction (vertical, horizontal, vertical) and partner mix	–
Characteristics of partnership	n	Describes the character of the partnership in terms of interdependencies & interactions, redundancies, and resource combinations.	–
Complexity of environment	u	Describes the number of interdependencies in the market that need to be monitored and taken into account.	–
Industry clockspeed	u	Describes the rate of introduction of new products, processes and organizational structures.	–

**new / adjusted / unchanged / not applicable*

3.5.3.2 Capabilities

In the following sections the original capability dimensions are again used to structure the discussion of foresight assessments in network configurations. All elements of the original model are reconsidered for the context of networks, and adjustments and additions for network settings are discussed.

3.5.3.2.1 Information usage

The original capability dimension *information usage* describes the kind of information that enters the system, its source and breadth as well as methods for data gathering (Rohrbeck, 2011, pp. 74-76, 95-98). *Scope* and *time horizon* are applicable on the network level similarly to corporate settings. However, *reach* and *source* require adjustments to reflect the change of perspective.

An overview of the update is given in Table 20.

Table 20: Adjusted *information usage* capability dimension. Based on table 4.2 in Rohrbeck (2011, p. 75).

Element	*Status (n/a/u/na)**	*Description*	*Comment*
Reach	a	Describes how deep a network scans in focus topics, adjacent topics and / or new topics	Understanding of categories different to original model due to lack of clearly defined business fields in a network.
Scope	a	Describes how broad a network scans (technology, socio-cultural, customer, competitors and political environment)	Slight redefinition to match network terminology.
Time horizon	u	Describes the time horizons of foresight activities (ranging from near future to up to 30 years)	–
Source	a	Describes the information sources; differentiated into partner vs. network vs. external, formal vs. informal	Changed differentiation to reflect network perimeter

**new / adjusted / unchanged / not applicable*

Originally, *reach* was defined based on the business fields the firm is active in. In industry-spanning or horizontal network organizations such as the Groupe Speciale Mobile Association (GSMA)[31]—an international and industry spanning association of mobile network operators—considerations can quite naturally be broadened to the whole industry instead of a single firm therein. However, in cross-industry and/or diagonal networks such as the EIT KICs, the perspective cannot be adapted as easily: white spaces for one industry or company might be adjacent or even core to another one represented in the network. Thus, while the classification may remain as before, I suggest to adapt the underlying projection of the categories on a case-by-case basis. They can be expected to be drawn back to a meso- or even macro-level due to a lack of clearly describable business fields in a network compared to a single firm.

Whereas in the original model *sources* were split into internal and external ones, a network calls for a subtler classification. The importance of different information sources is created through their accessibility and a potential competitive advantage that they might provide (Rohrbeck, 2011). In a network, sources can be i) internal, provided by the hub organization (if one exists), ii) from network partners and with limited access for other network partners, iii) from network partners with full access to other network partners, and iv) external.

Increased levels of trust based on contracts, active and/or latent relationships were pointed out by respondents. However, our survey also clearly showed that the level of openness of many partners of the EIT Digital is still limited (Boman & Dunaj, 2012) and is thus calling for the proposed third, intermediate classification *network sources*. A professor and group leader of a large Dutch research institute commented that 'the main events or main deliverables were joint activities (..) that gave the collaborative insight." As discussed in section 7.1.2.1, large

[31] See http://www.gsma.com/aboutus/ for more information on the composition of the network

parts of the anticipated value of a network for its partners lies in the greater accessibility to information and improved triangulation possibilities compared to their own sources and resources, thus giving further reason to introduce such an intermediate classification. A Group Leader of an industry partner stated in an early phase of EIT Digital operations (in January 2012):

> This is also particularly true for research topics. I was hoping that heterogeneous partners join in some way and that knowledge transfer takes place.[32]

Adding to the potential of knowledge exchange, a network operated by a hub organization may employ own experts, analysts, strategists or foresighters that possess industry insights beyond a single participant therein. Consequently, information sources should be differentiated into partner sources, network sources and external sources. For example, mature networks would be expected to have own experts, analysts, and/or foresighters to make use of many sources—including external ones—that may provide a competitive advantage to a partner organization and to systematically exploit the network partners to generate insights. In this context, exploitation is understood as profound integration of multiple partners into interpretative steps to extract information and knowledge. Also, I suggest to add the *network as pool of experts* to the list of information sources. See section 3.5.1.2.1 and Rohrbeck (2011, p. 99) for further details on this list.

3.5.3.2.2 Method sophistication

The original capability dimension *method sophistication* describes a firm's ability to apply its overall method portfolio for information interpretation (Rohrbeck, 2011, pp. 76-77, 98-102). The elements *match with context* and *match with problem* are applicable in network settings as they are for firms. As in firms, the method-mix needs to be chosen deliberately based on context and problem given. However, increased complexity and cross-organizational cooperation increase importance of *integration capacity* and *communicative capacity*. Table 21 below summarizes the suggested slightly changed elements in this dimension.

Table 21: Adjusted *method sophistication* capability dimension. Based on table 4.3 in Rohrbeck (2011, p. 77).

Element	*Status (n/a/u/na)**	*Description*	*Comment*
Match with context	u	Describes how deliberate the method is chosen, given a certain context	-
Match with problem	u	Describes how deliberate the method is chosen, given a certain problem	-

[32] Translated from German by the author. Original quote: 'Das trifft natürlich besonders auch auf Forschungsthemen zu. Und da wäre natürlich schon die Hoffnung gewesen, dass man sich also auch mal mit (...) durchaus auch heterogenen Partnern irgendwie sich zusammen tut, Wissensaustausch stattfindet"

Integration capacity	a	Describes how useful the method portfolio is for integrating different information	Integration of information from becomes partners vital
Communicative capacity	a	Describes how useful the method portfolio is for communicating information internally and externally to relevant stakeholders	-
Transfer capacity	n	Describes how useful the method portfolio is for transferring insights to partner organizations	New element focusing on facilitation of partners' and the network's resources for the benefit of achieving the network's goals

**new / adapted / unchanged / not applicable*

Integration capacity originally describes the capacity of integrating information from different sources and interdependencies of sources and causalities. It was found to play an important role in the overall interpretation capacity of a firm (Rohrbeck, 2011). In a network, interdependencies inherently span organizational boundaries and the range of utilized information sources can be expected to increase. Additionally, hierarchical structures change. Usually, project, program and/or task leaders have little hierarchical power to direct team members in network activities. This requires the application of methods that either a) create direct value for the participants and thus induce a virtuous circle generating sufficient engagement or b) create incentives to engage differently, e.g. through social recognition within the network of peers. As a result, the element *integration capacity* remains applicable but underlying methods and projections can be expected to differ in networks. Also, the relative importance of the element might be higher compared to single firms.

Similar arguments apply to *communicative capacity:* while the aim remains similar, i.e. communicating information within the organization and externally—in this case the meaning of *internal* changes to the network and its members—the mechanisms to achieve optimal results differ to corporate settings. Here, communication across organizational boundaries becomes the key challenge whereas in firms internal communication is the major concern and external communication often only a secondary objective. The manager of a networked foresight activity in the EIT Digital commented:

> If we still think that EIT is going to be like the European MIT, I mean we have to reach out with high quality intellectual exchange. So maybe in the future there should be not just workshops, but round tables and webinars and high-profile events.

In networks, greater attention needs to be paid to terminology, trust and openness of partner organizations and legal restrictions such as antitrust laws in case of horizontal networks. An example about terminating an activity within the network provided by a Manager of European

Innovation of a large research institute shows that communication within the network is a very sensitive issue:

> […] you have to make sure that if you terminate a project or an activity, the reasons have to be clearly documented. And it is not a matter of: "ok, today I decide an activity does not exist". It is about: "we have looked at the activity. We have a number of criteria and along these criteria we believe the activity is not worthwhile [to pursue]."

As before, the relative importance of the element *communicative capacity* might be higher than in corporate settings and projections will differ.

Finally, a new aspect requires attention in network settings: *transfer capacity*. As foresight in networks may have two key recipient groups—the network itself and the network partners—the transfer of foresight insights into and between partner organizations becomes crucial. As discussed before, the expectable benefits of networked foresight are based on the concept of relational rents (see section 2.4)*,* 'supernormal profit jointly generated in an exchange relationship that cannot be generated by either firm in isolation and can only be created through the joint idiosyncratic contributions of the specific alliance partners' (Dyer & Wilkins, 1991, p. 662). The extent of relational rents depends on several factors, most prominently *absorptive capacity* as introduced by Cohen and Levinthal (1990) and *relational capabilities* (Helfat, Dyer, et al., 2007), including knowledge sharing-routines (Grant, 1996). While Cohen and Levinthal argue that organizations' ability to absorb knowledge depends on their absorptive capacity, Teece and Kale (2007) transfer this to the relational view and argue that it is dependent on the source of knowledge (here: the network) as well as the recipient (the partner organization). Besides the overlap of knowledge bases, which is argued to increase absorptive capacity, it depends on the build-up of routines of interaction for any effective knowledge transfer (Dyer, 1996).

Based on this line of argument, transfer capacities should be considered key for creating meaningful foresight in networks. Thus, an element *transfer capacity* should be added as fifth element to the *method sophistication* capability to adapt the original model for network settings. It should capture the usefulness and effectiveness of the method mix for supporting and enforcing interactions among network partners and transferring information and insights within the network. In contrast to *communicative capacity*, the *transfer capacity* focusses on creating an environment within the network that facilitates the use of partners' and the network's resources for the benefit of achieving the network's goals. A section manager and professor described the information flow problem in the given case as follows:

> How do we organize the interaction between the participants? […] How do we organize the information flow to the participants to make sure things are organized on time? […]

> Right now, you are relying on the individuals to get things organized. And I know we had the same thing, there had to be a workshop. And how do we get the workshop on time, when, where, how? I could imagine that there could be better support for this.

And a business developer from an innovation incubator described the missed potential due to a flawed communication, integration and transfer capacities as follows:

> I think the internal communication [is flawed] and also the information about the other activities. What are they doing, when are they meeting, who is responsible? I don't have names, I don't have telephone numbers, I really don't know who is doing what. Ok, I can do my job, but I cannot make connections with them, because I don't know what they are doing.

To reflect the importance of knowledge transfer and for sharpening the distinction of this element to *communicative capacity* I suggest re-focusing the latter to purely communicative aspects, i.e. passing on information to *relevant stakeholders* with no internalization aspects. In an optimal case, *integration*, *communicative* and *transfer capacities* complement each other and create a virtuous circle that leads to the above-mentioned super-normal profits.

3.5.3.2.3 Culture

The original capability dimension *culture* describes to what extent the organizational culture encourages foresight efforts. Here, as in the original model (Rohrbeck, 2011, p. 79 et sqq.), the discussion is restricted to cultural aspects with an expected direct influence on the foresight capability. Cultural aspects beyond this are part of the context discussion, see section 3.5.3.1.

Table 22: Adjusted *culture* capability dimension. Based on table 4.6 in Rohrbeck (2011, p. 81)

Element	*Status (n/a/u/na) **	*Description*	*Comment*
Willingness to share across functions	u/na	Describes the degree of openness and inclination to share information across functions.	Not applicable in case of decentralized network settings, else unchanged.
Willingness to share across organizational boundaries	a	Describes the degree of openness and inclination to share information across organizational boundaries	–
Readiness to listen to scouts and external sources	a	Describes the openness and inclination to listen to external information sources.	–
Trust	n	Describes the level of mutual trust among network partners.	
Informal diffusion of insights	a	Describes the role and effectiveness of informal communication for the diffusion of future insights.	Now referring to whole network as target of communication.

Network cohesion	n	Describes possible network effects and cohesion on social and organizational level	
Attitude of the organization toward the periphery	a	Describes the level of curiosity of the top management towards the periphery	Updated understanding of periphery, now split into *inner periphery* linked through network and *outer periphery*.
Willingness to test and challenge basic assumptions	a	Describes the degree of willingness of executives to challenge underlying assumptions	–

**new / adapted / unchanged / not applicable*

In an interfirm discussion the element *willingness to share across functions* is either not applicable or decreases in overall importance. In case the focal network is decentralized, i.e. without central hub organization, willingness to share across functions is not applicable. No central functions exist, evaluations have to be conducted on network partner level, thus the framework version as discussed in section 7.1 above would be adequate. In case of a centralized network, the willingness to share across functions remains a valid assessment element, albeit limited to this often relatively small hub organization. As the overall foresight capability of a network is primarily based on the network partners, the relative importance of the element *willingness to share across function*s within the hub organization is arguably lower.

