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MASTER THESIS

The Effect of Regulated Techstandard Introduction on a Business Ecosystem

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Abstract

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The Effect of Regulated Techstandard Introduction on a Business Ecosystem

by R. JOOSTEN

Companies in the European business ecosystem are forced to adopt new regulations such as the revised Payment Service Directive and the General Data Protection Regulation. These regulations imply new standards that are changing the technological groundings of the companies in the business ecosystem. Multiple technology adoption models can be used to measure the adoption process on a firm level, but little research is available on the factors that influence the adoption of a new techstandard on a business ecosystem level. This research aims to fill the literature gap by defining a new model, the Regulated Standards Ecosystems Effect Model (RSEEM). The first step in this study was a systematic literature review. This revealed nine relationships between technology adoption models and business ecosystem health models. Secondly, expert reviews were conducted to iterate the conceptual into a final model. After this a single case study related to the revised Payment Service Directive (PSD II) was conducted to evaluate the RSEEM and show the practical implementations. The aim of the model is to give a prescriptive analysis for regulated techstandard introductions for every actor in the business ecosystem. The RSEEM provides results that provide insights on the thoughts of the different actors in the ecosystem. These results can be used by the business ecosystem actors but also by regulatory institutions.

Keywords: techstandard adoption, business ecosystems, technology adoption, business ecosystem health model

Contents

Chapter 1

Introduction

Innovating companies cannot evolve in a vacuum, they need resources, attract capital, partnerships, suppliers and customers to create a business ecosystem (Moore, 1993). According to Iansiti and Levien (2004) a healthy business ecosystem should create an environment that allows the creation of innovative technological components, that each company in the ecosystem can learn how to use and commercialize. In order to achieve this environment the ecosystem needs a balance between cooperation and competition in a dynamic market (Nachira, Dini, & Nicolai, 2007). If the regulator believes that the balance is disturbed then they can introduce a regulation that can restore order in the ecosystem. These regulations are often related to competition policies, pricing, market entry, natural monopoly and public utilities. Besides this the regulations could imply the need for a new technological standard which will help to achieve the goals of the regulation itself. To achieve the new technological standard, innovation on a company level is needed (Liu, Kauffman, & Ma, 2015).

When the regulator provides a clear roadmap about the regulation, innovation in the ecosystem can be boosted and market uncertainty will disappear (Warren, 2008). But there could also be negative effects related to the new technological standard. Technology innovation created by new entrants could initiate a defensive strategy of the traditional companies in the business ecosystem (Katz & Shapiro, 1987). If the new technological standard brings technical problems causing potential security risks or change market competitive power, traditional players could start a resistance (Ferrier, Smith, & Grimm, 1999).

Besides this the moment on which the regulation is introduced in the business ecosystem, can influence the ecosystems life cycle. Business ecosystems evolve according to a life-cycle that consists out of four stages: birth, expansion, leadership, and self-renewal. If the last stage is not successful then the business ecosystem will die. The regulation that is introduced can have a catalytic working on the evolving stages and life-cycle of the business ecosystem. As each stage has its own challenges towards cooperation and competition some actors in the ecosystem cannot come along with the levels of competition or find the correct cooperation.

But how can the companies that are facing these challenges be defined in the ecosystem? Rothschild (1990) states that every company can be defined by its technology and innovation level. According to Anderson, Banker, and Ravindran (2006) technological innovations are critical for the survival and success of companies, and thereby indirectly for the business ecosystem. An example in history is the smartphone company Blackberry that was, according to Goasduff and Forni (2017), not successful in these technological innovations and lost in six years time 20,7% world market share. At the end of 2016 their global market share ended on 0,0%.

1.1 Research Problem and Goal

In the past decade several regulations have been put into force to change the European business ecosystem examples are the Payment Service Directive (PSD) and the International Bank Account Number (IBAN). In 2018 the General Data Protection Regulation (GDPR) and the revised Payment Service Directive (PSD II), are put into force and are expected to deliver changes which have big impact on companies. Iansiti and Levien (2004) describe the impact of the regulatory agencies and media outlets that can have a less immediate, but just as powerful effect on your business. Therefore they see the regulators as an equal actor in the ecosystem.

For complex new technology adoptions the combination of multiple theoretical technology adoption models is needed to understand the adoption processes better (Oliveira & Martins, 2011). In the past there were several studies conducted which combine technology adoption models. Hsu, Kraemer, and Dunkle (2006) and Oliveira and Martins (2010) combine these models to explain the adoption of E-business. Other researchers, Soares-Aguiar and Palma-dos Reis (2008) and Li (2008) use different technology adoption models to evaluate the E-procurement adoption. But limited attempts have been made to better understand the technology adoption process into business ecosystems, especially not by combining theoretical adoption models.

In order to measure how these new technology standards will be adopted in the business ecosystems several technology adoption models can be used. Examples of these models are the Technology Acceptance Model (TAM) (Davis, Bagozzi, & Warshaw, 1989) or the Technology, Organisation, Environment (TOE) framework (Tornatzky, Fleischer, & Chakrabarti, 1990). These models are focusing on the technology adoption on an individual or firm level. This research tries to fill the gap and extend these models so they can be applied on a ecosystem level. To apply these technology adoption models on a ecosystem level and to measure the effects on the ecosystem itself, variables are needed. The researchers den Hartigh, Tol, and Visscher (2006) extend the critical success factors (robustness, productivity and niche creation) of Iansiti and Levien (2002) with two new factors: partner health and network health. The business ecosystem health model of den Hartigh et al. (2006) misses the factor of forced regulations and the technology adoptions they could imply. Summarizing the previous argumentation, the formal problem statement of this research can be stated as follows:

"New regulations can impact the life cycle of a business ecosystem by implying a new standard which changes the technological grounding. Despite this fact, little research is available on the factors that influence the adoption of a new regulated standard in a business ecosystem. The actors in these ecosystems vary from old established companies to new start ups. When adoption a new standard each of these actors have different related business challenges. Together these challenges could imply a change in the business ecosystem which can be beneficial or disadvantageous for the companies in it."

The primary goal of this research is to create an artifact that indicates the factors that are influencing the adoption of a new standard in a business ecosystem. It is not the intention to extend each technology adoption or business ecosystem health model individually. Rather by creating one artifact, Regulated Standards Ecosystems Effect Model (RSEEM) which can be embedded into the traditional models. By doing so this research tries to extend the literature related to technology adoption, and on the other side tries to show the effects in business ecosystem health caused by a new techstandard.

1.2 Research Questions

The research problem and goals are addressed in the main Research Question (RQ) which is formulated as follows:

RQ: *What factors influence the adoption of new standards in a business ecosystem?*

In order to answer the research question, sub-questions (SQs) are formulated. Each sub-question aims to answer a specific part of the main research question. First a thorough understanding of the different adoption models is required. This overview will help identify the major themes and factors that are important during the adoption of a new standard. This identification will be addressed in SQ1:

SQ1: *What are the factors of the different technology adoption models related to the adoption of new standards?*

Once the different adoption models are analyzed, an understanding of the relation between ecosystem health and the adoption of a new standards is needed. This helps to indicate the different variables that are available to measure adoption in a business ecosystem. This issue is addressed in SQ2:

SQ2: *How does business ecosystem health influence the adoption of new standards?*

After studying the different adoption models and how they are influencing the business ecosystem health, when adopting a new techstandard, it is essential for this research to provide a definition for the concept of "Regulated Standards that Effect Ecosystems" in the form of a model. With this model this research is able to position the concept into the current research fields. A conceptual model is created that will support the definition and positioning of the concept. After all key aspects are identified it is essential to study how the new created conceptual model can be used into practice. This is addressed by a case study related to the adoption of the new standard in a business ecosystem. SQ3 will address all before mentioned aspects:

SQ3: *How can a model be defined that provides actionable insight for practitioners?*

1.3 Research Relevance

1.3.1 Scientific Relevance

This research provides several scientific contributions. First, existing literature is being analyzed and validated on how the major themes of technology adoption are related to the adoption of a new techstandard. Secondly the literature related to the health of a business ecosystem and how this is affecting the adoption of a new techstandard is being researched.

