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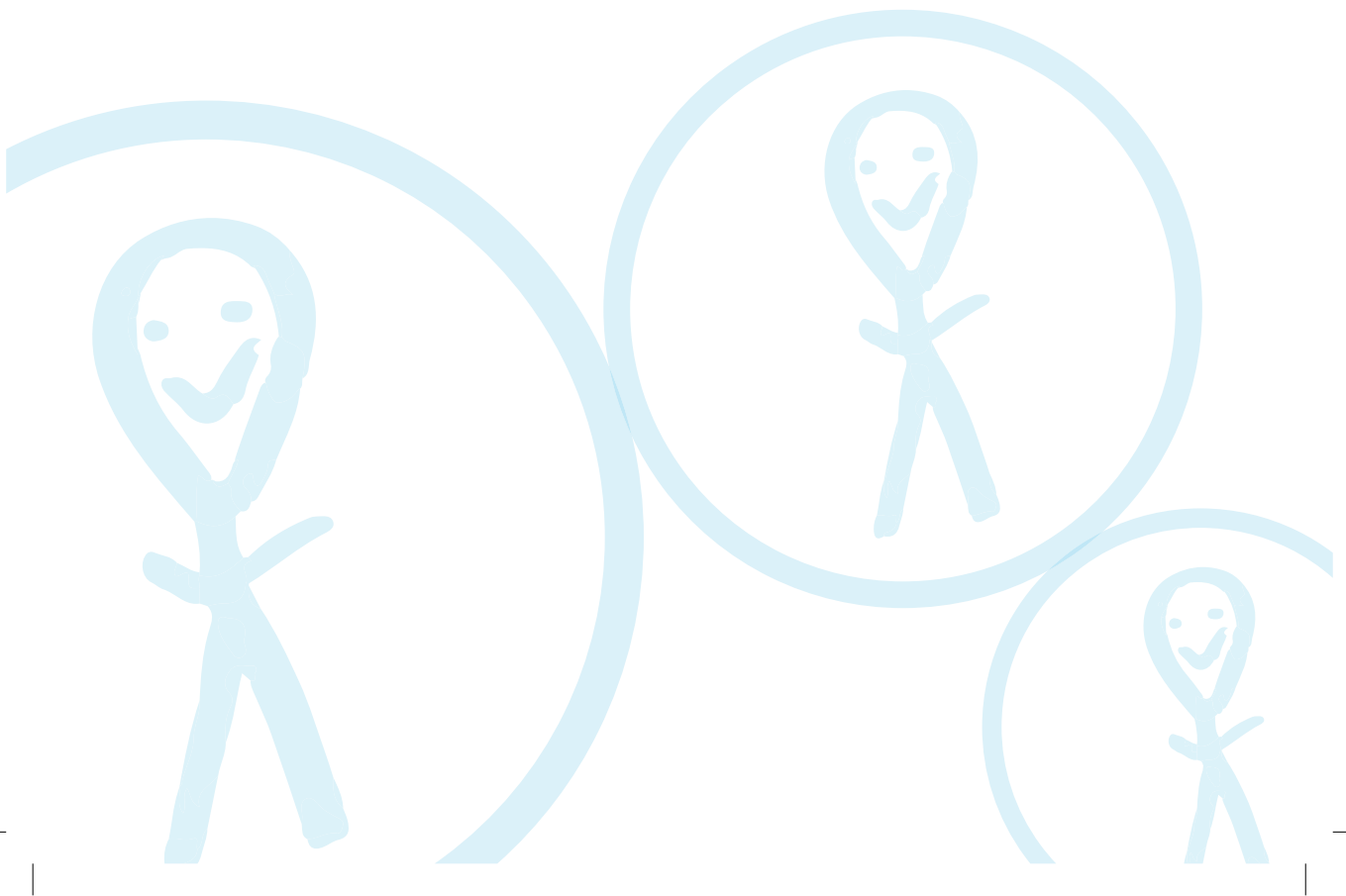
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Chapter 7

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7.1 Looking back

The objective of this dissertation was finding ways to improve the Agility of IT service networks, leading to the main research question:

Main research question: How to ‘improve’ the ‘Agility’ of ‘IT service networks’?

