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Toward networked foresight? Exploring the use of futures research in innovation networks

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ABSTRACT

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 inter-organizational 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, e.g., the broad resource base and the large pool of people with diverse backgrounds that are available. Furthermore, effective instruments for the re-integration of knowledge into the networks' partner organizations are needed.

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 [1], Tidd [2]) and the use of futures research within individual companies has been studied on various occasions. These studies have provided insight into how futures research methods and innovation processes can be combined and integrated [3], how technology intelligence processes can be organized [4] and how corporate foresight affects companies' innovative capabilities [5].

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" [6]. Since

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the introduction of the term, studies using it have attracted increasing academic and corporate attention [7,8]. 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., Gassmann [9], Edquist [10], Rigby and Zook [11]. 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 [12]. A way to practice open innovation are 'innovation networks'. Under this term, cooperations organized as inter-organizational networks with the goal to innovate collaboratively are understood.

The link between 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.

2. Toward networked foresight

2.1. Analogies in the development of innovation management and futures research

Liyanage [13], Niosi [14] and Ortt and van der Duin [15], van der Duin et al. [16] 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 [17]. 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 toward 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 [18–20]. Subsequently, futures research focused on identifying possible and preferable futures instead of trying to predict the future [21]. 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 [22].

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*.

2.2. Linking futures research to innovation networks

2.2.1. Trends driving corporate innovation toward open innovation processes

Innovation, i.e., the process of creating a new product, service or system [24], has long been considered a driving force behind economic growth [25]. 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" [26]. Later, it

Table 1
Generations of innovation management and futures research (based on van der Duin [3], see also Daheim and Uerz [23]).

	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

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" [27]. 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 [28]. *Dynamic capabilities* research shows that strategic resources lose their value over time [29]. Thus, firms need to have innovative capabilities and instruments to renew their strategic resources in order to maintain a competitive advantage [30].

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 [31] and increasing complexity of products [32].
2. High innovation speed [33].
3. Shortening product life cycles [34].
4. Spread of knowledge in the value chain and concentration on core competencies [35,36].
5. Business models that integrate across various industries [9,37].

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 [38].

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, e.g., 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 and Gemünden [5] 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 and Rohrbeck [39] 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* [8]. 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 ideal generation stage of the innovation process and as inside-out and outside-in processes (see [40] 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. In [41] Jasner describes the 'Moonraker' project of the car manufacturer Volkswagen. 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. Methodology

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 [42]. Case study research is therefore recommended for exploratory qualitative research characterized by scant previous knowledge [43–45].

Two rationales for multi-case study designs can be identified [44]: first, two cases already allow for literal or theoretical replication and thus more robust conclusions [46]. 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 great depth, while 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 65 partner organizations.

To collect data for the EICT and EIT ICT Labs case studies a participant-observer approach was utilized.[2] 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.

3.2. Analytical framework

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 [47,48]. 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 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 Fig. 1. 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 toward 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.

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

[2] 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 [43]. However, we ensured that at least one researcher acted solely as an observer in both cases.

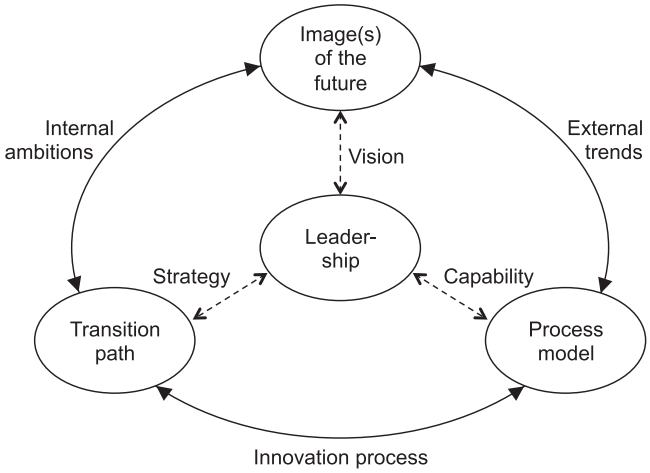

Fig. 1. Level 1 of the Cyclic Innovation Model: the connection between innovation and the future. For details see [48].

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.

3.2.2. 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., 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. Also, that it might be that 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 gray-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 that the levels in the illustration do not rate or reflect business performance of the organizations. They merely reflect the state of each case concerning the planned and actual network orientation concerning futures research activities.

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 and Gemünden [5]: initiator, strategist, and opponent (Table 2).

When foresight is implemented to contribute through these three roles [5], 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).

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.

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

Table 2
The three roles of foresight as described by Rohrbeck and Gemünden [5].