Technology adoption models are typically looking into the effects on a consumer or a firm level. On the other side, business ecosystem health models are often measuring the health by looking at the relationships or active projects within the ecosystem (Jansen, 2014). Therefore this research combines different theoretical technology adoption and business ecosystem

health models to create a new artifact in the form of a model. A technology adoption model on a business ecosystem level. Additionally this artifact is the first attempt to create a model which can be used in future work and extended with observations and suggestions from other case studies.

1.3.2 Practical Relevance

Besides the scientific relevance this research has several benefits for practitioners. By using the new created artifact practitioners could see how the business ecosystem health is affected over time by adopting a new regulated techstandard in the business ecosystem. Also the artifact presents factors that influence the adoption of a new regulated standard in the ecosystem. The practitioners, project managers, could thereby see which factors are important for the adoption process.

1.4 Document Structure

This chapter provides an introduction to the research topic and gives an explanation of the research problem, goal and relevance. Chapter 2 will provide theory on the research approach that was followed to answer all the research questions. Chapter 3 contains a state-of-the-art literature study, which is needed to answer the first two sub-questions (**SQ1** + **SQ2**). Chapter 4 presents the results of Chapter 3 in the form of a conceptual model. After this the conceptual model is evaluated in Chapter 5 by making use of expert reviews. The analysis part from Chapters 3 to 5 is followed by a case study, in Chapter 6. Chapter 7 presents the results of the case study and a final version of the conceptual model, this will answer sub-question four (**SQ3**). Chapter 8 discusses limitations and present suggestions for future studies. Finally, the main research question (**RQ**) together with all the sub-questions are answered in Chapter 9.

Chapter 2

Research Approach

Chapter 1 introduces the research problem, goal and relevance. This chapter elaborates on the approach and techniques which has been used in the execution of this research. Besides the elaboration on the approach and techniques also the treads to the research validity and reliability are discussed. The chapters ends with a milestone and research plan overview.

2.1 Preliminary Literature Study

The first activity of this research was a preliminary literature study on the topics business ecosystems, adoption models and PSD II. The goal of this literature review was to identify issues which had enough societal and scientific relevance. Two kinds of literature are reviewed. On the one side scientific literature, which was for most related to the business ecosystems, and technology adoption models. This literature was gathered by making use of Google Scholar. On the other side commercial company reports were studied, which are related to PSD II. These reports were acquired through multiple company websites. The deliverable of this preliminary literature study is the research project proposal, and was accepted on May 1st, 2018 by the Utrecht University. This deliverable is incorporated in the introduction, research approach and partly in the structured literature review.

2.2 Research Method

According to Hevner, March, Park, and Ram (2004) the Information Science (IS) research domain can be divided into two main disciplines: behavioral science and design science. Behavioral science tries to explain and predict business and human phenomena relevant for analysis, design, implementation, management and the use of an information system. On the other side, design science is fundamentally a problem solving paradigm that seeks to create innovations in the form of artifacts which support the effective and efficient analyses, design, implementation, management and use of information systems.

As the aim of this research is not to explain or predict the effects of new standards into business ecosystems, behavioral science is not followed. This research tries to create an artifact that supports the effective and efficient analyses of new standards in business ecosystems, design science is in line with this research. Therefore the research method of this research can be categorized as a design-science approach.

Hevner et al. (2004) describes seven guidelines to ensure the quality of a design science project. These guidelines are described and explained below:

1. **Design as an artifact**: *"Design-science research must produce a viable artifact in the form of a construct, a model, a method, or an instantiation."* This research creates an artifact in the form of an model, to be more precise the Regulated Standards Ecosystems Effect Model (RSEEM).

2. **Problem relevance**: *"The objective of design-science research is to develop technology-based solutions to important and relevant business problems."* The problem relevance is discussed in Section 1.3.2 Practical Relevance.

3. **Design evaluation**:*"The utility, quality, and efficacy of a design artifact must be rigorously demonstrated via well-executed evaluation methods."* The artifact created in this study will making use of expert reviews in the form of interviews, which will evaluate the framework itself. Second a case study will a be executed to evaluate the findings of the artifact.

4. **Research contribution**: *"Effective design-science research must provide clear and verifiable contributions in the areas of the design artifact design foundations, and/or design methodologies."* The research contribution is discussed in Section 1.3.1 Scientific Relevance.

5. **Research rigor**: *"Design-science research relies upon the application of rigorous methods in both the construction and evaluation of the design artifact."* This research provides detailed information about the construction and evaluation methods which have been used. Therefore this guideline is met.

6. **Design as a search process**: *"The search for an effective artifact requires utilizing available means to reach desired ends while satisfying laws in the problem environment."* The construction of the artifact is based on utilizing three available means: theoretical background, expert reviews and a case study.

7. **Communication of research**: *"Design-science research must be presented effectively both to technology-oriented as well as management-oriented audiences."* This thesis is written to provide scholars and practitioners new insights. These will be substantiated by providing a clear formulated research approach and results which can be reproduced.

Hevner et al. (2004) used these guidelines together with the Information Systems Research Framework. This framework helps to identify the application in the appropriate environment and additions to the knowledge base. For a graphical representation how this framework is applied to this research, see Figure 2.1.

2.3 Research Process

Wieringa (2014) describe a design science project as an iteration over activities of designing and investigating. This can be decomposed into three main processes: problem investigation, treatment design and treatment validation. Because design science researchers iterate over these processes, the collection of these three are called the design cycle.

The result of the design cycle, validated treatment could be implemented in the real world. To achieve this, there are two extra processes: treatment implementation and implementation evaluation. The design cycle together with these two extra processes form the engineering cycle, which can be seen as a rational problem-solving process. Because it is not in the scope of this research, to treat the problem by using the designed artifact or to measure

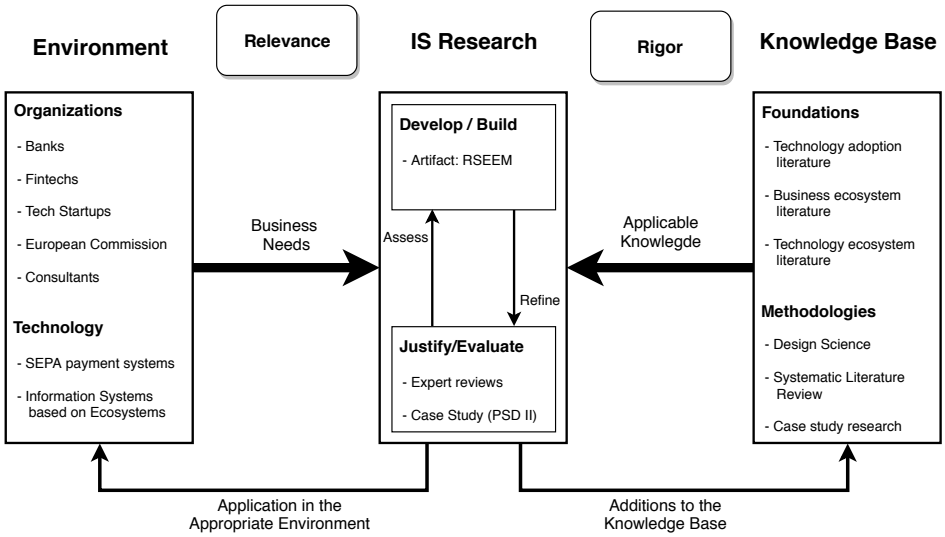

FIGURE 2.1: Information Systems Research Framework applied to this research based on Hevner et al. (2004)

how successful the treatment will be. This research only perform the tasks that belong to the design cycle. Each process in the design cycle has his own specific tasks or questions. In order to fulfill these tasks or to answer the questions, different research objects can be used. Some of these objects are knowledge questions and some are design problems.