To answer the research question IT incident handling and software development processes in IT service networks have been studied, in the telecom and the financial industry. The research included a number of case studies ranging from 2010 to 2015. Given the existing body of related work some of the case studies are inductive in nature. With the case studies and surveys new theory has been induced and tested. The dissertation started by studying and developing the visibility and IT service network performance concepts. The theory was subsequently elaborated with additional concepts, while moving to IT service network Agility. With the concepts an Agile 5+1 framework has been developed, guiding Agility improvements in IT service networks. The effectiveness of Agile 5+1 has been (indirectly) confirmed with two incarnations.

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7.2 Revisiting the research questions

In the introduction chapter the research is split into individual research questions. In this section the individual research questions of chapter 1 are revisited, with the results of the studies in chapter 2, 3, 4, 5 and 6.

The first research question aims to enhance understanding of the impact of the macro-level, meso-level and micro-level links onto the Agility of IT service networks. Macro-level links represent interdependencies between the ISPs, meso-level links represent interdependencies between teams and micro-level links represent interdependencies between staff. The first research question is defined as:

RQ 1: What IT service network interdependencies affect IT delivery in IT service networks?

The answer to this question is given in chapter 2, by conducting an inductive case study in a network of nine interdependent IT service providers. In the case study three types of networks with interdependencies are identified: the human network, the contractual network and the technical network. The interdependencies in these networks and between these networks are to a large extent based on the information

that is needed by staff to deliver the IT services. The needed information is distributed over multiple technical and human stores, creating dependencies between staff. To access the information stores, the staff needs an overview over all stores. Since information is partially stored in human stores, staff needs overview over the human network. The answer to the research question includes a conceptual model with the three network types.

The next question is which information needs to be visible in each of the three identified networks, resulting in the following research question:

RQ 2: What information needs to be visible for IT delivery in IT service networks?

The second research question is also answered in chapter 2, by providing the needed information categories of each network type. Regarding the human network, information about human resources, contact details, resource changes, performed processes and human roles needs to be shared. With regard to the contractual network, information about the events in the IT service, network of IT services, IT service levels and changes in the supplier services needs to be shared. As the IT incident handling process is studied, the identified events are IT incidents. Regarding the technical network, information about the technical system process, critical IT system changes, capacity changes, IT system network and IT system design needs to be shared. The study identifies a lack of almost all information categories in the studied IT service network. The study shows that most of the information categories need to be shared beyond the first 'tier' in the IT service network. The tier level (first, second, etc.) indicates the minimum number of edges that information has to travel between two nodes (Caridi et al., 2010a). A first tier relationship indicates a direct interdependency (edge) between two IT providers (nodes).

With a subset of the identified information in the contractual network the hypothesized impact of visibility on IT service network performance was tested, based on the research question:

RQ 3: To which extent does visibility of information improve the performance of IT service networks?

The answer to that question is provided in chapter 3, by a confirmatory case study in an IT service network. The results of the case study show that IT service network performance can be improved by enhancing information visibility with visibility-based

interventions. In the end state, the team achieves high levels of incident handling performance.

The interdependencies require teams between and within ISPs to collaborate while handling IT failures and achieving IT changes. Question was which collaboration related factors impact IT service network performance. In order to find these collaboration related factors the following research question was defined:

RQ 4: What collaboration related factors impede the Agility of IT service networks?