In contrast, *willingness to share across organizational boundaries* is of very high importance—this willingness is at the very core of the network approach to foresight as discussed in this research. The element captures the degree of openness and inclination to share information across organizational boundaries. Miles et al. (2010, p. 100) observed that attitude and values of network partners evolve towards a supportive attitude over time. Similarly to observations in the EIT Digital, their argument implies that creating a supportive and open atmosphere that allows for efficient knowledge exchange and creation is a process—not a decision that can be made top-down—that is fueled best by exemplary openness of key stakeholders and opinion leaders.

The underlying concept was described by Gassmann and Enkel (2004) who defined the *inside-out process* as one of three archetypes of open innovation. They argue that '[c]ompanies that choose the inside-out process as a key process focus on the externalising of the company's knowledge and innovation in order to bring ideas to market faster than they can through internal development' (p. 10). While their discussion is broader and entails innovation and new product development processes, the proposed element here focuses on the subtopic *knowledge sharing* across boundaries. At that, the element here utilizes the network as central perspective—meaning that sharing across organizational boundaries can range from *not at all*

to *within the network* to *openly with external parties*. The survey conducted within the EIT Digital supports this hypothesis (Heger & Boman, 2015).

The counter element *readiness to listen to scouts and external sources* depicting the outside-in process for information absorption as described by Gassmann and Enkel (2004) remains applicable with minor modifications. Primarily, I propose to introduce an intermediate level analogous to before–*readiness to listen to scouts and sources from the network*.

Trust has proven to be a highly discussed element during the interviews. In literature, trust has been examined as critical success factor for various forms of interorganizational networks, especially for decentralized, long-term networks, see e.g. Kontos (2004) or Hakansson and Johanson (1988). In the original Maturity Model, trust was included in context factors and indirectly in several other elements. For example, the projection of the s*tate of relationships* context element (part of *type of partnership)* indicates a certain level of trust: in case of *potential* relationships, trust has yet to be established. In contrast, *latent* relationships usually indicate a high level of trust based on past activities. Still, new joint activities can be started rather easily, regularly without the need to fix them in new contracts beforehand.

But an element manifesting its importance for any activities in networks, including and especially for networked foresight activities, has yet to be introduced. The following two exemplary statements of a Deputy Managing Director of a research institute and the Head of Department of a MNE substantiate the importance of trust as element to assess networked foresight:

> First of all, critical success factors are a functional network of mutual trust. That is also the reason why European projects start to work after one year only. […] And this is why I like the EIT ICT Labs [EIT Digital] as much. For me they are the best basis for working [in collaborative] projects.[33]

> At the end of the day the network will only work if involved people see a benefit of their involvement and if one succeeds in building up mutual trust to achieve something collaboratively. And that is what the network will live off.[34]

In contrast, the statement of a managing advisor of an industry partnership shows negative implications that the lack of trust may have for a network in general:

[33] Translated from German by the author. Original quote: 'Die kritischen Erfolgsfaktoren sind meiner Meinung nach erst mal, dass man ein funktionierendes Netzwerk des Vertrauens aufbaut. Das ist ja der Grund, warum alle europäischen Projekte erst nach einem Jahr anfangen zu funktionieren. (...) Deswegen finde ich ja die ICT-Labs so gut. Also ich für mich wären die ICT-Labs die beste Basis, um funktionierende Projekte zu starten."

[34] Translated from German by the author. Original quote: 'Aber am Ende des Tages, meines Erachtens nach funktioniert das Netzwerk nur dann, wenn die Leute, die darin aktiv sind, für sich einen Gewinn darin sehen und wenn man irgendwie Vertrauensbeziehungen aufbaut und da gemeinsam was machen kann. Und davon wird das leben."

> What we see, what we get from the management, it's not very transparent. The rules keep on changing every month, and, you know, that's confusing. And maybe for universities that's not a big problem, but if you want to add companies to be part of the EIT, and if you want to have companies invest in the EIT, then you have to make things clearer a little bit sooner.

Further, the willingness to share across organizational boundaries and the readiness to listen to scouts and external sources can be expected to increase in case of trusting relationships. Albeit, a high level of trust does not causally imply a high willingness to share and listen. For this, multiple other factors play decisive roles, e.g. the direction of the network, rivalry, the nature of the network or perceived quality of partners. Multiple statements throughout the interviews show that it is indeed a sensitive issue. A principal scientist of an institute for applied research pointed to the sensitivity of the network composition:

> […] we are a lot focused on, say, consortium projects, so multi-party projects. And when you have a multi-party project you must be very careful about the quality and the constitution of the consortium because partners should not be competitors in the value chain.

A senior researcher of an MNE added:

> In relation to EIT ICT Labs [EIT Digital], they [the management] are quite hesitant, because they do see the value of patents, particularly when it goes into spinoffs and so on. So sharing that with others, they would like to do under strict conditions. And that is, by the way, what they share with other large companies like Siemens and Ericsson and so on. They are looking for things like consortium agreements with the partners to safeguard the IP part, because the IP part is not handled by EIT ICT Labs [EIT Digital].

In contrast, a member of the executive board of another research institute stated with regard to openness in EIT Digital:

> Sometimes I guess the industry could impose some restrictions on the information that they want to disseminate, but I didn't really encounter this problem. When we discussed about the longer term, I think also people from industry were very open and provided their views and their visions, so that's not really, I didn't see it as an issue, to be honest.

Summarized, I suggest assessing *mutual trust among network partners* in a corresponding element due to its central importance for functional interorganizational relationships when assessing networked foresight.

When changing the reference base from a single firm to a network, considerable differences in the underlying understanding of *informal diffusion of insights* become imminent. In single

firms, informal diffusion of insights can be expected to be focusing on the focal firm. Also, firm-internal measures can be applied at the will of the management. For high reach in a network, informal diffusion needs to span across a multitude of organizations and thus across organizational boundaries, lying in the hands of many. To allow and facilitate this diffusion, appropriate measures are required, e.g. 'social integration of partners in existing teams' as one respondent recommended. The Innovation Director of the R&D department of an MNE added specifically with regard to diffusion of foresight information:

> So for me it's fast moving, consuming. You need to publish, talk about it. People will see, 'aha, something happened, good'. If I really want, I do click and read about some outcome. […] It should be done fast.

Finally, I propose to introduce a new element *network cohesion* to capture effects from social cohesion and organizational cohesion—physical proximity—and thus identification of individuals and member organizations with the network. An interviewee pointed out its importance and the complexity to achieve high cohesion when stating

> […] let alone what makes the people, but also the organizations, tick: their motives for being engaged that are in fact very different. A professor aims for publications and funding for that. Industry partners have strategic, political motives. And this does not always match one hundred percent. I mean, oftentimes it does not match at all. And making that work, managing the differing interests is quite complex - in any case for large numbers of partners but especially with these different groups of stakeholders [in diagonal network configurations as the EIT Digital]. It is difficult, albeit interesting, to handle the different cultures of industry partners, academia and research institutes.[35]

An SME's Innovation Manager further pointed out that 'strengthening commitment and checking whether high quality people participate" is a key success factor during build-up of the network.[36] Further, a deputy director of the hub organization pointed out a) the role of available funding as fundamental prerequisite but also b) the required intrinsic motivation to work on it, pointing to aspects related to network cohesion.

> As a pure network organization especially academic partners would engage less and also for industry partners networking would not be possible on the same level [without funding]. […] But besides high funding sums, funding is especially about searching and

[35] Translated from German by the author. Original quote: 'Alleine wie die Leute sind, aber auch wie die Organisation tickt, was für Anreize die haben hier, die ja unterschiedlich sind. Ein Professor möchte veröffentlichen und das Geld dafür bekommen. Und die Industriepartner haben irgendwie strategische, politische Ziele, die sie möglicherweise verfolgen, und es passt nicht immer hundertprozentig zusammen. Also es passt auch häufig gar nicht so richtig zusammen, und das dann unter einen Hut zu kriegen, die verschiedenen Interessen, das ist schon recht komplex, ohnehin bei vielen Partnern aber auch gerade bei unterschiedlichen Gruppen. [...] Eine andere Schwierigkeit, die macht es auch interessant, sind auch die unterschiedlichen Kulturen in den Gruppen, also Industriepartner, Forschung, Unis."

[36] Translated from German by the author. Original quote: 'Commitment stärken, auch noch mal darauf zu schauen, dass man wirklich gute Leute auch an Bord hat.

> finding personalities with specialized knowledge, an entrepreneurial spirit and a high intrinsic motivation to build something that produces world class results on a regular basis.[37]

Further, two comments made by an innovation manager and one innovation controller emphasize the personal note of networks. First, by assuming that it is all about persons and their will to mingle, and second by pointing to people that strive for power regularly, leading to parallel hierarchical structures within networks that provide a way to powerful positions.

In cluster research, physical proximity has been identified as one important success factor for informal information diffusion. Effects of clusters were found to be threefold (Porter, 2000): 1) productivity of companies improves, 2) new business field creation is fostered and 3) innovativeness of companies increases. Positive externalities include knowledge spillovers, access to highly skilled workers in the region and lower transportation costs. For leveraging the network effects best, a critical number of organizations needs to be linked through a common topic. Geographical proximity is often cited as a particularly critical success factor, albeit its necessity was challenged by some researchers, e.g. Jungwirth and Müller (2010). Two prominent examples for clusters are the Silicon Valley for ICT-related innovations (Saxenian, 1994) and Hollywood for motion picture development (Porter, 1998).

The elements *attitude of the organization toward the periphery* and *willingness to test and challenge basic assumptions may* remain as discussed in section 3.5.1.2.3.

3.5.3.2.4 Organization

The dimension *organization* originally captures a firm's capability to identify, process, interpret and act upon insights systematically, independent of the organizational units that are operating foresight tasks (Rohrbeck, 2011, pp. 79, 104). Organizational complexity for creating supportive formal conditions increases further in networks. 'Effective large-scale multi-party collaboration requires rethinking organization design concepts, capabilities, and values. The process of large-scale collaboration places heavy strains on existing forms of organizing, which typically are based on hierarchy as the primary means of coordination and control' (Miles et al., 2010, p. 101). Key elements of 'collaborative community-based organizational designs' are values, protocols and infrastructure that facilitate collaboration and access to joint resources. In addition to supportive structures in the network, partner organizations need to be prepared

[37] Translated from German by the author. Original quote: 'Also als reine Netzwerkorganisation wäre wahrscheinlich bei vielen gerade akademischen Partnern weniger Engagement dabei und bei den industriellen Partnern wäre die Vernetzung mit akademischen Partnern nicht auf diesem Niveau möglich. (…) Das ist jeweils viel Geld, was da fließt, aber es ist nicht nur das Geld, aber es ist vor, dass man eine Persönlichkeit sucht, die das hohe Fachwissen hat, den Unternehmergeist und die hohe intrinsische Motivation dort etwas aufzubauen um sich herum, was dann auf ihrem Gebiet, auf dem sie arbeiten möchte, dann sich regelmäßig als absolute Weltklasse zeigt."

to handle external input and process it internally for optimal value creation.

Table 23: Adjusted *organization* capability dimension. Based on table 4.5 in Rohrbeck (2011, p. 80)

Element	*Status (n/a/u/na) **	*Description*	*Comment*
Mode	u	Describes how the network engages in foresight activities. Differentiated into top-down vs. bottom-up continuous and issue-driven.	
Integration with other processes	u	Describes to what follow-up processes the foresight activity is linked.	
Integration with partner processes and functions	n	Describes to what follow-up processes, functions, and units the network foresight activity is linked within the partner organizations	
Formal diffusion of insights	a	Describes the role and effectiveness of formal communication to transfer future insights within the network and its partner organizations	
Accountability	u	Describes the extent to which people active in the network are responsible for detecting and acting on weak signals.	Two levels to be considered: network and within partners
Incentives	a	Describes if rewards or bonuses are awarded to encourage future orientation and wider vision.	

**new / adjusted / unchanged / not applicable*

While all other elements of the original model require minor to medium changes, *accountability* can be applied in network settings as in the original model.