For the problem investigation process the question "What phenomena must be improved? Why?" can be asked. In order to answer this question this research elaborates on the different stakeholders, goals, phenomena and a conceptual problem framework. Together these aspects resulted in research questions. By making use of thorough and rigorous research techniques the research questions will be answered. The "Why?" part of the investigation process is answered by a systematic literature review (SLR). This review provides a theoretical background on technology adoption and business ecosystems.

The next process in the design cycle is the treatment design. The task that could be set for this process is "Design one or more artifacts that could treat the problem." Based on the systematic literature review, a structured overview of the available treatments and a specification of requirements will be created. After this an artifact in the form of the RSEEM is created.

The third process of the design cycle is the treatment validation process. The corresponding question of this process is "Would these designs treat the problem?". To answer this question this research uses two types of validation: expert reviews and a case study. These methods tries validate the conceptual model which has as a result the final version of the RSEEM.

A Process-Deliverable Diagram (PDD) is created to provide an overview of the described processes and deliverables. The PDD is created according to the method described by van de Weerd and Brinkkemper (2009). They describe the PDD technique as a meta-modelling technique in which two integrated diagrams are used. On the left side of the diagram the activities are presented by making use of a UML activity diagram. On the rights side of the diagram the deliverables are described by making use of a UML class diagram. The deliverables are called concepts and are derived from the activities, these connections are presented

by dotted arrows. Each activity described in the diagram has his own deliverable and are placed in chronological order. Although they are placed in a chronological order, this research keeps in mind that the research process is based on the iterating design cycle. The resulting PDD is presented in Figure 2.2.

2.4 Systematic Literature Review

After a general orientating literature review in the form of a preliminary literature study, this research makes uses of a Systematic Literature Review (SLR). According to Kitchenham (2004, p. 4) a SLR is defined as: "*A means of identifying, evaluating and interpreting all available research relevant to a particular research question, or topic area, or phenomenon of interest.*" This literature study method is claimed as a unbiased and rigorous method which is reproducible and can be done in a transparent and objective way (Atkins & Louw, 2000; Okoli & Schabram, 2009, 2010; Oates, 2011).

To ensure the SLR is completely and rigorous conducted the checklist described by Boell and Cecez-Kecmanovic (2015) is used. The first checkpoint is describing SLR which has been done in the previous paragraph. The second checkpoint is using a protocol, and the third checkpoint is cite SLR guidelines. The SLR is based on the protocol and guidelines described by Okoli and Schabram (2010). This has been done to ensure scientific validity. The full protocol and guidelines applied to this research can be found in Appendix A. The fourth checkpoint is using inclusion and exclusion criteria which are formulated in this chapter. The last checkpoint is report search details, this will be met by presenting the search results before the actual SLR in Chapter 3.

The purpose of the SLR is to provide an overview of the research reported in the field related to the first two sub questions. SQ1 requires a review of the literature that describe the major themes and factors of the different technology adoption models. SQ2 requires insights and a overview of the influence of ecosystem health on the adoption of new standards. Therefore the SLR is split into two parts.

The literature of the SLR was found by making us of Google scholar with a proxy provided by Utrecht University [1], as this search engine seeks literature in a pool of multiple scientific databases. The preliminary literature study was used to generate the search terms for the SLR. Based on common used terms and keywords in these articles, a list of keywords is generated that was used to seek for more literature in the SLR. The search queries that were used are presented in Table 2.1.

The second reason why Google sholar search engine is used, is the possibility to sort the literature in order of relevance and keywords. Therefore only the first 30 search results are selected for the next phase in the selection process. This next phase is based on including and excluding selection criteria. These are set to identify the studies that provide direct or relevant evidence about the research questions (Kitchenham, 2004).

Inclusion Criteria

- Peer-reviewed papers
- Studies that are written in English or Dutch

[1] https://scholar-google-nl.proxy.library.uu.nl/

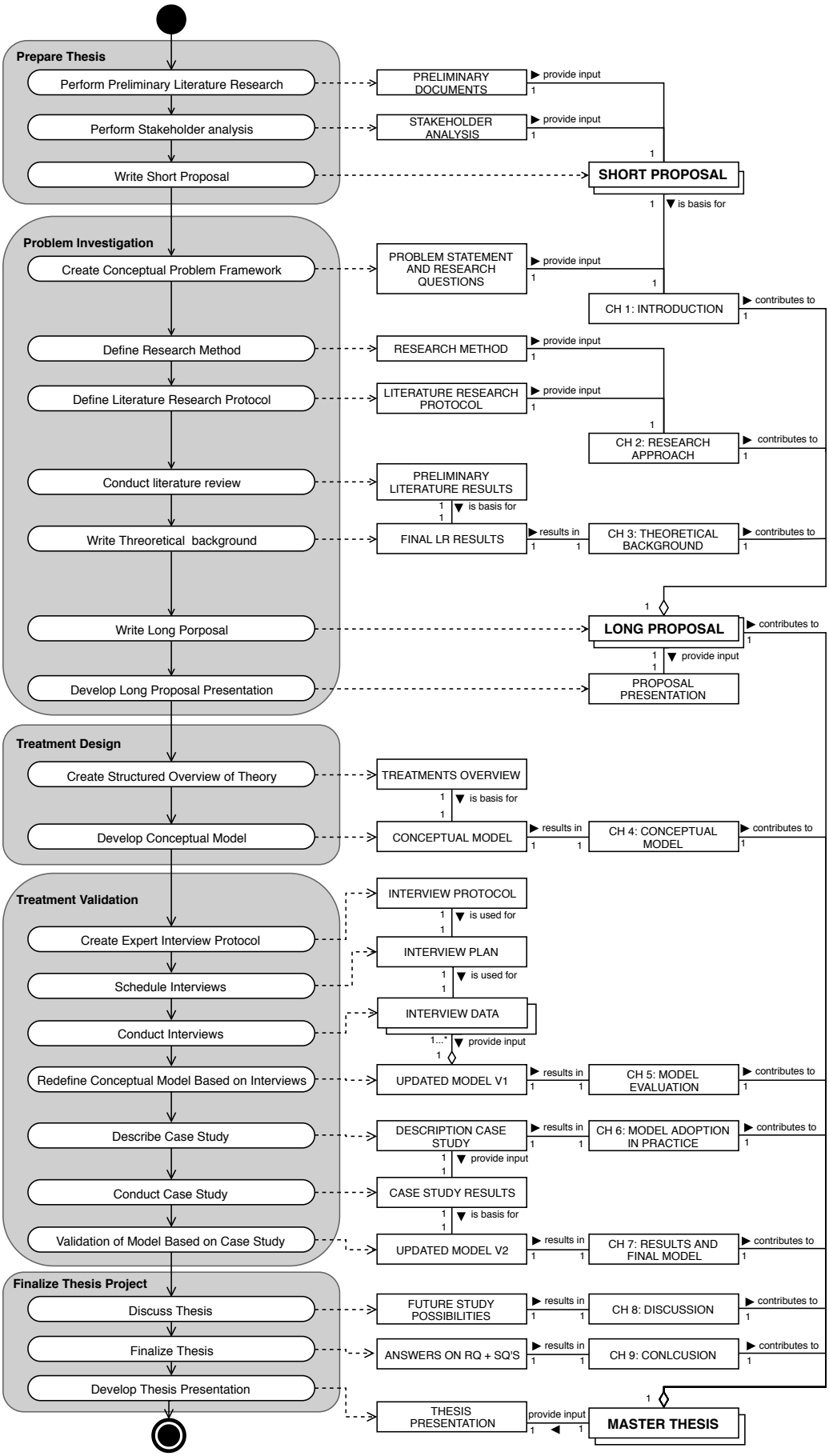

FIGURE 2.2: Process-Deliverable Diagram of the Research Approach

SQ	Search Terms	Queries Used
SQ1	Technology Adoption	technology adoption OR technology adoption model OR technology adoption framework OR technology adoption process OR technology adoption method OR adoption of technology OR adoption of technology process OR information technology adoption OR technology acceptance model OR TAM
	Technology Organisation Environment	technology Organisation Environment OR TOE framework OR adoption of innovations OR standard adoption OR adoption of standards OR adoption across industries
	Information Technology Adoption	diffusion of innovations OR interorganizational systems OR information systems adoption OR technology delivery OR open banking adoption
SQ2	Business Ecosystems	business ecosystems OR ecosystem OR business ecology OR digital ecosystem OR technology ecosystem OR entrepreneur ecosystem OR business ecosystem model OR business ecosystem OR technology standards in business ecosystems OR transforming business ecosystems OR evolution of business ecosystems OR companies in a network OR network of companies OR fintech ecosystem
	Business Ecosystem Health	business ecosystem health OR business ecosystem health models OR health of business ecosystem OR health framework of business ecosystem OR robustness productivity and niche creation OR technology platform health OR standard adoption effects business ecosystem health OR ecosystem level health OR competitive advantage in ecosystem