The answer to research question 4 is provided in chapter 4, by defining six collaboration related factors: (1) coordination, (2) priority, (3) alignment, (4), automation, (5) predictability and (6) visibility. The factors are based on the six collaboration related issues that were empirically identified in multiple IT service networks. The six identified issues are: (1) a lack of coordination between nodes (2) mismatched priority between nodes, (3) alignment issues, (4) a lack of IT process automation, (5) unpredictable delivery and (6) a lack of information visibility. The synthesis of the factors with existing theory resulted in nine propositions. These nine propositions were subsequently combined to a conceptual model.

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With the results the question emerged whether the collaboration related factors impact IT service network Agility. In order to test the impact the following research question was defined:

RQ 5: To which extent does alleviating collaboration issues improve the Agility of IT service networks?

The question is answered with the case study in chapter 5. In the case study the Agility of an IT service network is improved by alleviated collaboration related issues. For the improvement a set of intervention actions is developed, based on the collaboration related factors. The intervention actions are subsequently deployed to mitigate the collaboration issues in a codependent set of Scrum teams, and to validate the effectiveness of the intervention actions. While the intervention actions are deployed the cycle time of new features is reduced from 29 days to 10 days. Participants in focus groups confirmed the causality between the observed improvements and intervention actions. The validated intervention actions are packaged in a governance framework for codependent sets of Scrum teams, the Scrum Value (chain) Framework.

Based on the results of chapter 2-5 the main research question is answered in chapter 6, by developing the Agile 5+1 (intervention action) framework for improving IT service network Agility. Based on the related work 20 intervention actions have been developed to improve the Agility. These intervention actions have been packaged in the Agile 5+1 intervention action framework with two dimensions. One dimension is based on four elements of an IT process (Who, When, What and With). The second dimension is based on the collaboration related factors. The Agile 5+1 framework is iconized by the Agile 5+1 model. The model and the framework together are abbreviated as 'Agile 5+1'.

Two incarnations of Agile 5+1 have been (indirectly) tested, by developing intervention actions based on the collaboration related factors. The most elaborate incarnation was tested in chapter 5 in a software development context, by developing intervention actions packaged in the Scrum Value (chain) Framework (Vlietland et al., 2015). The incarnation in the IT incident handling context was validated in chapter 3, with the development of the visibility-based interventions, deployed in an IT service network (Vlietland & van Vliet, 2014b).

7.3 Contribution and implications

The results of the experiments in chapter 3 and 5 confirm that the intervention actions based on the identified collaboration related factors can improve the Agility of IT service networks. The two incarnations support the validity of the hypothetical Agile 5+1, while the abstract nature allows appliance in many different IT service network contexts. Even though the nature of Agile 5+1 is abstract, the practical set of questions used by Journalists (Spencer-Thomas, 2012) allows straightforward tailoring of the intervention actions. For instance 'Who' can be straightforwardly translated to roles in an IT service network and 'What' to workflow activities and deliverables.

The studies advance the field of Agile software engineering in different ways. In the first place by identifying three different networks within and between IT service providers, which need to be analyzed to understand the interdependencies between IT service providers. These interdependencies affect collaboration between and within IT service providers. Studying the interdependencies and collaboration advances the knowledge of network based IT ecosystems (Jansen & Cusumano, 2013; Jansen, Finkelstein, & Brinkkemper, 2009; Riedl, Böhm, Rosemann, & Krcmar, 2009), that consist of staff, teams, ISPs and information technology.

Secondly, the studies enhance knowledge of Agility improvements in network constellations, by identifying the collaboration related issues that impede Agility in network settings. These identified collaboration related issues assist in developing

ways to improve the collaboration in network settings, such as in complex distributed outsourcing contexts (Paasivaara et al., 2012; Ralph, Shportun, & Bloomberg, 2013; Sutherland et al., 2009).

A third implication is the development of intervention theories to improve the Agility in IT service networks. By developing theory and intervention actions, and subsequently testing these intervention actions in the IT industry, help developing our understanding about organizational change and complexity theories in IT eco-systems (Cummings & Worley, 2014; Jansen et al., 2009; Stacey, 1995; Stelzer & Mellis, 1998).