The *mode* element remains closely related to past research of organizational settings for foresight processes, e.g. Becker (2002). While Becker (2002) differentiates creation and operations of foresight units, Rohrbeck argues along the lines of engagement, i.e. top-down versus bottom-up and continuous versus issue-driven. With regard to hierarchy in the network one respondent stated:

> I personally did not insist on it [hierarchy] in the beginning because I thought we could just start working on our task and in case higher management supports the activities this can be understood as ex-post legitimization. This way, you don't have to challenge each and every step permanently. However, the fact is that to control that many partners, [hierarchy] seems to be necessary. Everything else seems to provoke discontent.[38]

[38] Translated from German by the author. Original quote: 'Also ich persönlich habe da mal gar nicht so drauf gepocht am Anfang, weil ich auch dachte, die Idee, da kann ich mir was drunter vorstellen, fangen wir mal an und wenn das sozusagen von hohen Hierarchieebenen gefördert wird, dann hat man ja sozusagen auch die Legitimation, das zu tun. Dann muss man nicht alles Schritt für Schritt hinterfragen, aber Fakt ist, um so viele Partner in den Griff zu kriegen, scheint es nur so zu gehen und alles Andere bringt sehr viel Unmut."

While the view on mode may remain as in Rohrbeck's original model, additional triggers for foresight activities in network settings exist. Thus, structured ways to handle issue-driven foresight requests from

24. top management of the network organization, including both executives of a hub organization or steering board members in de-centralized network;
25. divisional and/or functional units on the network level:
26. foresight units within the partner organizations;
27. executives of partner organizations

may be taken into account.

The foresight ability of a network largely depends on the foresight capabilities of its partners, albeit to a different degree in centralized and decentralized networks. When applying the model in network settings, there is a need to capture the *integration with partner processes and units*. The aim with this additional element is to capture formal connections of networked foresight activities to processes, functions and units within the partner organizations, e.g. foresight units, strategy, research and development, innovation management, market and business intelligence.

Integration with other processes in this context focusses on capturing the follow-on processes in collaborative network activities subsequent to foresight work.

Formal diffusion of insights describes formal distribution channels for foresight insights within the organization. The aim with the element remains as before. The need for instruments addressing distribution were for example emphasized by a Section Manager:

> As for the information flow to the participants, that could be improved. There are all sorts of solutions which I won't [lay out] for you now, but, I mean, there has to be a better way of organizing our interaction [than at the time of the interview, March 2012].

However, structural differences in networks compared to companies require differences in distribution channels. Whereas in corporate settings formal distribution to relevant recipients could be captured via access to, participation in, and/or formal roles in functional and divisional boards and activities, this logic cannot be transferred directly to networks. As for several elements before, the two levels *network* and *partner organization* have to be differentiated. The original logic is applicable on the network level—access, participation and role in network level boards and activities are an important element for distribution of future insights. However, direct access of network level foresight units that may consist of employees of multiple different organizations cannot be expected in member organizations' boards—even in highly trusted

networks with extensive non-disclosure agreements. While this information pull has not been reported from the EIT Digital foresight activity, one can argue that information pull from partner organizations from such a unit might be viable in selected occasions. Whereas guest speakers are fairly common in *parts* of board meetings, it has been reported by several discussion partners in informal talks that ample access and participation of non-employees in sensitive parts of board meetings 'will not happen'.

Finally, *incentives* and *accountability* are particularly challenging aspects in network organizations. Miles et al. (2010, p. 101) found that 'from a design perspective, the challenges faced in such situations include

28. ensuring enough commitment to the common goal so that all of the necessary investments are made
29. coordinating the efforts of the various contributors
30. ensuring that their solutions are compatible and therefore fit together in the larger system.'

As has been reported, incentive systems can be designed with various components, e.g. financial rewards, promotion, or social recognition (Markmann et al., 2011; Miemis et al., 2012; Rohrbeck, 2011). In companies, financial rewards in different forms, e.g. on a per identified topic basis or as part of the annual review, are often in place. In firms with more mature foresight systems, this is complemented by management recognition of some sort (Rohrbeck, 2011). Specifically, it was found that 'cultural control mechanisms [are] important for influencing motivations to engage in foresight and thus enforce participation in, and value creation from, organization-wide foresight systems' (Boe-Lillegraven & Monterde, 2014, p. 18). As for networks, financial rewards are often hardly possible to implement. In many publicly funded networks such as the EIT KICs, paying out financial rewards depending on dynamically changing factors such as weak signal, trend, threat or opportunity identification or even less defined tasks such as having a 'wider vision' is not foreseen in financial guidelines. Also, Day, Schoemaker, and Snyder (2009) note that incentive structures in networks should not be designed too efficiently, automated and task-oriented to allow for broad peripheral scanning. Miles et al. (2010) argue that collaboration is intrinsically motivating since the process itself is enjoyable and productive. Boe-Lillegraven and Monterde (2014) observed a 'glue effect' made up of various aspects as critical success factor for Cisco's foresight system with an Innovation Radar as core element. The goal behind incentive schemes to reward a wider vision remains similar to firms, i.e. motivating active members in a network to detect and report weak signals,

insights, trends, etc. Thus, it can be argued that *incentives* are highly relevant in networks as well.

Some researchers, e.g. Markmann et al. (2011), argue that increasing the quality of foresight data and insights alone might suffice to motivate engaging in smaller communities. In large, anonymous communities, however, they see the need for additional incentive schemes, e.g. lead user or gamification approaches known from crowdsourcing (Leimeister, Huber, Bretschneider & Krcmar, 2009; Markmann et al., 2011). Gamification techniques include highscores, leaderboards, participation and activity points, virtual badges and currencies, or virtual games and challenges (Miemis et al., 2012). Miemis et al. and other open foresight scholars also note that motivation can be promoted by exploiting individual motives—e.g. reputation, becoming a visible member of a community, creating something meaningful—and that 'curated, careful user interfaces and design is a powerful way to lower cognitive barriers' (Miemis et al., 2012, p. 94). Among others, a Research & Innovation Director of an MNE stated his belief that 'project members need to be acting voluntarily'. A head of section of a research institute explicitly stated that

> for me it is just work. […] there are no concrete benefits for me. I have to draw satisfaction from the tasks myself.

Others found that supporting teams or individuals acting as community managers, i.e. constantly encouraging and pulling information from informants, are helpful. An Innovation Director of an MNE's central R&D unit commented on the use of tools and dedicated teams for fostering discussion:

> You cannot find a tool which is useful for everybody and for all the needs. And there are many needs in a big organization. We will never have one fit for all. So if you want to have a communication bus into the community, you need to find something that supports this. And then you need some analytical engine behind it so you can pick out some trends from what people talk about. Still, you need to invest one or two or three FTEs who just make it a living (..) platform. That's costs you need to bear to have these people who will run it. It will not just work because of people having some interest—never.

When it comes to different levels of maturity for this aspect, these can be expected to range from no schemes at all to sophisticated systems with various levels of recognition for engagement. Somewhat mature networks can be expected to encourage thinking of a wider vision and to have some kind of incentive scheme in place, e.g. social recognition through participation in cross-organizational meetings. More advanced networks can be expected to have structured systems in place that integrate multiple factors, e.g. year-over-year

gamification techniques with rewards for high performers. At the high end, sophisticated reward systems that combine multiple factors with impact recognition of high performers within their parent company should be observable, e.g. through direct notification to their superiors, invitations to expert panels and high-exposure events (Miemis et al., 2012). Solutions that combine multiple process steps up to the new product development initiation and incentives for participation are marketplaces, e.g. that of Rite-Solutions (Burkus, 2013). The Innovation Director quoted above summarized the required mix of incentives as 'You need buzz, you need to have a platform, you need to do the social activities so people feel part of it.'

3.5.3.2.5 People & network

The dimension *people and networks* captures communication efficiency and effectiveness within an organization based on internal and external networks (Rohrbeck, 2011, p. 77). The required characteristics attributed to successful foresighters—curious and receptive, open minded and passionate, broad and deep knowledge, strong internal and external networks (Rohrbeck, 2011; Wolff, 1992)—do not change when analyzing networks as another form of future-oriented organization.

The view on networks, however, is in need of change for a meaningful discussion of networked foresight. Specifically, two viewpoints with two network layers each can be differentiated.

31. External network
    a. the external network understood as ties of network members to entities outside of the focal network;
    b. the external ties of a network itself, e.g. to other (network) organizations. This way, network level inter-connectedness would be accounted for as well. In an ideal case, a network complements its own focus by nurturing ties up- and downstream and across domains to cover developments in adjacent and white fields as well. For example, EIT Digital has formal and informal ties to the European Investment Fonds (EIF), multiple private investment funds across Europe and the US to detect and improve performance of European startups in early stages.
32. Internal network
    a. the network that members develop and have within the focal network
    b. the network within a single partner organization of the network.

Table 24: Updated *people & network* capability dimension. Based on table 4.4 in Rohrbeck (2011, p. 78).

Element	*Status*	*Description*	*Comment*

	*(n/a/u/na)**		
Characteristics of foresighters	u	Describes to what degree characteristics of the foresighters meet the ideal characteristics.	
External networks	a	Describes the extent and intensity of external ties of the network as a whole and its member organizations	Definition slightly changed to reflect network and member organizations' level
Internal networks	a	Describes the extent and intensity of internal ties within the network among its member organizations and active persons	Definition slightly changed to reflect internal ties within the network on organizational and personal level

**new / adapted / unchanged / not applicable*

3.5.3.3 Value contributions and impact

The impact of foresight in networks can be expected to be twofold as discussed in Heger & Boman (2015): first, for the network partners that may capitalize from it. Second, for the network itself that may benefit from collaborative activities directly and indirectly. Potential value contributions to member organization have been discussed in depth in 3.5.2.3. The now following section focusses on impact on the network as organization itself. The focus lies on new value contributions that were implied for, and within, a network organization such as the EIT Digital.

3.5.3.3.1 Development of a shared vision

In past research, a shared vision was stressed as a factor promoting cooperative behavior through trust and dense interconnections (Coleman, 1988), eventually leading to interfirm success (Baum and Ingram, 2002). During this research, a shared vision has been indicated multiple times as key benefit resulting from joint network activities. Key reasons given for its positive perception were:

- development of a broadly accepted and understood vision by all partners, i.e. strategy making;
- assessment and reconfiguration of the network's activity portfolio, i.e. strategy implementation and steering;
- alignment and joint understanding among network partners.

Further, the evolution of the network, its capabilities, its process model and behavioral change among people within the network were recognized as value contributed through joint visioning.

3.5.3.3.2 Trust building

A necessary antecedent to joint visioning is mutual trust among the partners and towards the hub organization (Coleman, 1988), see also 3.5.3.2.3. In interorganizational settings, particularly those orchestrated by a hub firm, research finds that building trust is a critical responsibility of this hub organization (Skardon, 2011; Zaheer, McEvily & Perone, 1998). Exemplary for the role of the hub organization in this regard, the head of the EIT Digital Innovation Radar described the role and value of trust and its effects in so-called radar workshops as having relaxing effects on people, eventually making them speak freely[39].

A professor and manager from a research institute went on to state:

> I think it is important that […] that there are enough moments of contact, or at least ways of getting to know the right partners to collaborate with. So that is kind of the meeting place function or some infrastructure to allow that.

Network partners see trust as basis for value adding activities. In summary three core value contributions based on trust in this particular context were indicated:

1. Trust resulting from regular encounters within the network fueling the transformation of potential relationships into active and latent ones.[40,41]
2. Latent relationships as origin for quicker than usual take-up of activities such as joint development projects and EU-funded projects[42], i.e. potentially building up lead time against competitors.
3. Institutionalized trust as facilitator for deep interaction between network partners and others brought in by network members.[43]

3.5.3.3.3 Shaping and driving the ecosystem, visibility of the network

[39] :
[…] the workshop brings people together. You get fairly close in these workshops, because you are honest, you are free of your corporate burden, you are there more or less as a private person. When you express [an] opinion, its your opinion. Hopefully you get the feeling that you are among friends. So this means that some of my workshop participants, they bond socially afterwards, they keep in touch on LinkedIn or emailing or whatever. And this has a value too, both for recommending EIT ICT Labs to other people not part of the KIC yet and also contributing towards this overarching goal on becoming a thought leader on ICT in Europe […].

[40] Related verbatim from a MNE unit CIO (in German): Und da steckt auch, unabhängig von dem ganzen EIT, also allein in diesen Treffen, wo man doch immer wieder mit einer Gruppe von Leuten, zu denen man zunehmend auch Vertrauen und Kontakt gewinnt, zusammen kommt, da steckt schon auch ein Stück Wert, also dieses Thema Netzwerk, ja, das erlebt man dort auch schon ein Stück weit.