TABLE 2.1: Search terms and queries for SLR

Exlusion Criteria

- Studies that are not related to the research questions for this literature review
- Articles with duplicate titles are not included

After the search terms and the selection criteria, the titles and abstracts were analyzed. This has been done to identify if the article will bring new relevant insights or is expected to contribute as a scientific base to one of the two sub questions. If the paper passes all three selection phases it has been fully read, summarized and structured in a research database. To double check the SLR selection procedure, the reference list of the articles that have been fully read are scanned. This scan is based on the snowballing approach described by Jalali and Wohlin (2012) and used to minimize the possibility of missing relevant papers (Webster & Watson, 2002).

2.5 Expert Interviews

According to the third guideline of Hevner et al. (2004) a design should be evaluated so the utility, quality, and efficacy of a design artifact is ensured. This research makes use of expert interviews to validate the created conceptual model on a quality and efficacy level. The experts in these interviews are enabling the researcher to capture information in a short period of time (Flick, 2014). Expert interviews can be seen as a form of semi-structured interviews which are capturing and context knowledge gathering processes (Meuser & Nagel, 1991). The combination of the validation by experts and information gathering process, is in line with this part of the research and therefore expert interviews are adopted. To ensure the reliability and validity of the experts selection procedure, multiple selection criteria are set. Each expert must meet the following competence criteria:

- Discipline-related research or knowledge of technology adoption or business ecosystem analysis.
- The expert should have experience in working with technology adoption or business ecosystem models. Or should have been involved in decision making processes which are related to one of these research fields.
- High scholarly qualifications or more than five years work experience in one of the related research fields.

Besides the selection criteria, experts with different backgrounds are selected. Preferably first experts with a academic background or working at a scientific institute are selected, due to affection towards scientific research and specific domain knowledge. Secondly experts from the business domain are selected. The goal is to select the same number of experts from both domains.

The experts are informed about all the stakeholders of this research and are asked if they agree upon being recorded. If the experts agree, the interview is recorded by making use of a smart-phone application. Afterwards the recorded interviews are transposed into summaries. In these summaries the relations towards the created model are drawn, so the variables can be evaluated and relations can be drawn. After the interview, the experts were asked if they have knowledge of additional material, possible unpublished presentations or blogs related to this research.

The protocol used for this expert interview is based on Castillo-Montoya (2016) interview protocol refinement framework (IPR). This framework describes four phases which strengthen the reliability of interview protocols used for qualitative research. The IPR contributes to improving the data quality gathered from the interview. The expert interview protocol will be made final after the draft version is checked and validated by an academic of Utrecht University.

The expert interview starts with a general introduction on the research problem and goals. Hereafter, the expert is asked to give an introduction. After the introductions the questions are being asked. As the interview is based on a semi structured basis all possible follow-up questions are asked on the go. At the end of the interview the expert is asked if he or she has any questions. The full interview protocol can be found in Appendix B.

2.6 Case Study Evaluation

After the expert interviews this research makes use of a case study to validate the conceptual model on utility. According to Yin (2009) and Baxter and Jack (2008) the benefit of a case study evaluation is that it allows a researcher to study a phenomenon in a real-life context and to explore individuals or organizations, simple through complex interventions, relationships, communities, or programs. Benbasat, Goldstein, and Mead (1987) states that case evaluation supports two kinds of evaluation: confirmatory or disconfirmatory.

Confirmatory case studies needs multiple cases to measure the generalization between the cases, disconfirmatory case studies can be based on a single case which is representative for a larger number of cases Yin (2009). As this study has a time-constraint the disconfirmatory case study is preferred. The purpose of this preferred case study is to disconfirm the conceptual model. Thus it is important to select a case that has a high probability to confirm the conceptual model.

A single case study approach allow to expose the model to controlled stimuli and analyze in detail which mechanisms are responsible for the responses (Wieringa, 2014). By doing so the research is able to get an in-depth understanding of the effects of the conceptual model (Yin, 2009). This single case study is conducted according to a case study protocol. This protocol can be found in Appendix C.

2.7 Research Validity and Reliability

Yin (2009) describe study tactics and four design tests in order to judge a study design on the quality. These tactics are adopted in this research and explained below:

1. **Construct Validity**: *"Establishing correct operational measures for the concepts being studied."* To successful pass the test related to this validity three steps must be covered. The first step is that multiple sources of evidences are used to create the model. Scientific literature, expert reviews and the results of a case study. The second step is the establishment of a chain of events. By creating this chain the question "Does the model indeed reflect the specific types of changes based on the changes that are indicated?" can be answered. The third step is have key informants review draft case study reports. A conceptual model is created and reviewed by experts before the case study evaluation is conducted.

2. **Internal Validity**: *"Establishing a causal relationship, whereby certain conditions are shiwn to lead to other conditions, as distinguished from spurious relationships."* This validity is for explanatory or causal studies only (Yin, 2009). Although, in this research the systematic literature review gives insights in the effects of the causal relationship of the conditions which lead to other conditions. Based on this literature study the conceptual model is created. When creating the final model the effects are being evaluated towards the findings of the literature study to seek for possible biased variables.

3. **External Validity**: *"Establishing the domain to which a study's findings can be generalized"* According to critics this threat to the validity is a concern when using a single case study (Yin, 2009). As this research uses a single case study this could be a threat to the validity. (Yin, 2009) argue that single case studies offer a poor basis for generalizing. To handle this treat to the validity the conceptual model is based on two theoretical models, technology adoption models and business ecosystem models. Based on these models, corresponding case study selection criteria are formulated.

4. **Reliability**: *"Demonstrating that the operations of a study such as the data collection procedures can be repeated, with the same result."* To support the reliability of the results, each part of this research that includes data collection uses a protocol. By using a clear formulated protocol the repeatability of operations is ensured. This study includes three components that includes data collection, for each of these components a protocol is used. The first component is the literature study. For the literature study a SLR based on the protocol described by Okoli and Schabram (2010) is used. See Appendix A for the used protocol. The second component that includes data collection is related to the review process of the conceptual model. The protocol used for the review is based on the research of Castillo-Montoya (2016) and added as Appendix B. The third and last component is related to the case study. The protocol used for this is based on the research of Yin (2009) and can be found in Appendix C.

2.8 Milestones and Research Plan

This research has five milestones divided into three paper deliverables and two oral presentations. The first milestone is a long research proposal, which have to be handed in on April 30, 2018. This proposal must be presented during a colloquium session at the University Utrecht, currently planned on May 28, 2018. This presentation is the first of the two mandatory oral presentations. The second milestone is the research document which have to be handed in together with the third milestone, a scientific research paper. Both milestones have a deadline on August 31, 2018. These two documents will also be presented during a colloquium session, which is the second of the two mandatory oral presentations.