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
	Challenging the state-of-the-art of current R&D projects

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".[3] 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.[4] 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" [49].

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 [49]. 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.

4.1.2. Process model

With regard to 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.

4.1.3. Transition path

The transition toward an open innovation program has undergone several steps: from an initially government-internal planning program to an externally supported innovation program. This program 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.

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

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

Table 3
Networked foresight activities in 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

to act as guards against defective outside political influences while also making sure that the internal components of the network were aligned.

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. 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).

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 their research and development activities in the area of information and communication technology.[5]

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 [10]. 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.[6]

4.2.1. Image of the future – vision

When applying the CIM to the EICT, the vision (i.e., becoming the leader in ICT innovation) as stated by the network partners 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.

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 and provide input in an optimal way [50]. 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

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

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 toward its partners and speeds up the creation of new innovation activities.

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.

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.

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 [39], 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.

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 [51]. 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" [52]. 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 [53]. 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

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

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 were created.

The EIT ICT Labs consist of 20 core partners from industry and academia and approximately 40 associated or affiliated partners. 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 [54]. 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 [55].

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.

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 future,[7] 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 [56] and best-practice benchmarking [57]. 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 between the network partners. Thom provides an overview of the EIT ICT Labs Innovation Radar in [58].

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 [57].

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" [56]. The best-practice benchmarking ensures the implementation of state-of-the-art instruments and methods.

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

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

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 toward activities within these fields	Program
3.2	Experience and 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 technological opportunities within universities and research institutes	Program
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

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 aforementioned foresight instruments innovation radar and best-practice benchmarking.

The importance of stakeholder management results from the inter-organizational 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 [55]). 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 [59].

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.

5. Evaluation of the cases

In this section, we evaluate the three cases, followed by a cross-case evaluation.

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.

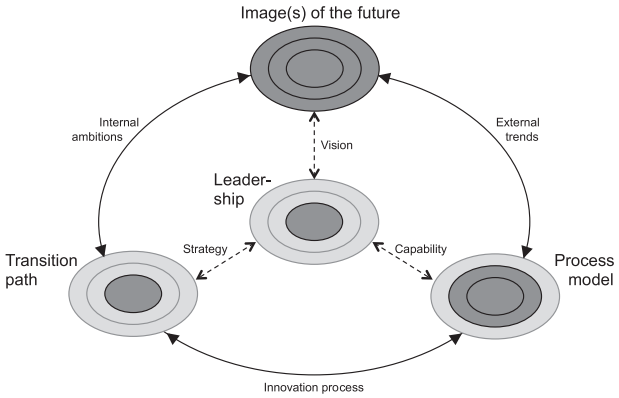

Fig. 2. Visualization of WINN managed by Rijkswaterstaat in terms of its openness and network orientation.

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. Fig. 1 visualizes the analysis of WINN in terms of its openness and network orientation.

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 & Gemünden [5] 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" [60]. The *opponent role* was addressed ancillary within business case analyses (Fig. 2).

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 (1) contemplation about the future, (2) structuring, writing down, and analyzing thoughts about the future and (3) 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).

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 toward 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.

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

Table 6
The scope of the foresight activities in Rijkswaterstaat and their matching to the roles of foresight according to Rohrbeck & Gemünden [5].

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.

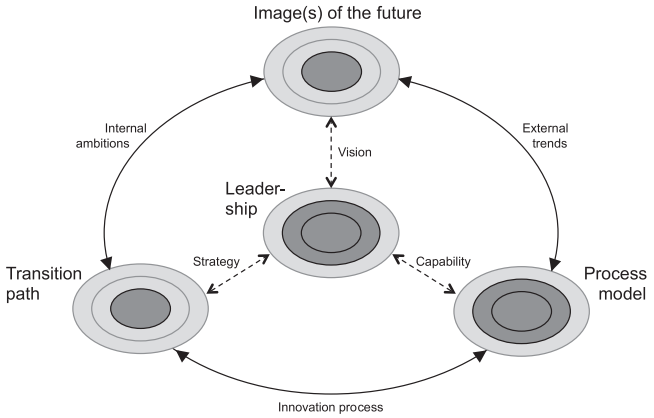

Fig. 3. Visualization of the EICT concerning openness and network orientation.

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.[8]

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.

Fig. 3 visualizes EICT in regard to its openness and future orientation based on the CIM.

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.

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

1. 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.
2. Beneficiaries of networked foresight activities are the network partners within the pre-defined project settings.
3. 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.
4. The existing foresight activities could be utilized to capture external developments adequately to guide EICT prepare it for the future.
5. Foresight would benefit from additional network partners that add to the existing knowledge base.