[41] Related verbatim from a academic research (in German): „Dieser Community-Effekt, da hat das EIT wirklich was geschafft, Leute zusammengebracht, man sieht sich, was weiß ich, zwei- dreimal im Jahr, immer die gleichen Leute und hat da doch eine recht vertrauensvolle Art inzwischen schon, zusammen zu arbeiten, obwohl es sehr viele sind und aus sehr unterschiedlichen Bereichen, also wieder Industrie, Unis und so. Das ist, also das ist wirklich gut.'

[42] Related verbatim from a MNE unit CIO (in German): Was man schon beobachtet, ist dass das Netz sich auch gegenseitig nutzt. Und das war ja auch ein Ziel, Partner zu suchen für Förderprojekte, also für die aktuellen Calls des EU-Rahmenprogramms. Und das ist dann schon eine interessante Geschichte, weil man da, dadurch, dass man eben schon gewisse Partner hat, mit denen man schon ein Stück weit Vertrauen aufgebaut hat, dass man da leichter und schneller auch Partner für Förderprojekte findet.

[43] Example described by an AI section manager and professor: 'There were two people who knew each other. One person in my group and the group in Sweden, who actually embraced this to make, to strengthen their collaboration. And they brought in a number of other parties to become in involved and they actually very, very active in workshops and interactions. It's considerable."

In past studies, e.g. in Rohrbeck and Schwarz (2013), mixed results have been reported with regards to the value and use of corporate foresight for shaping the future. The potential influence of networks with the size as EIT KICs can be immense if partners act aligned. In fact, one of the original and still remaining EIT Digital objectives is 'developing the ecosystem' (EIT Digital, 2016, p. 4) or, as it was put earlier 'develop[ing] the EIT ICT Labs ecosystem and its impact' (EIT ICT Labs, 2014, p. 5). In the original call for KICs, the EIT parent organization formulated its own ambitions to become 'a key driver of sustainable European growth and competitiveness […]', its KICs shall therefore 'have societal impact in terms of job creation and quality of life' (European Institute of Innovation and Technology, 2009, p. 1).

A key success factor for having an impact on the ecosystem is visibility. Already in very early phases key European stakeholders have been involved, as José Manuel Barroso[44] initiated the EIT originally. Partners active in the preparation of the submitted application documents of the EIT Digital recognized this as a key value and benefit. The Managing Director of a founding partner stated in 2012:

> The support by high decision-makers for this project [the EIT Digital] is surely positive, I recognize that. It attracts attention on high political levels.[45]

A General Director of an Italian governmental research institute added:

> The main benefit is to be able to have international visibility for our work by involving a number of partners in this network to achieve a greater impact of our research, of what we do. But also a greater impact at the European level, […] our influence on the European policies, to give you an example, by speaking in a unified voice together with the other EIT ICT Labs [EIT Digital] partners.

The EIT KICs as one particular form of network organizations can therefore act as filter, facilitator, and moderator of change of industry and society within Europe, gauging individual interests of European companies and other organizations through effective foresighting and resource deployment.

3.5.4 Conclusion

The objective of this section was an analysis of Rohrbeck's original Maturity Model for the Future Orientation of firms with an emphasis on increasing importance of interorganizational relationships, i.e. introducing the relational view to corporate foresight research. For this, the Maturity Model is used as model to guide the discussion of interorganizational foresight routines as centerpiece of the relational view. The analysis had to

[44] President of the European Commission 2004 - 2014

[45] Translated from German by the author. Original quote: 'Das ist sicher positiv, was gelungen ist, an hohen Entscheidungsträgern für dieses Projekt zu unterstützen. Das nehme ich wahr. Es hat eine hohe politische Aufmerksamkeit.

be split into two separate parts: the first focusing on the individual organization's perspective as common in corporate foresight research, the second broadening the scope to the network organization.

In the relational view it is argued that 'dyad/network routines and processes [are] an important unit of analysis for understanding competitive advantage' (Teece & Singh, 1998, p. 661). For realizing relational rents as result of interorganizational routines, the partners' basic compatibility is—among other factors—determined by the degree of knowledge base overlap. Further, the partners must develop effective interaction routines. Helfat, Dyer, et al. (2007) discuss relational capabilities by combining the relational view and dynamic capabilities and argue that the 'relational capability can be viewed as a type of dynamic capability with the capacity to purposefully create, extend, or modify the firm's resource base, augmented to include the resources of its alliance partner' (Helfat, Dyer, et al., 2007, p. 66). Additionally, they argue that 'firms can create value from their alliance relationships only if they move these away from generic, arm's-length relationships as a basis for competitive advantage' (Helfat, Dyer, et al., 2007, p. 67). In the section 3.5.2 I analyze in depth to what degree relational context and interorganizational routines are reflected in Rohrbeck's Maturity Model and to what end. As result, several changes to the original model are put forward to reflect the increasing importance of interorganizational relations and indications for realizable relational rents through networked foresight are discussed.

In section 3.5.3 the model is revisited and its application to network organizations is discussed. With regard to the firm's or the individual organization's view the network some argue that 'for effective knowledge transfer, interfirm processes need to be developed and then institutionalized' (Helfat, Dyer, et al., 2007, p. 69). The underlying hypothesis for the analysis was that the model is applicable—with changes—as networks are an organizational form themselves. The discussion reveals the necessity for various changes through all three dimensions of the model: context, capabilities and value contributions. The suggested changes largely build on pre-existing constructs from network research. In the context dimension, company size is replaced with network size, itself split into several sub-items. In terms of strategy, Day and Schoemaker's generic firm strategies are replaced with network strategy directions, specifically the alternatives exploitation network, exploration network or a combination of both. The corporate culture item needs to be replaced by a broader network culture construct. Further, multiple additional context factors are required to capture the networks nature. These include constructs to describe the type of the partnership—captured through the construct degree of centralization, state of the relationships, the direction and the partner mix—and characteristics of the partnership—described with the constructs

interdependencies & interactions, resource combinations and redundancies among the partners. With regard to the model's capability constructs, adjustments to all five capabilities are discussed. Finally, resulting rents—value contributions—are presented. While relational rents for the network partner are discussed in section 3.5.2.3, I discuss three additional value contributions on a network level in section 3.5.3.3: 1) development of a shared vision, 2) trust building, and 3) shaping and driving the ecosystem in conjunction with visibility of the network as secondary benefit.

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4 Concluding remarks

Corporate foresight research concerns the capabilities and practices required to prepare an organization for change, proactively steer it toward a desired future by identifying and interpreting this change, and preparing it for action. This resulting *future preparedness* relies on the ability to broadly scan and understand forthcoming developments, even from perspectives unfamiliar to an organization. Perceiving, interpreting and acting upon change can be difficult to achieve within organizations due to such deficiencies as shortsightedness, unidimensionality and myopia inherent to closed processes.

This research was initiated based on the hypothesis that interorganizational relations—which have previously been found to hold considerable potential for its members in many respects—can contribute to foresight capabilities and practices. From a management theory point-of-view, the relational view that introduced relational rents as result from interorganizational routines and processes provided the foundation for the present work, as well as related theories such as the RBV and dynamic capabilities

The first paper presented in section 3.1 of this dissertation explores corporate foresight in one dyad and two networks, including the extent of practiced networked foresight activities in these three interorganizational settings. Besides analyzing innovation abilities by applying the cyclic innovation model as analytical framework, foresight activities in the three focal cases are analyzed in terms of type, scope, and role. The latter is based on the three roles of foresight as introduced by Rohrbeck and Gemünden (2009).

The three analyzed cases are:

- *Rijkswaterstaat* (RWS)–WINN: the RWS is a part of the Dutch Ministry of Infrastructure and Environment, while WINN was a water innovation project within this department.
- The European Center for Information and Communication Technologies (EICT): originally founded by Deutsche Telekom, Daimler AG, the Fraunhofer Society, the Technical University of Berlin, and Siemens AG, the EICT was an attempt at implementing Open Innovation among these organizations, including the long-term and interorganizational exploration of future topics.
- EIT Digital*:* the digital branch of the European Institute of Innovation and Technology founded with objective to drive European innovation and to shape the environment in this field.

The three cases were chosen based on the following factors: 1) foresight-related objectives, 2) diverse network sizes, and 3) the characteristics of their partnerships. The partners in all three cases were committed to make a broad resource base available, as well as a substantial pool of people with diverse backgrounds in all three partnerships. Potential partnerships were formed, adding to the available knowledge base for all activities. In these potential partnerships—as defined by Kontos (2004)—a base level of trust can be assumed due to formal partnership agreements. Anecdotal evidence from all cases at the time of the analyses suggested that routines involving interaction and relational capabilities, which allow the effective reintegration of knowledge into the networks' partner organizations, had yet to be developed and systematically applied. At the time of the analysis, EIT Digital had not yet transformed into an active partnership, and its ties remained mostly contractual. Despite their longer existence, the type of the partnership was found to be just slightly more active in the EICT and RWS cases.

Despite this lack of close and active partnerships, evidence particularly in the EIT Digital case indicates that deliberate actions were taken to exploit interorganizational resources and capabilities. At the EIT Digital, among the 10 individual foresight-related activities that were identified, for example, an innovation radar aimed at systematically utilizing the network's combined knowledge base to create an outlook for selected activity fields. Another activity aimed at drawing from the varying perspectives available in the network to develop novel business models, particularly relevant during socio-technical transitions of which digitalization has characteristics of (Bidmon & Knab, 2014). These activities can arguably be understood as aiming at capturing either *relational rents* or *supernormal profits* based on partner contributions that form the foundation of Dyer and Singh's (1998) relational view, or more specifically, *appropriated relational rents* as discussed in the extended RBV (Lavie, 2006). Thus, this analysis provided initial support for extending the perspective of corporate foresight research to the relational view. Further, it provided initial insights into the state of networked foresight at the time, i.e. objective 1 stated in Section 2.4.

Subsequently, in section 3.2 the EIT Digital is introduced in depth. In the article, we discuss its semi-open innovation ecosystem in particular, as this is one of its initial knowledge and Innovation Communities founded in 2008. The EIT KICs are typically large diagonal networks with more than 50 heterogeneous partner organizations, including multi-national corporations, small and medium-sized companies, start-ups, research institutes, and universities. The EIT Digital network is tightly integrated and coordinated by a central hub organization, runs regular strategy cycles, develops yearly business plans, and is operated

and steered by a management and supervisory board. Some argue they function as quasi-firms (Colombo et al., 2006). It aims to bundle and facilitate the competences and resources of its more than 120 high-profile partners from both academia and industry through interorganizational routines. Further, the network's objective is to tackle such grand societal challenges as the increasing importance of digital technologies for various industries, including the digital energy environment, advanced mobility systems, and an urbanized society.

The article first introduces the origins of EIT Digital from a corporate partner perspective—the evolution from corporate innovation silos to open innovation systems. Second, collaboration types are discussed, specifically university-industry collaboration and interorganizational cooperation, used as a basis for expected positive returns for the network partners—essentially relational rents as defined in the relational view—, the network itself, and society. This is followed by the reasoning for public funding for EIT Digital from a European perspective and an analysis of the founding principles and underlying motives for its creation from the industry, academic, and societal perspectives. Finally, the discussion of a capability profile follows, in which a set of reinforcing capabilities for successful implementation of the network are introduced and discussed.

In section 3.3 the EIT Digital's networked foresight system is analyzed and implications are discussed. The detailed case study is based on 49 interviews, a survey among partner organizations, access to confidential internal documents, and participation in foresight and strategy work within the network. The analytical framework is primarily built on dynamic capabilities theory combined with corporate foresight practices and known value contributions of foresight in corporate settings. The analysis focuses on potential and practiced foresight activities, as well as value contributions to the network itself and returns for its partners.

Within the EIT Digital, an innovation radar has been established as a central foresight activity to create future insights, to map and understand the future of information and communication technologies, to build future scenarios, and transfer knowledge across organizations. Specifically, four separate instruments were used:

1. Foresight workshops, to gather and present material on a predetermined subject, then gather and form opinions through collective work among the network partners' experts;
2. Foresight studies, to provide deep technical and conceptual insights into new trends, ideas, and technologies;

3. White papers, to cover topics with a broad, less predetermined perspective, including sociological, political, and business aspects; and
4. An online platform, to provide the possibility to collaboratively collect, discuss and interpret, and evaluate emerging topics.

Ultimately, we could not observe direct contributions to strategy and decision making within the partner organizations at the time of the analysis. Instead, partners primarily drew value from:

5. Contributions to organizational sensing capabilities, and
6. The initiation of new innovation activities, to a lesser extent.