In order to reach all milestones at the correct moment in time, a global research plan is created. This plan is based on a Gantt chart and can be consulted through this link: Global Research Plan - Rick Joosten. The summary of this global research plan is presented in Appendix D. Not only the research plan helps to reach all milestones, there are also biweekly catch-up meetings with three supervisors. They help to keep on track during the research process. These meetings are on Thursdays with Slinger Jansen of Utrecht University, on weeks with an even number with process supervisor Kim Verkooij of Adyen and on weeks with an odd number with context supervisor Francesc Altisent of Adyen.

Chapter 3

Theoretical Background

This chapter provides a theoretical overview of the research fields that are applicable to this research. Thereby this brings the research questions **SQ1** and **SQ2** into focus. The Systematic Literature Review (SLR) described in Chapter 2.4 provided the input for this chapter.

In the search for literature Google Scholar is used. In Table 2.1 the specific queries can be found that have been used to find literature. These queries correspond to the two research questions mentioned in the previous paragraph. They resulted in a raw input number of articles for the SLR. Table 3.1 is split into two pipelines and lists the number of articles that have passed the steps corresponding to the SLR, these steps can be found in Appendix A. Each pipeline corresponds to its own research question.

Corresponding SLR Steps	**SQ1: Technology Adoption Models**	**SQ2: Business Ecosystem Health**
Considered (X)	70 (of 112 results)	67 (of 101 results)
Selection criteria (Y)	38 (- 32)	36 (- 31)
Title and abstract review (Z)	17 (- 21)	13 (- 23)
Accessible (A)	17 (- 0)	11 (- 2)
Retrieved from author (R)	17 (+ 0)	12 (+ 1)
Relevant and used (N)	17	12
Snowballing (S)	19 (+ 2)	15 (+ 3)
End result (F)	**19**	**18**

TABLE 3.1: SLR Pipeline Results

This chapter is structured into four sections. The first Section 3.1, provides a brief historical overview of technology adoption models, the combination in usage of these models and their relationship towards the adoption of a new standard. The second Section 3.2 elaborates on what this research defines as a business ecosystem and how it could be used. The third Section 3.3 shows the different models how to measure the health of a business ecosystem. This section also explains the effects of business ecosystem health on the adoption of a new standard. These three sections leads to concluding Section 3.4 in which the chapter is summarized.

3.1 Technology Adoption Models

This section provides an overview of the different technology adoption models and their related factors towards the adoption of a new standard. The aim of this section is to answer **SQ1:** *What are the factors of the different technology adoption models related to the adoption of new standards?* Constant new technological innovations are creating threats to the business models of established companies, on the other side start up companies can use these innovations to start a new chapter in the business domain (Lai, 2016). Technology adoption models are theories in Information Systems (IS) research that are focusing on these adoption processes of technology.

A Brief History

Multiple researchers have researched the technology adoption process. In 1960 the researcher Rogers started to research the Theory of Diffusion of Innovations (DOI) (Rogers, 1995). He started by creating a theory that was the foundation for conducting research on adoption and technological innovation acceptance. His theory explains "*the process by which an innovation is communicated through certain channels over time among the members of a social system*" (Rogers, 1995, p. 5).

Fifteen years later, the Theory of Reasonable Action (TRA) was published by (Fishbein & Ajzen, 1975). This theory uses the behavioral intention of a person to measure the attitude towards adoption a technology. An example of this attitude is the belief in or the thoughts about certain behavior of an object. Two factors of this theory are used in the by Ajzen (1991) developed Theory of planned Behavior. The theory determines the behavioral intentions and thereby the persons attitude towards behavior and use of technology.

In 1986 the first version of the Technology Acceptance Model (TAM) proposed by (Davis, 1985) was published, he finalized the model in 1996 together with the researchers Venkatesh and Davis (1996). The TAM was created to model a user his acceptance of an information system or specific technology. Four years later this model was iterated for the first time, which includes more explanations and variables on the usefulness a person experience at three different moments in time. The model is called Technology Acceptance Model 2 (TAM2) (Venkatesh & Davis, 2000). Besides this TAM2 model the researchers Venkatesh, Morris, Davis, and Davis (2003) developed another theory the Unified Theory of Acceptance and Use of Technology (UTAUT). This model unified four different variables of the behavioral intention, these are: social influence, effort expectancy, performance expectancy, facilitating conditions. In 2008 the second iteration of the TAM model was published, Technology Acceptance Model 3 (TAM3) by Venkatesh and Bala (2008). This was an combination of the TAM2 and the UTAUT. The model is an integrated model of technology and innovation acceptance that includes all the variables of both models.

Through history the technology and innovation adoption models are split into two levels of adoption. The models discussed so far, except the DOI, are focused on the adoption of technology on an individual level. Based on the literature review of Oliveira and Martins (2011) on Information Technology (IT) adoption models at firm level. Two traditional firm technology adoption models are being stated as most used and grounded by a solid theoretical foundation. The first model called in the paper of Oliveira and Martins (2011) is the Technology, Organisation, Environment (TOE) framework of Tornatzky et al. (1990). This

framework describes the process by which a firm adopts and implements technological innovations based on the three characteristics. The DOI model called in the first paragraph was published five years later in 1995 and named by Oliveira and Martins (2011) as the second most used and grounded technology adoption models on a firm level.

Based on the TOE framework and the DOI model new models have arised that extent or combine these two to create new models. In 1995 the Iacovou et al. model (Iacovou, Benbasat, & Dexter, 1995) was published, it analyses the interorganizational systems (IOSs) characteristics that are influencing the firm adoption of IT innovation related to EDI adoption (Oliveira & Martins, 2011). More on the combination usages of these models can be read in Section 3.1.2.

Definition of Technology Adoption

How can technology adoption be defined? Multiple definitions are used in literature, a general definition is given by Tatnall and Burgess (2009), they describe technology adoption as the decision by an organization or individual to utilize and implement a technology. Later in time this definition is supported by Gao and Krogstie (2016), they define it as a choice to acquire and use a new innovation. A more organization related definition of technology adoption is stated by (Umapathy, 2009) "*In organizational context, technolgoy adoption can be defined as commitment to invest towards implementing and using a technology to support core business functionalities.*". This definition is particular relevant for this research as it emphasizes technology adoption on a organizational level. Hence, this definition is adopted in this research.

3.1.1 Traditional Models

This research focuses on the technology adoption models on a firm and ecosystem level. The technology adoption models that are related to individual technology adoption are not taken into account. Because these models are explaining and elaborating on the process of how and when an individual is accepting or adopting a technology.

The three most used and cited technology adoption models on a firm level described by Oliveira and Martins (2011) are explained more in detail in the next three paragraphs. Each technology adoption model on a firm level will be described in order to provide a thorough understanding of all implications and factors related to the adoption of a new technology in a firm.