[8] During the revision of this article a regular strategy meeting took place and subsequently EICT is adjusting its strategy and mission.

Table 7
The scope of the foresight activities in the EICT and their matching to the roles of foresight according to Rohrbeck & Gemünden [5].

No.	Activity	Initiator role	Strategist role	Opponent role	Scope
2.1	Future studies	□	(□)		Open (organizations and 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.

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 toward 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.

Fig. 4 visualizes the EIT ICT Labs in regard to its future orientation and openness.

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 8 the foresight activities are matched to the three roles defined by Rohrbeck and Gemünden [5]. Additionally, the scope (contributors and beneficiaries) is shown.

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

1. Within the EIT ICT Labs foresight that utilizes the network on various levels is practiced.
2. 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.

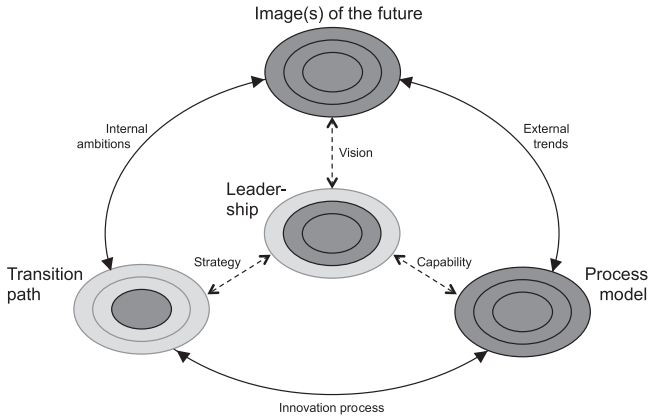

Fig. 4. Visualization of the EIT ICT Labs concerning openness and networks for futures research activities.

Table 8
The scope of the foresight activities in the EIT ICT Labs and their matching to the roles of foresight according to Rohrbeck & Gemünden [5].

No.	Activity	Initiator role	Strategist role	Opponent role	Scope
3.1	Action lines	(□)	□		Closed network
3.2	Experience and living labs		□	(□)	Open (organizations and 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.

3. 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.
4. Some activities, e.g., the action lines (thematic fields) and the selection process, could be applied further to guide the transition path toward an open network that generates excellent research and business results.
5. 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.

5.4. Cross-case evaluation

5.4.1. Toward networked foresight within the three cases

In Fig. 5 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

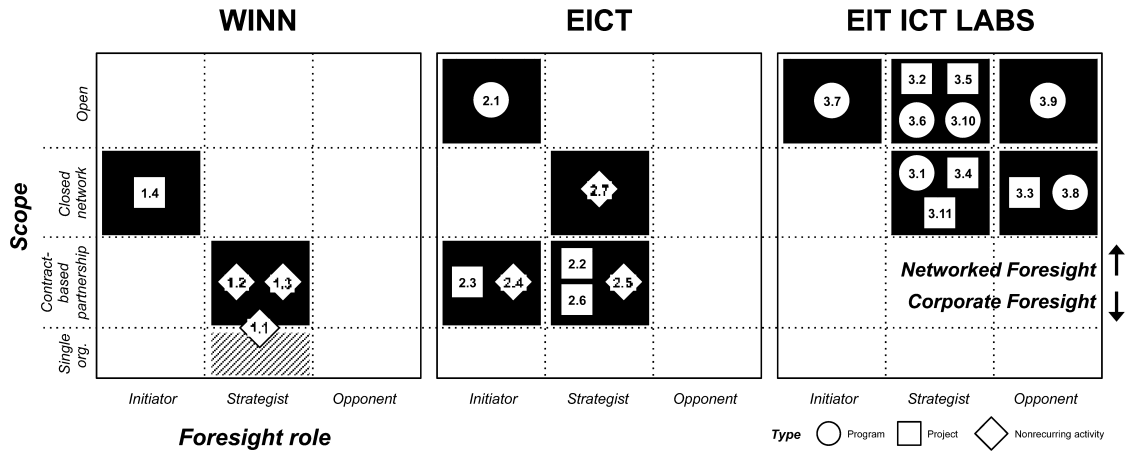

Fig. 5. Foresight activities from the cases matched to foresight roles, scope and type of activity.

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 the "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*.

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 toward 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 toward 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:

1. In all three cases the foresight activities are used as information sources for initializing new activities internally within the network partner organizations (*outside-in*).
2. 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.
3. 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.

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 the 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 (1) to address the future of the networks themselves and (2) 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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