Value for the network hub organization evolves beyond the value contributions previously discussed in the corporate foresight literature. These include contributions to develop a shared vision, organizational learning, and network reconfiguration capabilities.

The article provides an in-depth analysis of corporate foresight in one specific network and presents further evidence for relational rents. At the time of the analysis, the network has transformed from a purely contractual partnership to an activate one with multiple integrated interorganizational foresight activities. By doing so, one can argue that they have moved from arm's-length relationships as Helfat, Dyer, et al. (2007) called them, towards closer relationships—thus also moving closer to creating value, i.e. relational rents, from the relationship for the individual organization.

In the context of Lavie's (2006) extended RVB one can further argue that the EIT Digital's foresight activities can be understood as appropriated relational rents. They incorporate 1) intentionally committed—by definition but also in practice—resources from the KIC's partners, 2) which are jointly possessed as at least the KIC core partners typically hold shares in the network organization, and are 3) relation-specific as resources within the partner organization and the network are dedicated to these activities, 4) they include multiple knowledge-sharing routings such as the presented innovation radar, foresight workshops, studies and white papers, are 5) effectively coordinated by the network hub organization and the acting people, and finally 6) rely fully on complementary network partner resources made available.

In summary, the article provided detailed insights into the execution of networked foresight for the creation of such relational rents in one specific network, i.e. it relates to objective 2 stated in Section 2.4.

In section 3.4 a detailed description of a case of applied networked foresight which involves using a novel combination of foresight methods in a loosely coupled, temporary network is provided. The described activity in this case involved part of CELTIC, a public-private partner network under the larger EUREKA organization with more than 500 participating organizations. This network aims to strengthen competitiveness among the European telecommunications industry in pre-competitive phases. In the described activity, collaboration occurred among five major European telecommunications operators (BT, DTAG, France Telecom, KPN, and *Telefónica*), one hardware vendor (Alcatel-Lucent Bell), two research institutes (IBBT and TNO), and two universities (Ghent University and the University of Zaragoza).

In the article we present a collaborative, integrated foresight approach for exploring and probing new business fields ex ante. Specifically, it is designed to:

1. Interpret opportunities and threats under high uncertainty with no obvious and distinct alternatives, but high ambiguity and systemic effects;
2. Integrate multiple perspectives and create a more reliable analysis; and
3. Ensure participation from key stakeholders, such as the management team, researchers, engineers, and futurists, among others.

The topic under investigation in the case is *Quality of Experience*, an approach to balance the potential over-provisioning of bandwidth through fiber-based networks and congestion scenarios in legacy telecommunication networks at a time of substantial cost pressures and uncertain development in network demand.

The selection of foresight-related methodologies was guided by the objective to analyze four aspects: 1) the required product properties, 2) the value network and its configurations and potential partner selection, 3) trends and drivers for the new market, and 4) the market's viability.

This involved implementing a combination of:

1. *Use cases* to define product properties;
2. The *MACTOR* method for a value-network analysis;
3. A *scenario analysis* to examine trends and systemic effects; and
4. *Target-costing* to quantify the overall financial viability.

This sequence of applied methods results in high methodological synergies, with insights from earlier steps used as input for subsequent stages. The approach creates a validated

state of understanding or extended scope of analysis for each step which otherwise might have been overlooked.

Further, we discuss dedicated measures implemented to foster collaborative, interorganizational work such as regular calls, face-to-face meetings, panel discussions, team-building events, pre-structured questionnaires and templates to effectively gather information, supportive digital and web-based tools, and transparent project progress visualizations that were openly available to all network partners at all times.

The presented case provides detailed insights into an applied networked foresight activity and specifically the routines and mechanisms useful for applying foresight in a complex interorganizational setting, thus contributing to objective 2 of this work. The case is a second example of an attempt to create relational rents through networked foresight—in this case in a temporary collaboration based on a pre-existing latent network. This complements the EIT case presented in sections 3.1-3.3 which was a network transforming from a potential to an active network at the time of analysis.

Finally, section 3.5 provides a synthesis of findings from the previously presented cases from two perspectives. First, context, routines and value contributions—relational rents—of networked foresight to the individual organization and its corporate foresight systems are discussed, i.e. benefits from interorganizational relations for the individual organization. As frame for the analysis I use Rohrbeck's (2011) Maturity Model for corporate foresight. Each dimension of the original Maturity Model for Organizational Future Orientation is discussed with a particular focus on relational aspects; eventually adjustments to the model are suggested. Second, I use the Maturity Model for assessing practices, capabilities and contributions in and to the network organization itself. In the section I argue that networked foresight can be discussed and benchmarked similarly to corporate foresight with some changes to the original model. Predominantly I introduce pre-existing constructs from network research to the Maturity Model to reflect the interorganizational, relational aspects that are at the center of a network. Anecdotal evidence from the original EIT case interviews and three additional interviews with the network's CSO, the head of foresight and a partner's contributor (the latter two have been interviewed before) is used to substantiate the suggested modifications of the model.

Ultimately, the article is an attempt to move towards measurability of networked foresight in two different ways, thus addressing objective 3 put forward in Section 2.4.

4.1 Managerial and theoretical contributions

While the interest in, attention to, and understanding of corporate foresight and subsequently the maturity of corporate systems has increased in the past decade (Rohrbeck et al., 2015), systematic ways to integrate interorganizational ties seem to have lagged behind. Further, despite increasing research efforts on collaborative and open foresight, scarce attention has been paid to foresight from a network perspective.

This work contributes to the foresight research field in several ways. First, it guides individual organizations in effectively utilizing their foresight systems in interorganizational environments and benefitting from these connections. Second, it helps interpret the capabilities required to conduct foresight in networks, the resulting impact on organizational performance, and presents a novel practice for conducting a complex foresight activity in a network setting. Third, this work extends the theoretical understanding of foresight with a particular focus on its interorganizational aspects in general and its relational aspects in particular. Summarized, primary contributions are:

- An extended theoretical understanding of corporate foresight given a relational view of the organization.
- A review of the Maturity Model for corporate foresight as introduced by Rohrbeck, reflecting interorganizational relationships to a higher degree. Specifically, four new assessment items are introduced, as well as suggestions to revise four original items to reflect relational aspects
- A deepened understanding on how to support corporate foresight by engaging in networked foresight. In particular, anecdotal evidence emphasizing the contributions to scanning and interpretative capabilities are presented and discussed.
- A best practice case of an applied integrated methodology for collaborative exploration of business fields is presented, discussed and evaluated.
- An analysis of how foresight impacts networks, although the results are inconclusive. An initial analysis in section 3.1 (van der Duin et al., 2014) including three cases showed a predominant strategist role. In a subsequent analysis presented in section 3.3. (Heger & Boman, 2015) value contributions related to the initiator role were predominant instead.
- An adoption of the original Maturity Model for corporate foresight for applying it to network organizations. This is facilitated by suggesting three new context items, adjusting two, and omitting one. Further, four new items and changes to 14 existing items are proposed to assess foresight capabilities. Finally, three value

contributions specific to network organizations were identified and discussed.

4.2 Future research directions

From a relational perspective, a network depends to a great part on interorganizational relationships, routines, and network partners' contributions. Arguably, the formation of networks—such as the EIT Digital network central to this research work—is a means to collectively utilize complementary resources, assets, and capabilities from a pool of organizations to benefit each network partner. Following arguments of the extended RBV and the relational view (see section 2.4, Figure 3) I therefore argue that the analysis of foresight needs to reflect and incorporate interorganizational relations to a higher degree. The analyses presented in this work provide evidence that foresight capabilities of individual organizations benefit from integration into interorganizational settings, although the findings on specific value contributions remain inconclusive and require further analysis.

4.2.1 Networked foresight, the Relational View and Dynamic Capabilities

The relational view and its extensions seem particularly relevant for the suggested future research: therein, relational rents are defined as 'supernormal profit[s] jointly generated in an exchange relationship that cannot be generated by either firm in isolation and can only be created through the joint idiosyncratic contributions of the specific alliance partners' (Teece & Singh, 1998, p. 662). Networked foresight as presented here is inherently understood as exchange relationship—in the central case of this work the EIT—and fueled by the joint contributions of the network partners.

Earlier studies have examined corporate foresight's impact on organizational performance, as well as its influences on the organization's resource and capability base (Rohrbeck, 2012; Rohrbeck & Schwarz, 2013). Therefore, the value contributed by foresight has been categorized in multiple ways. In Heger and Boman (2015) we synthesized an integrated view on dynamic capabilities, as well as value propositions of corporate and networked foresight. All foresight capabilities closely relate to Teece's sensing, seizing, and recombination and reconfiguration capabilities when applying a dynamic view of organizations (Heger & Boman, 2015; Teece et al., 2002; Teece et al., 1997). Our analysis interprets foresight as a comprehensive set of dynamic capabilities, and we group them into perception, sense-making, and transformational activities. We further hypothesize that organizations can benefit from engaging in networked foresight in all three of these activity categories.

Perceptive activities as a core capability of foresight depends on the quality of input to avoid an internal, myopic view, which could omit external developments. The quality of information sources have been previously discussed in section 3.5.1: substantial external input enables an organization's comprehensive insights on external developments and trends, competitive strategies, external resources, new business models, and internal needs. Thus, it is expected that the insights generated in such a network contribute to corporate foresight capabilities.

It is widely accepted that organizations that are largely detached from external input are not likely to develop innovative products and services, they lack a trigger for new innovation activities and strategic discussions, and are less likely to challenge existing mental models within the organization. Sense-making activities—and especially subsequent interpretation and facilitation activities—should also directly influence the network itself and its combined assets, capabilities, and resource base. Researchers bring forward similar arguments for seizing capabilities (Helfat, Finkelstein, et al., 2007; Teece, 2007; Teece et al., 2002; Teece et al., 1997).

An organization can be transformed through recombination and reconfiguration, or specifically organizational learning, strategic discussions and decision-making, and breaking from path dependencies. Thus, organizations may substantially benefit from foresight conducted collaboratively in a network. Organizational learning in particular is based on past experience, as noted in Cyert and March's school of thought. Interorganizational learning 'takes special interest in the routes, mechanisms, and effects of learning from other organizations" (Argote & Greve, 2007, p. 341). Thus, a direct, positive impact on both the network and partner organizations' assets, capabilities, and resource bases might be expectable as a result of transformational foresight practices.

4.2.2 Absorptive Capacities and Relational Capabilities

Realizing rents from networked foresight requires both absorptive (Cohen & Levinthal, 1990) and relational capabilities (Helfat, Dyer, et al., 2007), including knowledge-sharing routines (Grant, 1996). The concept of organizational absorptive capacity was introduced by Cohen and Levinthal (1990); Helfat, Dyer, et al. (2007) transferred this to the relational perspective to argue that it depends on the source of knowledge (in our model, the network) as well as the recipient (the partner organization). While overlapping knowledge bases are found to increase absorptive capacity, it also depends on the building of interaction routines for effective knowledge transfer (Teece, 1996). This also includes the effective interplay among the network partners, network organization, and processes at the interface that

contribute to the efficient application of networked foresight, to a significant extent. Thus, one could hypothesize that stable interfirm knowledge-sharing network routines are required for effective integration into corporate foresight processes. A network setting may be more beneficial than open foresight, as the former involves a partially controllable system that may steer cross-organizational knowledge-sharing routines (Teece, 1996).

4.2.3 Organizational aspirations

Albeit an organization of its own, a network inherently depends strongly on its partners. Each partner organization makes a conscious, strategic choice to enter a network, accompanied by expectations. Aside from other factors, they are influenced by performance levels and external factors, such as environmental dynamism, competitive contest, future prospects, norms, and stakeholders. Consequently, the network partners' aspirations precede their commitment to a network—as reflected in the network's assets, resources, and processes—which might be moderated by the network's performance, and indirectly through forecasting its contributions to the network partners' performance.