Technology Organisation and Environment Framework

The TOE framework of Tornatzky et al. (1990) formulates three indicators that are influencing the adoption of a technology on a firm level. These three aspects are: Technology, Organization and Environmental context. A graphical representation of this model can be found in Figure 3.1. The technological context focuses on the internal and external technology availability which are important for the firm. This technology context is based on two sub variables: availability and characteristics. The second context, organization is linked to information about the organization. Examples are size, scope and communication processes. The third context is external task environment. This context is related to the ecosystem in which the organization is performing its business. This context has three sub variables:

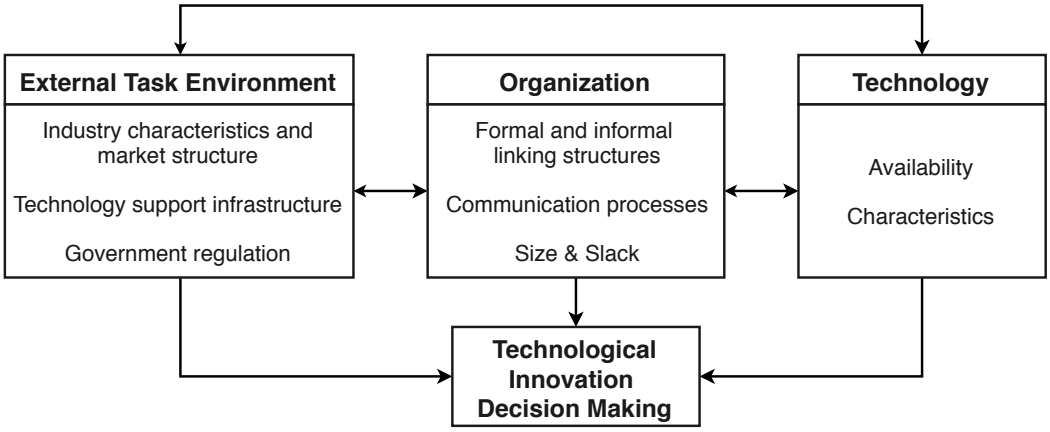

FIGURE 3.1: TOE Framework of (Tornatzky et al., 1990), is based on three main focus points: external task environment that involves external influences, organization is the variables in the company itself, technology involves the technological factors related to the company.

industry characteristics and market structure; technology support infrastructure and government regulations. The difference between the TOE framework and the DOI model is that the TOE framework is including the environmental context. By this context new constraints and opportunities can be identified related to relationships between companies.

Based on past research, according to Zhu, Kraemer, and Xu (2006) it is proven that the TOE framework is effective. Multiple studies have adopted the TOE framework to explain the adoption of innovating technologies and IT. Examples of these studies are open systems Chau and Tam (1997), e-business adoption Zhu, Kraemer, and Xu (2003) and ERP adoption Pan and Jang (2008). Ramdani and Kawalek (2007) formulate in there research that based on the multiple studies in different innovative technologies, that the TOE framework has proven to be validated.

Diffusion of Innovations Model

Rogers (1995) elaborates on technology adoption by making use of the concept of diffusion of innovations. He describes diffusion as *"the process through which (1) an innovation (2) is communicated through certain channels (3) over time (4) among the members of a social system"* (Rogers, 2002, p. 2). Secondly he described innovation as "an idea, practice, or object that is perceived as new by an individual or other unit of adoption" (Rogers, 2002, p. 2). Based on these two concepts Rogers (1995) defines five key elements for the diffusion of innovation:

- **Innovation**: *"Innovation is a broad category, relative to the current knowledge of the analyzed unit. Any idea, practice, or object that is perceived as new by an individual or other unit of adoption could be considered an innovation available for study."* (Rogers, 1995, p. 11).
- **Adopters**: *"Adopters can be individuals but also organizations, clusters in a social network or countries."*(Rogers, 1995)
- **Communication channels**: *"Diffusion, by definition, takes place among people or organizations. Communication channels allow the transfer of information from one unit to the other."* (Rogers, 1995, p. 17).

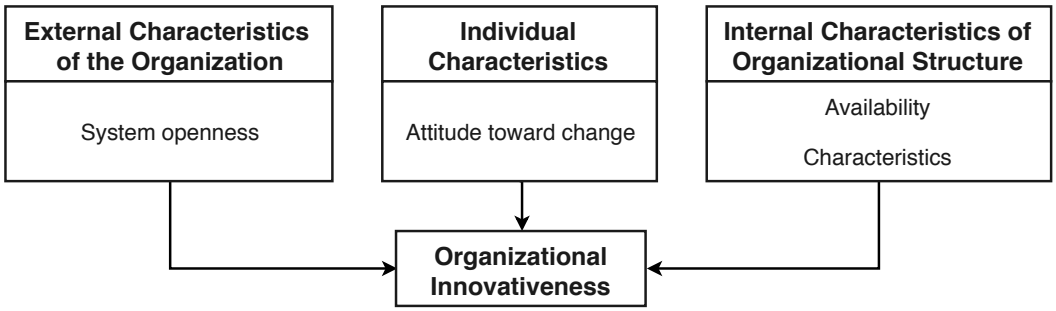

FIGURE 3.2: DOI Theory (Rogers, 1995) is based on three main focus points: external characteristics that involves external influences, individual characteristics are related to the opinions of the employees, internal characteristics involves the technological factors related to the company.

- **Time**: *"The passage of time is necessary for innovations to be adopted; they are rarely adopted instantaneously."* (Rogers, 1995, p. 21)
- **Social system**: *"There are many roles in a social system, and their combination represents the total influences on a potential adopter."* (Rogers, 1995, p. 24).

The five key elements are transformed by Rogers (1995) into the DOI theory. The framework focuses on a individual and firm level adoption of technology and describe the final result as organizational innovativeness. Rogers (1995) describes three characteristics which are influencing this result, an illustration of the theory can be found in Figure 3.2. The first characteristic is the companies attitude towards change. The second characteristic is the internal organizational structure. This includes six sub characteristics: centralization, complexity, formalization, interconnectedness, organizational slack and size. The third characteristic is the external characteristics of the organization which are measured by looking at the system openness.

The same as the TOE framework, the DOI theory has been used in multiple studies related to information technology adoption research. Examples of these studies are Beatty, Shim, and Jones (2001) web site adoption, Li (2008) for E-procurement and Zhu, Dong, Xu, and Kraemer (2006) on E-Business.

3.1.2 Combining Adoption Models

By combining the traditional technology adoption models Oliveira and Martins (2011) expects that more complex new technology adoption can be better understood. The Iacovou et al. (1995) model is an example that combines the TOE framework with a new factor "Perceived benefits". The model is based on the analyses Iacovou et al. (1995) performed on interorganizational systems (IOSs) characteristics. They questioned the influences these systems have on the adoption of IT innovations. This model is based on three characteristics that are together explaining the adoption: perceived benefits, organizational readiness, and external pressure. In the external pressure characteristic the trading partner power is new and critical for IOSs addoption (Oliveira & Martins, 2011). See Figure 3.3 for a graphical representation.

The Iacovou et al. model is not the only example that has explored the use of innovative technologies and IT adoption by combining the TOE framework and DOI theory. Multiple

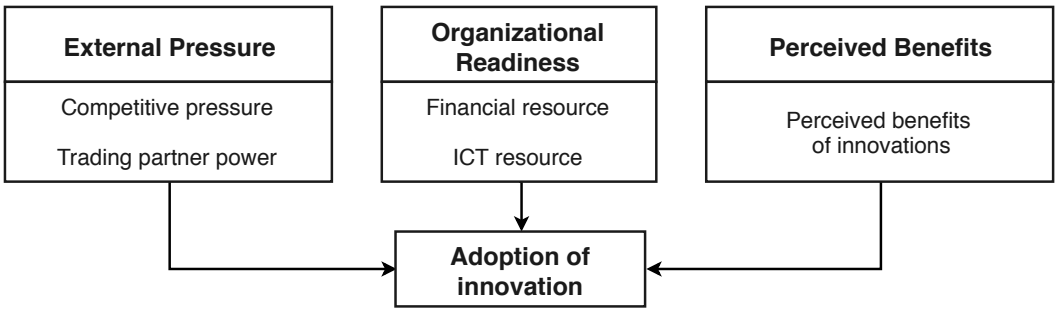

FIGURE 3.3: Iacovou et al. Model (Iacovou et al., 1995) is based on three main focus points: external pressure which involves external influences, organizational readiness are related to the resources of the company, perceived benefits is related to the benefits of adopting the technology.

researchers have done this in order to better explain the adoption from a organizational perspective. In the study of Hsu et al. (2006) the Iacovou et al. model, the TOE framework and the DOI model are used to explain the adoption and usages of e-business. The final model they use in this consist out of four constructs organizational readiness, perceived benefits, external pressure and environment.

Another example is the study of Oliveira and Martins (2010) which used the TOE framework and the Iacovou et al. model to explain the e-business adoption in European Union (EU) countries. They researched firms that are located in the EU and are active in the telecommunication or tourism industry. Their final model has three constructs organizational readiness, perceived benefits, technology and environmental pressure.