7.4 Limitations and future research

The dissertation has various limitations and opportunities for future research. One limitation is the inductive nature of the studies in the dissertation. The main research question was answered with the development of the Agile 5+1 (intervention action) framework. The Agile 5+1 framework has been based on the collaboration related factors, which were identified and confirmed by case studies in the software development environment (Vlietland & van Vliet, 2015b). Though the factors were tested and confirmed by only one case study and the effect of the individual intervention actions was not tested (Vlietland & van Vliet, 2015b). Even though the 'visibility' improvement factor was identified and confirmed in the IT operation environment (Vlietland, 2011; Vlietland & van Vliet, 2013, 2014c), the other factors have not been researched in the IT operations context. Hence, Agile 5+1 and the impact of the factors onto Agility of IT service networks has not been (fully) empirically confirmed and remains hypothetical. A future research avenue is therefore (1) to study more IT service networks and validate the identified factors and (2) to test Agile 5+1 and the individual intervention actions in various IT service networks. These results might lead to an understanding of the intervention action dependencies, based on the characteristics of the IT service network. Such understanding might help predicting the feasibility of the intervention actions, similar to the IT service maturity levels of Niessink and van Vliet (1998). A related future avenue is conducting experiments in IT service networks with 'automation' (Continuous Delivery) deployed over multiple ISPs. Automated software development processes (Humble & Farley, 2010), probably impact other collaboration related issues as modeled by Vlietland and van Vliet (2015b).

Another limitation is the abstract nature of the Agile 5+1 framework, while targeting process, roles and deliverables. Next to these 'hard' aspects, the Agile 5+1 intervention actions typically require a shift in mindset and behavior. To achieve that shift the intervention actions need to be tailored to these specific contextual factors. To enable

such tailoring the contextual factors need to be identified and linked to the applicable organizational design theory (Daft, 2009; J.R Galbraith, 1977), while taking the Agile principles and objectives into account. Identifying the factors and tailoring the intervention actions can be a significant investment, depending on the existing organizational culture. Currently Agile 5+1 does not provide any guidance in tailoring the intervention actions, leaving tailoring to the interpretation of the user. An opportunity for research is therefore to develop a number of tailoring principles for the Agile 5+1 intervention actions. These tailoring principles guide change agents in developing intervention actions for the specific IT service network context. These tailoring principles can for instance take into account the organization and social culture, perceived distance between staff and governmental, political and architectural constraints (Ambler, 2009).

A third limitation is the relationship between performance and Agility. At the start of the dissertation the dependent variable was IT service network performance. Performance was defined with objective (supply chain) performance indicators. After answering RQ3, IT service network performance was redefined as IT service network Agility, based on similar (objective) indicators. Yet, such definition of Agile is rather narrow, compared to other definitions that include awareness, flexibility, productivity and adaptability (Plummer & McCoy, 2006). Moreover, the definition of Agility in this dissertation is based on contractual (supply chain) parameters (Vlietland, 2011), while the Agile manifesto advocates collaboration over contracts. The definition of Agile seems therefore misaligned with the Agile manifesto. A future research avenue is developing a more comprehensive definition for IT service network Agility. In that comprehensive definition social network theory (Freeman, 1979). might be useful to explain the impact of the three identified networks (Vlietland & van Vliet, 2014c), on IT service network Agility.

The studies in for this dissertation have been carried out in IT service networks in the telecom and financial industry. Applying future research in other industries might benefit these industries, while enhancing the understanding of Agility improvements in IT service networks. Future research can also be in the direction of adapting Agile 5+1 to a model that assists enterprises to become a 'responsive enterprise'. The responsive enterprise is a philosophy explaining how companies can adapt, learn and respond to our evolving world (ResponsiveOrg, 2014). Such adaption of Agile 5+1 transcends the scope to service networks (Viswanadham et al., 2005), possibly benefiting the much broader service network field.