Organizations' strategic decisions are guided by discrepancies between aspirations and performance, while these aspirations can be understood as desired performance levels (Shinkle, 2012). Organizations that engage in networks will do so with a certain motivation or aspirations. Further, the aspirations related to networked foresighted are expected to be usually a part of an overall aspiration set covering multiple aspects of the network (Chen & Miller, 2007). These aspirations are influenced by internal and external factors as previously discussed, performance, and time (Shinkle, 2012). The strength and priority of the aspirations related to networked foresight can then be expected to be reflected in the organization's commitment to the network (Cavusgil & Nevin, 1981; Overby, 2009), which should subsequently contribute to the network's assets, resources, processes, and capabilities. Literature presents diverging findings on the role of organizational commitment. For example, research on strategic alliances and open innovation presents such commitment as a key factor (Du Chatenier, Verstegen, Biemans, Mulder, & Omta, 2010; Kale & Sing, 2009). In contrast, Gattringer et al. (2017) found this commitment to be significantly less important in an action research case involving a collaborative foresight project. One key difference, though, lies in the nature of these studeis. The project presented by Gattringer et al., for example, included 'joint work on future developments and there were only non-competing partners, [and] the risk of loss of know-how (for example, technological know-how) was low" (2017, p.10). Further earlier research also covered a broader scope of activities.

As I discuss in the present work, networked foresight brings activities to the fore that surpass singular, one-off projects in diverse networks and potentially contribute to strategy development, research and development, and the exploration of new business fields. The aspirations in such a setting should evolve beyond the short-term benefits directly related to the field under investigation. Section 3.5.2.3 provides several examples for value contributions, such as broader scan areas, new perspectives, and trust-building, which can shape and drive the ecosystem. However, research on the motivation for foresight in general and particularly in interorganizational settings is still limited (Iden et al., 2017). Moreover, the impacts of network partners' motivation, aspirations, and commitment on the network's assets, resources, processes, and capabilities tied to networked foresight need further investigation.

4.2.4 Networked foresight future research directions summarized

In summary, recommendations for future research are:

1. In preparing quantitative studies, the analysis could be extended to a cross-sectional design with multiple cases and varying network forms to increase the validity of generalizations. Particularly, the following variants should be investigated:
    a. horizontal and vertical networks in addition to the diagonal EIT Digital / KICs networks
    b. regionally limited networks
    c. cross-industry networks
    d. both decentralized and centrally coordinated networks
2. The analysis should integrate the roles of networked foresight in cross-sectional studies to further clarify the currently inconclusive picture in this regard.
3. External data—such as commission data from the European Union in the case of the EIT KICs—should be used to evaluate network performance and the potential impacts of networked foresight.
4. A longitudinal design should be incorporated to investigate networked foresight activities' impacts on both network and partner organizations' performance, organizational aspirations and partner commitment in networks, and absorptive capacity over time.
5. The aspiration-commitment relationship has not been sufficiently studied (Mezias, Chen, & Murphy, 2002; Shinkle, 2012), as it remains unclear as to how organizations will retain or change their commitment to networked foresight if aspirations are unmet, whether on a network or organizational level. Both aspects require a longitudinal design to provide time for such measures to become effective.

6. The analysis should be extended to the individual level of acting persons, as individuals acting in network settings serve multiple principals that often have diverging interests. Specifically, managerial cognition and multiple-principal analyses as a part of principal-agent theories appear to be highly relevant.

4.3 Limitations

From my perspective, the primary limitation of the current work is that it is mostly built around one to two cases—EIT Digital that outweighs the self-contained CELTIC EUREKA RUBENS case—with additional insight from further cases (the EICT and Rijskwaterstaat), and a lack of longitudinally. However, this design was chosen because it allowed an investigation of a contemporary phenomenon within its real-life context—primarily the evolution of EIT KICs—and the emergence of its networked foresight system. In his work on case-study research Yin (2009) identified singular case studies as particularly suitable when

1. the boundaries between the phenomenon and its context are unclear;
2. more variables of interest are likely than data points;
3. multiple sources of evidence are required for triangulation; and
4. the theoretical work contributes to meaningful data collection and analysis.

Following these arguments, the chosen approach is suitable for the work at hand as I could gather information from many organizations within the partner network in various ways, including interviews, surveys, and the participant-observer approach. This provided a way to address the underinvestigated variables of relevance, uncertain boundaries of corporate and particularly networked foresight—the latter field has been identified as both emerging and largely under-investigated in research (Rohrbeck et al., 2015)—and provided a step towards itemizable research and measurable data points.

Common concerns about the single-case study design include a lack of methodological rigor, external validity and generalizability, and researcher subjectivity. I have taken dedicated measures to counter these issues. First, multiple data sources have been used in all sections of this work, and the information was triangulated as far as possible. Regarding the interview series, interview partners were selected based on their roles. The 49 interviews conducted for the primary EIT Digital case cover both the management and employee perspectives—including white collar staff, researchers, and developers—within EIT Digital and its partners. Indications about the statements' uncertainty were provided by referring to the number of times specific aspects were mentioned in interviews and surveys,

reproducing verbatim or anecdotal evidence. Second, additional cases supplement the findings from the main case. Third, the primary, previously published sections of this work have been developed with recognized researchers from different scientific backgrounds to increase the analytical variance and, consequently, external validity. Fourth, this study did not aim to test a theory, but rather adopts theories from related fields to explore the networked foresight phenomenon and to enhance corporate foresight research to the relational view. Single case studies with a broad pool of data and informants were recognized as suitable for this objective (Yin, 2009).

Further, I chose EIT Digital as an extreme and rare case of networks. It can be considered extreme because it was built from the greenfield, and the network initially involved more than 50 partners from industry and academia; this number increased to more than 120 partners as the research analysis came to an end. Thus, prior structures that would develop a biased networked foresight concept did not exist, and a large variety of organizational input could be collected in an early developmental stage. However, this clearly comes with the risk of missing the effects, structures, and contributions that only manifest in mature networks. The EIT will remain a rare network form because it represents the EIT's KICs, or networks that are and can only be initiated by the EIT and the European Commission. Currently, plans involve no more than ten KICs until 2027.[46] Thus, research must be extended to include various other forms of networks to create a stable basis for theory-testing research designs and to increase this work's validity and generalizability.

Further, this work's analysis focuses on the network and its partners, with research conducted similar to Shinkle's (2012) review of organizational aspirations in the sense that managers set the aspirations for the organizations they represent. Accordingly, we assume that managers merely process influencing factors through their cognitive sense-making, 'ultimately combining them through organizational processes to represent organizational-level perspectives" (Shinkle, 2012, p. 423). Nevertheless, prior research has recognized individuals' importance in corporate foresight activities; for example, the original Maturity Model for corporate foresight involved such related concepts. Individuals are an especially critical component in relational and absorptive capabilities, as 'involving the right people is […] essential to ensuring a high impact from the foresight activity" (Rohrbeck, 2011, p. 77). This work presumes that organizational-level commitment lays the foundation for foresight in the institutionalized network, and thus, the individual's role is underrepresented.

[46] See https://eit.europa.eu/who-we-are/eit-glance/eit-strategy-2021-2027 for further information on the EIT strategy until 2027.

Ultimately, this research attempts to extend corporate foresight research to the relational view, with the aim to contribute to managerial and theoretical understanding of the phenomenon. I discussed the relational view's suitability and applicability in an attempt to integrate it into a theoretical basis of corporate foresight research. However, network theories' contributions to the discussion of networked foresight still require an in-depth examination. Substantial future research in subdomains of interorganizational and collaborative corporate foresight research is necessary to stabilize the knowledge base, its understanding, and to develop and validate suitable management methods.

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6. Appendices

6.1 Curriculum Vitae (in German)

Pages 227-228 contain private information and have thus been removed from this document.

Pages 227-228 contain private information and have thus been removed from this document.

6.2 Publications of Candidate

The following statistics were retrieved from the Google Scholar profile of Tobias Heger on October 29th, 2020.

- Total citations: 336 (see details below)
- h-index: 6
- i10-index: 4

6.2.1 Peer reviewed journal papers

Heger, T., & Boman, M. (2015). Networked Foresight - The Case of EIT ICT Labs. *Technological Forecasting and Social Change, 101*, 147-164. doi:http://dx.doi.org/10.1016/j.techfore.2014.02.002

Citations: 67

Cited in (e.g.): Technological Forecasting and Social Change, Futures, Journal of Business Ethics, International Journal of Management Reviews, International Journal of Innovation Management, Journal of Cleaner Production, Organization & Environment, California Management Review, International Journal of Technology Management, Sustainability, Business Process Management Journal, Technology Innovation Review

van der Duin, P., Heger, T., & Schlesinger, M. (2014). Towards Networked Foresight? Exploring the use of futures research in innovation networks. *Futures, 59*, 62-78. doi:http://dx.doi.org/10.1016/j.futures.2014.01.008

Citations: 49

Heger, T., & Rohrbeck, R. (2012). Strategic Foresight for Collaborative Exploration of New Business Fields. *Technological Forecasting and Social Change, 79* (5), 819-831.

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Heger, T., & Bub, U. (2012). The EIT ICT Labs - Towards a Leading European Innovation Initiative. *it - information technology, 54*(6), 288-295. doi: http://dx.doi.org/10.1524/itit.0691

Citations: 7

6.2.2 Book chapters

Boman, M., & Heger, T. (2019). Circles of Impression: External Foresight in Global Enterprises. In D. A. Schreiber & Z. L. Berge (Eds.), *Futures Thinking and Organizational Policy - Case Studies for Managing Rapid Change in Technology, Globalization and Workforce Diversity* (pp. 179-199). Cham: Palgrave Macmillan.

Citations: 1

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6.2.3 Practitioner journal articles

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Citations: 2

Heger, T., Lesche, M., Rose, K. C., & Dunaj, M. (2013). Social Media in the Telekom Innovation Contest. *Transfer, 59* (4), 49-54.

6.2.4 Conference papers

Heger, T. (2014). *A Theoretical Framework for Networked Foresight*. Paper presented at the XXV ISPIM Conference—Innovation for Sustainable Economy & Society, Dublin.

Citations: 12

Heger, T., & Boman, M. (2013). *Value Creation from Networked Foresighting*. Paper presented at the XXIV ISPIM Conference—Innovating in Global Markets: Challenges for Sustainable Growth, Helsinki.

Citations: 4

Heger, T., & Bub, U. (2012). *Towards a Cyclic Capability Profile for Open Innovation Networks*. Paper presented at the The R&D Management Conference 2012 - Creating and capturing value through R&D management and innovation, Grenoble.

Weissmann, P., & Heger, T. (2012). *Exploring Instruments for Collaborative Innovation in Decentralized Networks*. Paper presented at the XXIII ISPIM Conference—Action for Innovation: Innovating from Experience, Barcelona.

Katzorreck, H. M., Heger, T., & Schlesinger, M. (2011). *Exploring the FTTx deployment plans of German housing associations.* Paper presented at the 10th Conference of Telecommunication, Media and Internet Techno-Economics, Berlin.

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Citations: 2

van der Duin, P., Heger, T., & Schlesinger, M. (2011). *Exploring the use of futures research in innovation systems* Paper presented at the The 4th International Seville Conference on Future-Oriented Technology Analysis, Seville.

Citations: 1

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Citations: 6

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Citations: 1

Heger, T., Monath, T., & Kind, M. (2010). *A Multi-Actor Analysis of the QoE Environment*. Paper presented at the 9th Conference of Telecommunication, Media and Internet Techno-Economics, Ghent, Belgium.

Citations: 5

Heger, T., & Schlesinger, M. (2010). *Value Creation in a QoE Environment.* Paper presented at the 21st European Regional ITS Conference, Copenhagen 2010 Copenhagen.

Citations: 4

Heger, T., & Pfeffer, H. (2009). *A Resource-Oriented Markup Language for the Rapid Creation of Loosely Coupled Mashups.* Paper presented at the WWW / Internet 2009, Rome.

6.3 Overview of interviewed persons for sections 3.3 and 3.5

Overview of n=51 interview partners. Interview data is used in sections 3.3 Networked Foresight—The case of the EIT ICT Labs and 3.5 A relational view on the Maturity Model for .