Besides these two studies there are more studies that combine the theoretical models Li (2008), Chong, Lin, Ooi, and Raman (2009) and Wang, Wang, and Yang (2010). All these studies use the TOE framework and especially the "environment" character from this framework. By making use of this character it becomes possible to explain internal but also external factors of technology adoption. The extension of this possibility is the explanation of relationship between firms and technology adoption. This external character is not included in the DOI theory.

Table 3.2 presents the before mentioned studies that combine technology adoption models in an overview. This table is based on the study of Oliveira and Martins (2011) and extended on which ecosystems or industry these models are focused.

3.1.3 The Innovating Technology Adopting Phase

Technology adoption on a organizational level has different phases that have corresponding processes (Grover & Goslar, 1993). They pointed out that organizational technology adoption can be divided into three phases: initiation, adoption and implementation. The researchers Zhu, Dong, et al. (2006) redefined the last phase into routinize. They explained the initiation phase as the perception and assessment of the technological innovation. The result of this phase is the measurement of performance in which the company can improve or benefit from the technological innovation. Zhu, Dong, et al. (2006) explain adoption phase as the decision making moment for the company. During this phase the company actual plans the use of resources for the technology adoption. During the last phase, routinize, the focus lays at the acceptance of the technology by the employees of the company.

Author	Traditional Model			IT Adoption	Region	Analysed Characteristics	Ecosystem / Industry
	TOE	DOI	Iacovou				
Zhu, Dong, et al. (2006)	X	X		E-Business Impact	EU	- Relative advantage - Security concerns - Technology readiness - Organization size - Partner readiness - Regulatory environment	1415 different companies
Li (2008)	X	X		E-Procurement	China	- Relative advantage - Complexity - Financial slacks - External Pressure - Government Promotion	Manufacturing companies
Hsu et al. (2006)	X	X	X	E-Business Use	US	- Perceived of innovations - Globalized level - Government pressure - Competition intensity - Effects in industry	Banking and Insurance
Oliveira and Martins (2010)	X		X	E-Business Adoption	EU	- Obstacles of e-business - Technological readiness - Competitive pressure - Effects in industry	Tourism and Telecommunications

TABLE 3.2: Combining Technology Adoption Models

As the focus of this research is to measure what the effects of a technological adoption on a company and ecosystem level are related to an regulated techstandard. The focus of this research lay at the initiation phase, during this phase the companies have to decide on what level and how they implement the new regulated techstandard.

3.2 Business Ecosystems

In order to understand the health of a business ecosystem this research first explains what a business ecosystem is and how this concept is being used in science and practice. Also the differences between ecosystems are explained to give reason why a business ecosystem is used.

A Brief History and Definition of Business Ecosystems

Business ecosystem research is based on the usage of the term "Ecosystem" by business researchers. Researchers start to compare and use the concept of biological ecosystem principals in the analysis of the inter relational business relationships and strategies. Moore (1993) start to use the term "Business Ecosystems" and define it as: "*that a company can be viewed not as a member of a single industry but as part of a business ecosystem that crosses a variety of industries*" (Moore, 1993, p. 76). According to Moore (1996) the actors who are including in the business ecosystems are: companies, competitors, supplying companies, inter-mediating companies and customers.

This definition of Moore (1993) does not include regulatory agencies. Iansiti and Levien (2004, p. 69) defines that the business ecosystem should also include these regulatory and government agencies: *"also comprises entities like regulatory agencies and media outlets that can have a less immediate, but just as powerful, effect on your business"*.

In this research the definition of Moore (1993) is used as the definition for business ecosystems. In addition, based on the research of (Iansiti & Levien, 2004), this research takes into account the regulatory and government agencies as actors of these business ecosystems.

3.2.1 The Concept of a Business Ecosystem

The researchers Den Hartigh and van Asseldonk (2004) describe the foundation on which a business ecosystem is build as a core of technology which multiple actors build there business around. These actors are depending on each other and form a network that is founded on the survival and success of each individual actor. The difference between supply networks and business ecosystems is described by den Hartigh et al. (2006) as the explicit modeling of the dependence of actors. The network value changes when a actor enters or leaves the network. The business ecosystem is based on the total sum of the individual network value of all the actors.

Actors in the Business Ecosystem

Iansiti and Levien (2004, p. 11) stated that *"A firm that takes an action without understanding the impact on the ecosystem as a whole is ignoring the reality of the networked environment in which it operates."*. To understand the network environment and the relationships between the companies in the business ecosystem a company needs to understand its own strategy. This is defined by the role the company wants to take. According to Iansiti and Levien (2004) a company has three choices: strategy as keystone, physical dominator or niche player. This choice is based on what the company aims to be but also on the business context. Iansiti and Levien (2004) created a model which explains the complexity of relationships between these strategies together with the level of turbulence and innovation. This model is represented in Figure 3.4

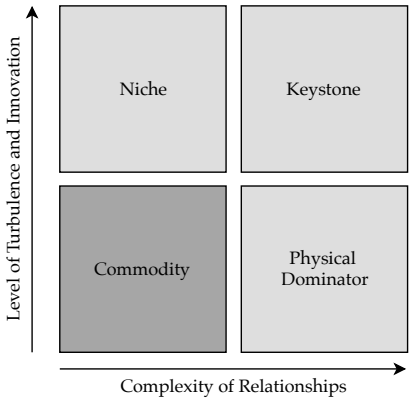

FIGURE 3.4: Business Ecosystem Strategy Model of Iansiti and Levien (2004), three different strategies a company can chose to carry out in the business ecosystem.

Iansiti and Levien (2004) define the keystone actor as the most important and crucial actor in the business ecosystem. As shown in Figure 3.4 this actor has a surrounding of high level of turbulence and innovation and also a high level of complexity of relationships. When a keystone actor is going bankrupt or leaves the business ecosystem it leads to a collapse

of the entire ecosystem. Therefor keystone actors ensure their own survival when they are ensuring the survival of the business ecosystem members.

According to the theory of Iansiti and Levien (2004) the keystone actors can act according to a strategy that has two phases. The strategy begins with a value creation of a product or service in the business ecosystem. Secondly the keystone actor has to find a way to share this added value so all actors in the business ecosystem can benefit of this.

Examples of a keystone actors in the European financial business ecosystem are Visa[1] or Mastercard[2]. These keystone actors have created a multinational financial service that is processing payments between banks of merchants and banks of shoppers or credit card unions. They provide services that are crucial for the business ecosystem survival. Mastercard and Visa share their service on a level that so the value of their platforms has always a surplus. So the cost of creating and maintaining it are lower then the profit.

Where the keystone actor has a more central role in the business ecosystem has the physical dominator a more vertical or horizontal vision of integration. The strategy of this vision is to own a large part of the business ecosystem, by this ownership its has little control of the ecosystem (Iansiti & Levien, 2004). The strategy result in the a consuming and extracting attitude towards the ecosystem. As can be seen in Figure 3.4 the environment of the physical dominator can be described with a high level of relationship complexity and a low level of turbulence and innovation.

Companies that are rapidly and continuously changing, measured by the level of turbulence and innovation. They could focus on a narrowed market and business segment which result in the upper left strategy in Figure 3.4, Niche player (Iansiti & Levien, 2004). These companies aim to develop special services and products that differentiate them from the rest of the market. When the niche player is successful in his strategy the value and innovation levels of the business ecosystem are often represent by these players.

An example of a niche player in the European financial business ecosystem is Adyen[3]. They focus on processing payments by offering a service that accepts electronic and physical payments. Adyen online payment platform connects multiple payment methods across different continents.

Roles and Relationships in the Business Ecosystem

The described roles: keystone, physical dominator and niche actor are not static. Each player can change their roles over time (Iansiti & Levien, 2004). Also the fact that a company is a certain player in one domain does not exclude the fact that this same player can have another role in another domain.