ID	*Position at Affiliation*	*Role in EIT Digital*	*Affiliation*
1	Professor, SICS Lead in ASSETS project	Activity Lead	SICS
2	CSO	CSO	EIT Digital
3	Software Engineer	Activity Member	Alcatel-Lucent
4	Researcher	Activity Member	Alcatel-Lucent
5	Professor	Catalyst Lead	CWI
6	Innovation Director	Activity Member	T-Labs
7	Head of Automotive IUI Projects	Action Line Lead	DFKI
8	Innovation & Project Manager	Activity Member	EICT
9	Managing Director	Action Line Lead	EICT
10	Innovation Manager	Catalyst Lead	EICT
11	Head of Innovation Management	Node Management	EIT Digital
12	Controller EIT Digital	Node Management	EIT Digital
13	CEO	CEO	EIT Digital
14	Research Engineer	Activity Member	Alcatel-Lucent
15	Head of New Business Development and Innovation CEMA Region	Catalyst Lead	Ericsson
16	Manager Network Architecture Lab	Action Line Lead	Ericsson
17	Researcher	Activity Lead	Fraunhofer Gesellschaft
18	Manager Innovation Europe	Activity Lead	INRIA
19	Coordinator EIT KICs and other funded activities	Activity Member	INRIA
20	Deputy Research Director	Action Line Lead	Institut Télécom
21	Director of Innovation	Activity Lead	Institut Télécom
22	Professor, Section Manager Systems Engineering	Activity Lead	NIRICT
23	Research Associate	Activity Lead	NIRICT
24	Business Developer Kennispark Uni Twente	Activity Member	NIRICT
25	Principal Scientist	Node Director, Board Member	Novay
26	Managing Advisor	Activity Member	Novay
27	Senior Director Philips Research	Node Management	Philips

28	Researcher	Activity Member	Philips
29	Director SAP Research Karlsruhe	Member General Assembly	SAP
30	Innovation Lead for Business Transformation Services	Activity Member	SAP
31	Director of Swedsoft	Activity Member	SICS
32	Communications Manager	Node Management	Aalto University
33	EVP, Director Corporate Research and Technologies	Member General Assembly	Siemens
34	Head of Unit	Activity Lead	Siemens
35	Business Coach	Activity Member	STING
36	VP Innovation Development	Node Director, Board Member	T-Labs
37	Researcher	Activity Lead	T-Labs
38	Researcher	Node Management	T-Labs
39	VP & Head of Infrastructure & University Cooperation	Node Management	T-Labs
40	Senior Project Manager	Node Management	T-Labs
41	Head of eMobility ETP, Member of Executive Board	Activity Member	Trento Rise
42	Researcher	Catalyst Lead	TU Berlin
43	Employee Gründungsservice TU Berlin	Activity Member	TU Berlin
44	Professor in Secure Mobile Networking Lab	Activity Lead	TU Darmstadt
45	Senior Researcher	Activity Lead	TU München / Fortiss
46	Professor	Action Line Lead	Université Paris Sud XI
47	Head of European Office	Activity Member	UPMC
48	European Affairs Officer	Activity Member	UPMC
49	Director	Member General Assembly	UPMC
50	Business Development Manager	Activity Member	Trento Rise
51	Researcher	Activity Member	Fraunhofer FOKUS

6.4 Semi-structured interview guideline used in interviews for sections 3.3 and 3.5

Consolidated semi-structured interview guideline for two interview series with n=51 interview partners in total. Interview data is used in sections 3.3 Networked Foresight—The case of the EIT ICT Labs and 3.5 A relational view on the Maturity Model for .

Context

1. What is your current position in your affiliation?

2. How are you linked to EIT activities, in what activities are you active, etc.?

3. How and why did you become function in/of the ICT Labs?

Motivation & expected benefits

4. Please describe why your affiliation (name) decided to join the EIT ICT Labs originally!

Examples: trend to open up innovation, barriers to innovation, ...?

5. Do you believe that this motivation has changed since then? In what way?

6. What do you think does your affiliation (name) expect to gain from the ICT Labs in terms of real outcome?

Examples: access to new knowledge (market knowledge, technologies, empirical data,…), close collaborations with partners, exchange of ideas between organizations, exploitation of otherwise foregone fields, access to additional research funding, reduction of R&D costs, enhanced prestige / image effects, risk sharing, opening up of innovation, better competitive position, access to partners products and/or strategies, etc.

7. What do you believe are the goals of other partners in the EIT ICT Labs?

Officially & inofficially, governments, industry partners, universities, research institutes

8. Do you think that the fact that public funding is available for the EIT ICT Labs has or had an impact on partner motivation? What kind of impact?

Barriers to innovation

9. What do you believe are the gravest barriers to successful collaborative innovation activities in general?

Examples: cultural barriers: different languages, assumptions, philosophies, divergent goals and expectations, uncertainties concerning Intellectual property, lack of informal connections, lack of trust Institutional barriers: high frequency of structural changes and

persons in charge, esp. at industry partners; varying incentive structures in universities and industry operational barriers: insufficient coordination, lack of transparency, insufficient formalization: processes, rules, policies, reporting; Not-Invented-Here syndrome; risk of exploitation by others

10. Do you believe that the ICT Labs construct (cataylst, carrier, co-funding, ...) supports collaborative innovation activities? Where do you see room for improvements?

11. What do you think are the top 3 most important factors for the success of collaborative innovation?

Examples: Mutual trust, Motivation, Quality of People, organization, IPR regulations, ...

12. Based on your experience, which processes, methods or practices have proven to be useful in collaborative innovation activities? What might be useful for the ICT Labs?

Current satisfaction

13. Please describe positive experiences and aspects of your work in the ICT Labs? „What was good'?

Keywords: built-up process, organizational structure, management structure; assignment of positions and activities; allocation of budget; ratio of input and output (if any output was observable)

14. Where do you see the major difficulties currently? Name 3!

Foresight

15. Do you consider foresight (or business intelligence) important for EIT ICT Labs? Why?

16. What benefits do you expect? On what levels: for the network, for the partners? Anyone else—greater good, firms outside of network, ecosystem, …?

17. What do you think is critical for running such an activity successful in the EIT ICT Labs?

18. How would you define success for this activity?

Discussion of specific foresight capabilities and practices.

19. Information usage

Describes the capability of sensing weak signals and feeding them into the system.

- What do you see as primary information sources?
- Which fields would you investigate (thematically and in scope, i.e. politically, competitive, customer-oriented, etc)?

- In which time horizons?

20. Method sophistication

Describes the organization's ability to interpret information.

- What kind of methods do you see as best fit for you goals? Specific method mixes?
- Do you see any particularities for the use of foresight in the network?
- What dissemination formats for results do you expect and recommend?

21. Culture

Describes the attitude, willingness to listen and change, and openness of an organization.

- Do you see any differences between your parent organizations and the EIT ICT Labs? Which ones?
- To what extent would you share intelligence generated in EIT ICT Labs? How? Also digitalized/computerized?
- Do you use the information for your activity field in your parent organization? What difference do you see to information coming from outside of the network?

22. Organization

Captures the ability of an organization to systematically identify, interpret, and diffuse insights (formal organization)

- How do think foresight in the EIT ICT Labs should be run? Top-down—bottom-up? Continuous or issue-/topic-driven?
- Do you see and formal integration possibilities?
- Do you have an idea or suggestions on how to incentivize people to contribute to such an activity?

23. People & networks

Describes the people and communicative ways within the organization (informal organization).

- What do you think would be most important for people contributing to a foresight activity in EIT ICT Labs: internal & external network? Attitude? Open-mindedness? Discipline?

Further suggestions and recommendations

20. Do you have any further recommendations or suggestions for the future of the EIT ICT Labs?

- Do you know organizations similar to the ICT Labs we should look into for adaptable practices?
- Do you have any suggestions about people in the network we should interview?

6.5 Survey used in section 3.3: value creation through networked foresight

Survey with n=54 respondents, response rate 49.09%

Innovation Radar Catalyst

Survey: value creation through networked foresight

Aim of the survey
The Innovation Radar is a central foresight instrument of the EIT ICT Labs. It seeks to establish a common outlook on the future of ICT to create cohesion and a strong community across the nodes and the partner organisations. With this survey we aim to

- identifying how information from the Innovation Radar is used within the partner organisations
- capturing the value that is created through the Innovation Radar
- identifying potential for improvements
- identifying related and relevant other foresight instruments from within the partner organisations

What do we mean by "foresight"?
We use the term foresight similar to the concept of *Corporate Foresight*. That means it describes an organization's ability to detect discontinuous change early, interpret the consequences, and formulate effective responses to ensure the long-term survival and success of the focal organization.

Who conducts the survey?
The survey is conducted by the Innovation Radar Lead Magnus Boman and a designated subteam related to the Innovation Radar and the Best Practice Benchmarking catalyst.

What happens with the results? Do I have access to the results?
The results of the survey will be used to improve the innovation radar and – if necessary – to initiate new foresight instruments. A report will be made available on the intranet of the EIT ICT Labs.
The data will also be used for a bachelor thesis and for scientific publications in the context of networked foresight and innovation networks. More information about this scientific work can be obtained directly from Magnus Boman or Tobias Heger. Contact data can be found below.

How is the data handled?
The conducting EIT ICT Labs affiliates bear the responsibility for the collected data. All data will be treated as strictly confidential, and with respect for privacy and personal integrity.
In scientific publications the results of the data analysis will only be published in summary, i.e. aggregated with data from other participants. Any anecdotal evidence that could be used to pinpoint single organisations or persons will result in requests for explicit permission to publish.

How to fill out the questionnaire?

- Fill out the following form or go to https://de.surveymonkey.com/s/EITICTLabs-Innovation-Radar-Survey-2012 (the QR code on the points to this URL as well)
- Please check the correct answer in the provided checkboxes.
- Please write your textual or numerical answers onto the provided lines.
- Please do not skip questions in case a value equals 0 or no comment can be given, but fill in a "0" or "-" respectively.

Please send your completed questionnaire to:

Email: **tobias.heger@ictlabs.eu**
or via fax to: **+49 30 3450 6690 102**
or by mail to: **EIT ICT Labs Germany GmbH, z.Hd. Tobias Heger, Ernst-Reuter-Platz 7, 10587 Berlin, Germany**

In case of any questions about this survey or the results do not hesitate to contact us.

Prof. Dr. Magnus Boman (SICS, KTH)
Innovation Radar Catalyst Lead

Phone: +46 72 7203 588
Email: mab@sics.se

Tobias Heger (EIT ICT Labs Germany GmbH)
Best Practice Benchmarking

Phone: +49 30 3450 6690 123
Email: tobias.heger@ictlabs.eu

General Information

A Please state the type of your affiliation!

☐ Industry (**S**mall **M**edium **E**nterprise) ☐ Industry (**M**ulti **N**ational **C**ompany) ☐ Research Institute ☐ Academic Institute

B What is your position therein? .....

C Are you involved in any EIT ICT Labs activities? ☐ Yes ☐ No

↳ Please specify which: .....

Foresight within your affiliation

D Are you aware of any foresight-related activities within your affiliation? ☐ Yes ☐ No

↳ Please estimate the annual total expenditures for foresight-related activities in your affiliation ..... €

E Please tick the foresight instruments that are being used within your affiliation!

1 Benchmarking ..... ☐
2 Bibliometrics ..... ☐
3 Business modeling ..... ☐
4 Cross-Impact-Analysis ..... ☐
5 Environmental scanning ..... ☐
6 Expert panels or workshops ..... ☐
7 Focus groups ..... ☐
8 Gaming (e.g. business war games) ..... ☐
9 Life-cycle analysis ..... ☐
10 Patent, publication analysis ..... ☐
11 Roadmapping ..... ☐
12 Scenario analysis ..... ☐
13 Scouting networks ..... ☐
14 Trend extrapolation ..... ☐

Others: .....

F In which form are the results of the foresight activities being produced ?

1 Reports ..... ☐
2 Roadmaps ..... ☐
3 Workshops ..... ☐

4 Newspapers ☐

5 White papers ☐

6 Trend or hype curves ☐

7 Up-to-date online visuals ☐

8 Visualisations, e.g. radar screen. Please specify: _____

9 Others: _____

G Does your affiliation share the information that is generated through foresight activities externally?

Yes, all information openly ☐

Yes, selected information (e.g. project results) openly ☐

Yes, all information openly in closed networks or with selected partners ☐

Yes, selected information (e.g. project results) in closed networks or with selected partners ☐

No ☐

H Are foresight results from within your affiliation in any way being made available to EIT ICT Labs currently? ☐ Yes ☐ No

→ Please specify how: _____

J Please specify to what degree the results are used within your affiliation for the given possibilities below

	Not at all	Some-times	Regu-larly	Constant-ly
1 To identify relevant external change (political, economic, societal, technological, environmental, legal)	☐	☐	☐	☐
2 To identify new internal needs	☐	☐	☐	☐
3 To identify new business models	☐	☐	☐	☐
4 To identify competitors' concepts and strategies early	☐	☐	☐	☐
5 To consolidate opinions and trigger discussions	☐	☐	☐	☐
6 To create a common view / perception of things within the organisation	☐	☐	☐	☐
7 To trigger new innovation activities	☐	☐	☐	☐
8 To ensure state-of-the-art innovation activities	☐	☐	☐	☐
9 To challenge and change existing mental models	☐	☐	☐	☐
10 To initiate or moderate strategic change	☐	☐	☐	☐
11 To support breaking away from determined or deadlocked paths	☐	☐	☐	☐
12 To search for missing resources	☐	☐	☐	☐
13 To support make-or-buy decisions	☐	☐	☐	☐
14 Other. Please specify _____	☐	☐	☐	☐

Foresight within the network

K Please specify what benefit you expect from a foresight activity carried out within the EIT ICT Labs network!

For the EIT ICT Labs as organisation .....

For an EIT ICT Labs activity (apart from the Innovation Radar) .....

For your affiliation .....

For you as a professional .....

For anyone outside of the EIT ICT Labs .....

For others: .....

L Do you believe that a networked organisation such as EIT ICT Labs could gain better foresight results than your affiliation itself? ☐ Yes ☐ No

↳ Please explain your answer: .....

M Do you believe that a networked organisation such as EIT ICT Labs could leverage the use of foresight results? ☐ Yes ☐ No

↳ Please explain your answer: .....

N Are you aware of the EIT ICT Labs Foresight Study on Smart Energy Systems, published in 2011? ☐ Yes ☐ No

↳ Please Indicate how you became aware of the publication .....

↳ Please comment on its usefulness or relevance to you .....

O Are you aware of the EIT ICT Labs Foresight Study on Future Media and Content Delivery, published in 2011? ☐ Yes ☐ No

↳ Please Indicate how you became aware of the publication .....

↳ Please comment on its usefulness or relevance to you .....

P Which information fomrat would you prefer for the foresighting results in the future?

Reports, brochures, booklets or similar (professionally edited, static) ..... ☐

Up-do-date online visuals (unedited, dynamic) ..... ☐

Q In case you are not already part of the Innovation Radar expert network: would you like to be involved as expert in the future? ☐ Yes ☐ No

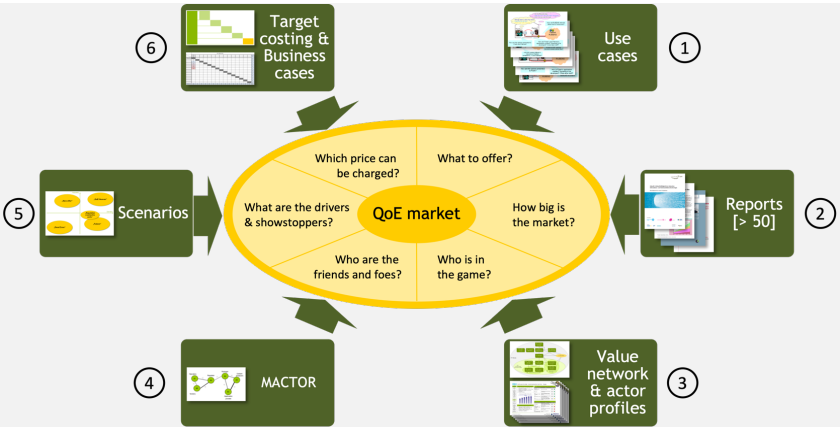
↳ If yes, please leave your email address for us to contact you. .....

R Do you have any other comments you would like to share with us?

6.6 Questionnaire used for method validation in section 3.4

I	CONTEXT				
For how long have you been active in telecommunication projects?	☐ < 1 year	☐ 1 – 5 years	☐ 5 - 10 years	☐ 10 – 15 years	☐ > 15 years
In which WPs are you active in RUBENS? More than one answer possible	☐ WP1	☐ WP2	☐ WP3	☐ WP4	
If you are involved in WP4: In which sub-WPs are you active? More than one answer possible	☐ WP 4.1	☐ WP 4.2	☐ WP4.3		
Which are your areas of expertise? More than one answer possible	☐ Consulting (e.g. in telecommunications)				
	☐ Service / Product Designer				
	☐ Standardization				
	☐ Network related (Access / Core)				
	☐ Techno-economics				
	☐ Others: _____				

II	GENERAL APPROACH IN WP 4.3				



	I fully agree				I fully disagree
The questions in the above illustration (within the ellipse) capture the important aspects that should be analyzed in WP 4.3 of RUBENS.	☐	☐	☐	☐	☐
If some aspects are missing, what other questions need to be answered when exploring new markets?					
_____					
_____					
_____					
The methodological approach that is shown above …					
... is suitable for the techno-economical analysis in WP 4.3 of RUBENS.	☐	☐	☐	☐	☐
… can be used for other projects that explore future markets.	☐	☐	☐	☐	☐

What was your expertise with the following methods before the RUBENS project?				
	I use it regularly	I used it before	I knew it but did not use it	I did not know it
Use cases	☐	☐	☐	☐
Value network	☐	☐	☐	☐
MACTOR	☐	☐	☐	☐
Scenario Analysis	☐	☐	☐	☐
Target Costing	☐	☐	☐	☐
Business cases	☐	☐	☐	☐

Please indicate if you agree with the match of questions and methods.								
			I fully agree				I fully disagree	Un-certain
Use cases	are adequate for	What to offer?	☐	☐	☐	☐	☐	☐
Literature review (studies, reports, papers, etc.)	is adequate for	How big is the market?	☐	☐	☐	☐	☐	☐
Value network	is adequate for	Who is in the game?	☐	☐	☐	☐	☐	☐
MACTOR	is adequate for	Who are the friends and foes?	☐	☐	☐	☐	☐	☐
Scenario Analysis	is adequate for	What are the drivers and showstoppers?	☐	☐	☐	☐	☐	☐
Target Costing	is adequate for	Which price can be charged?	☐	☐	☐	☐	☐	☐
Business cases	are adequate for	Which price can be charged?	☐	☐	☐	☐	☐	☐

III SCENARIO ANALYSIS

	I fully agree				I fully disagree
The scenario analysis provides important insights for the techno-economical analysis in WP 4.3.	☐	☐	☐	☐	☐
The scenario analysis is suitable for WP 4.3.	☐	☐	☐	☐	☐
The approach that is taken to conduct the scenario analysis is transparent.	☐	☐	☐	☐	☐

Please indicate the likelihood for each scenario in percent.

Scenario	**Key characteristics**	**Likelihood** (%)
QoE Heaven	Environment, customer demand and technology support the operation of QoE functionality in the networks.	_____

Immediate Action required	Environment and customer demand call for QoE functionality, but the industry did not yet implement Qo E functionality yet	_____
Dead Zone	Politics and regulators promote the increase of network capacity and customers see no need for QoE functionality.	_____
New Offer	The QoE technology is ready and is being integrated into the network, but customers do not see the advantages yet.	_____
Regulation crashes the party	An unfriendly regulatory environment inhibits QoE functions from being profitable.	_____

Please indicate the likeliness and importance of the following Wild Cards for the future of QoE. A Wild Card is an unpredictable event that has a significant impact on the introduction of QoE.

Wild Card	**Description**	**Likelihood** (%)	**Importance** 1: lowest importance 10: highest importance
Security Scandals	The trust of users into involved actors is shattered by security breaches, e.g. through loss of user profiles, bank data, other personal data or user generated content.	_____	_____
Next Generation Mobile Networks	Customers perceive QoE assurances more attractive for mobile terminals. Consequently, the willingness to pay for QoE is higher in mobile networks.	_____	_____
Unexpected behavior of an actor	A sudden move by an actor takes the others by surprise. For example if an acquisition by a so far uninvolved actor results in service bundles that cannot be matched by incumbents.	_____	_____
Credit crunch	The ongoing economical crisis leads to a credit crunch. As a result, some operators fail to secure the funding to build up the QoE infrastructure.	_____	_____
Machine-to-Machine Communication	As a result of a significant increase in Machine-to-Machine communication demand for storage and processing power increases as well as network traffic.	_____	_____
Unexpected shifts in customer behavior	An unexpected shift in customer behavior, such as the success of UGC-related applications, has heavy impacts on the QoE infrastructure.	_____	_____
Advertisement	New advertisement distribution channels create a strong increase in demand for QoE mechanisms on the B2B market side.	_____	_____

IV TARGET COSTING – DAY 1

General Approach

	I fully agree				I fully disagree
The Target Costing provides important insights for the techno-economical analysis in WP 4.3	☐	☐	☐	☐	☐
The approach that is taken to conduct the Target Costing is transparent	☐	☐	☐	☐	☐
Target Costing is the correct approach to identify the costs of each product component in RUBENS	☐	☐	☐	☐	☐

Explanation of upcoming terms	
Term	**Description**
Product	In this questionnaire the product is IPTV as a whole (including hardware, software, customer support, …) as you need a concrete product for the Target Costing process.
Customer Requirement	Customer Requirements summarize all product characteristics (ease of use, design, …) technical product functions (Time-Shift, Community, …) and technical product components (Set-Top Box, remote-control, …) demanded by the customers. They are described from a customer's point of view.
Product Function	Black box which serves different objectives, e.g. Bandwidth Management Subsystem (BMS) which handles every bandwidth-related task. Each function can be mapped in different ways to the actual physical architecture.
Product Component	Physical component as described in the reference model architecture (e.g. Aggregation Switch, Head-End, …)

Customer requirements

Please check the following table for completeness and add missing parts.
The table should cover all requirements from *a customer perspective* on IPTV.

1	Content	►	1.1	Free and Pay TV channels			_____
		►	1.2	Wide-ranging availability of individual movies (VoD) and blockbuster			_____
		►	1.3	Integrated Internet services			_____
		►	1.4	Integrated news / Information services			_____
		►	1.5	Integrated shopping services			_____
		►	1.6	Games			_____
		►	1.7	_____			_____
		►	1.8	_____			_____
2	Quality of Transmission	►	2.1	Reliability			_____
		►	2.2	Speed	►	2.2.1	Delay behind other transmissions (cable, satellite, radio…)
						2.2.2	Channel switching
					►	2.2.3	VoD Start-up delay
						2.2.4	_____
					►	2.2.5	_____
		►	2.3	Video quality			_____
		►	2.4	Audio quality			
		►	2.5	_____			_____
		►	2.6	_____			_____
3	Time sovereignty	►	3.1	PVR			_____
		►	3.2	VoD			_____
		►	3.3	_____			_____
		►	3.4	_____			_____
4	Access	►	4.1	Local independence / Place-Shift			_____
		►	4.2	Avoidance of discontinuity of media			_____
		►	4.3	Hardware independence			_____
		►	4.4	_____			_____
		►	4.5	_____			_____
5	Interactivity	►	5.1	Community (bulletin boards, blogs, …)			_____
		►	5.2	Participation in TV program (quiz, votings, …)			_____

		►	5.3	User-generated Content			_____
		►	5.4	Social network integration			
		►	5.5	_____			_____
		►	5.6	_____			_____
6	Ease of use	►	6.1	Installation	►	6.1.1	Smooth initial installation
					►	6.1.2	Integration of STB in living environment
					►	6.1.3	_____
					►	6.1.4	_____
		►	6.2	Usability	►	6.2.1	Simple handling of STB
					►	6.2.2	Customization of user interface
					►	6.2.3	_____
					►	6.2.4	_____
		►	6.3	Program survey	►	6.3.1	Intelligent EPG
					►	6.3.2	Possibility to search for and navigate in available content
					►	6.3.3	_____
					►	6.3.4	_____
		►	6.4	_____	►	6.4.1	_____
					►	6.4.2	_____
					►	6.4.3	_____
7	Data security	►	7.1	Security of personal data			_____
		►	7.2	User behavior profiling			_____
		►	7.3	_____			_____
		►	7.4	_____			_____
8	Customer support / Service	►	8.1	Order processing			_____
		►	8.2	Service in case of problems			_____
		►	8.3	Simple, fair, transparent, and customer-oriented charging			_____
		►	8.4	Single bill for multiplay services			_____
		►	8.5	_____			_____
		►	8.6	_____			_____
9	Image / Reputation of vendor	►	9.1	Subjective evaluation, if vendor is able to deliver offered services			_____
		►	9.2	Public image of vendor			_____
		►	9.3	_____			_____
		►	9.4	_____			_____
10	_____	►	10.1	_____			_____
		►	10.2	_____			_____
		►	10.3	_____			_____
		►	10.4	_____			_____
11	_____	►	11.1	_____			_____
		►	11.2	_____			_____
		►	11.3	_____			_____
		►	11.4	_____			_____