Relationships between the suppliers and the demanding companies are easaly drawn. When we look into the relationships and the boundaries of a business ecosystem they could be hard to define (Iansiti & Levien, 2004). By grouping the related companies or business domains the business ecosystem becomes more clear and easier modeled. An example of a business ecosystem is the Financial Technology Payment Ecosystem created by (van der Lugt & de la Rosa, 2018), see Figure 3.5 for a graphical representation. As can be seen in this figure the importance of the relationship is related to the thickness of the lines between the actors. Besides this, the size of the circles indicates the role the actors have in the ecosystem. The larger the circle, the bigger role the actor has in the business ecosystem.

[1] https://www.visa.com
[2] https://www.mastercard.com
[3] https://www.Adyen.com

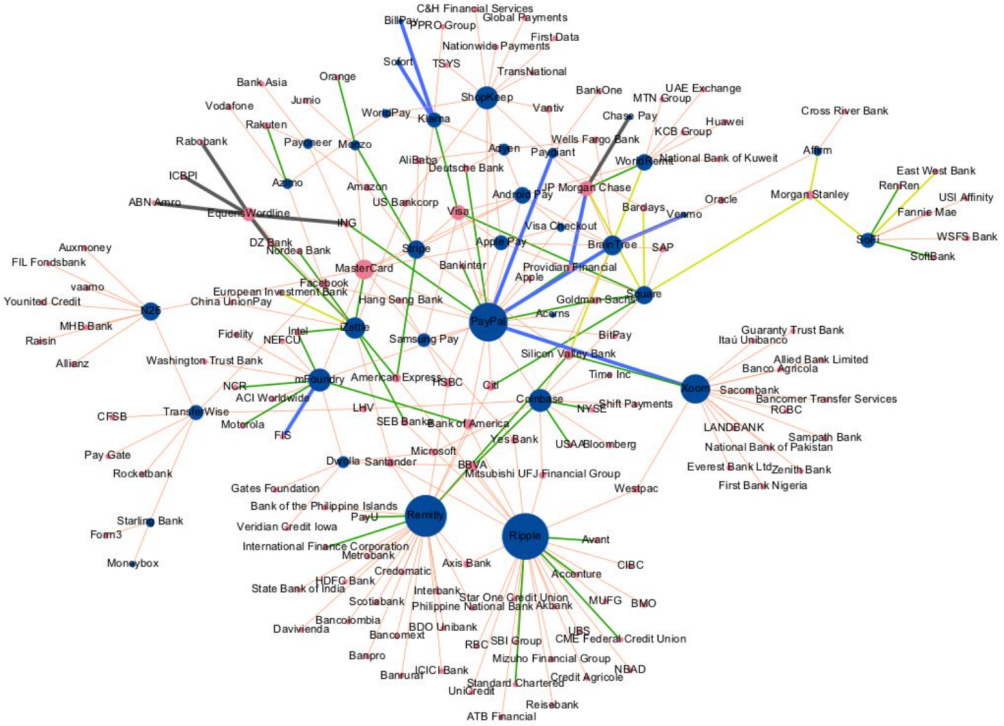

FIGURE 3.5: Graphical representation of the Financial Technology Payment Ecosystem created by van der Lugt and de la Rosa (2018), example of how roles and relationships can be modeled of an business ecosystem.

3.2.2 Analogies of Business Ecosystems

Ecosystems are not only analyzed by Business Ecosystems. In the past two decades multiple ecosystem analogies are developed that are explaining the the scopes and objectives of the actors in different ways. In the literature study of Pilinkienė and Mačiulis (2014) five main ecosystem analologies are being classified, ordered in historical order: Business Ecosystem (Iansiti & Levien, 2004; Moore, 1993), Industrial Ecosystem (Frosch & Gallopoulos, 1989; Korhonen, 2001), Digital Business Ecosystem (Nachira, 2002), Innovation Ecosystem (Adner, 2006; Wessner, 2007; Yawson, 2009) and a Entrepreneurship Ecosystem (Isenberg, 2010). In the literature study of Pilinkienė and Mačiulis (2014, p. 4) a table is presented to show different features of all the ecosystems. This research uses this table and extents it with the possible ecosystem health measurements and how these ecosystems are related to the adoption of new regulated standards. See Table 3.3 for the extended table.

What is not shown in Table 3.3 is the "interaction between ecosystem actors". In every analogy ecosystem this is a key determinant which affects the ecosystem performance. Secondly in the research of Nachira (2002), the Digital Business Ecosystems is being described as an extension of the Business Ecosystem and that these two ecosystems cannot act without one another.

Based on the different features of all the ecosystems and the scientific support for measuring the changes and effects of the ecosystem. This research chooses to use the Business Ecosystem. The first reason for this choice is the inclusion of governments and a wide scope of actors. Secondly the Business Ecosystem has three performance indexes: robustness, productivity and niche creation that can be linked to technology adoption.

		Different kinds of Ecosystems				
Property of Ecosystems		**Business Ecosystem**	**Industrial Ecosystem**	**Digital Business Ecosystem**	**Innovation Ecosystem**	**Entrepreneurship Ecosystem**
Authors		Iansiti & Levien 2004; Moore, 1993	Frosch & Gallopoulos, 1989; Korhonen, 2001	Nachira, 2002	Adner, 2006; Wessner, 2007; Yawson, 2009	Isenberg, 2010
Region		Local to Global	Local	Local to Global	Local to Global	Local
Environment		Interconnected Business environment	Industrial	Digital	Interorganizational, political, economic and technological	Specific Location
Actors	**Size**	Small and Large	Not specified	Small and Large	Small and Large	Small and Large
	Sort	Suppliers, Customers, Competitors, Investors and Owners	Manufacturers and Consumers	Research and Education and innovation centers	Education institutions, Research institutions, Laboratories, Venture Capital, Financial Markets	Educational institutions, Culture, Support measures, Human capital, Entrepreneur
	Governments	Yes	No	Yes	Yes	Yes
Micro Level	**Impact**	Create cooperative networks	Waste generation	Provides the digital support for the economic development of enterprises	Value and innovation creation	Affecting entrepreneurial activity
	Effects on	Business processes	Minimize the input of energy	Business processes	The level of firms' productivity	Encourages business creation and development
Macro Level	**Impact**	Enhance competitiveness	Sustainable development	Enhance competitiveness	Enhance competitiveness	-
	Effects on	The level of productivity	Environmental problems	-	Innovation index	Improve entrepreneurship
Ecosystem Performance and Health Measurements		Robustness, productivity, and niche creation	Industry and environment interaction	Services and technological solutions, business and knowledge	Resources, governance, strategy and leadership, organizational culture, technology	Opportunities, skilled people and resources
Technology Adoption		Yes	No	No	Yes	Yes

TABLE 3.3: Analogies of Business Ecosystems based on the result table of Pilinkienė and Mačiulis (2014, p. 6)

3.3 Business Ecosystems Health Models

This section provides a summarizing overview how the health of a business ecosystem health is affection the adoption of a new standard. Thereby the aim of this section is to answer **SQ2:** *How does business ecosystem health influences the adoption of new standards?*

Business ecosystem health, how healthy is the ecosystem a company is performing its business in? What are the indications of that the network as a whole is growing or declining? Are their enough opportunities in the ecosystem so each company in its own domain can benefit? By making use of Business Ecosystems Health Models indicators that address these questions try to explain the health of a business ecosystem.

3.3.1 An Overview of Health Models

Several conceptual frameworks are developed for the health measurement of a business ecosystem. One of the most used conceptual frameworks is the health model proposed by Iansiti and Levien (2004). They describe three determinants for measuring the overall health:

- **Productivity:** efficiency by which an ecosystem can convert inputs into outputs. The level of efficiency which is based on how participants of the ecosystem can produce their output by using as little as possible of inputs.
- **Robustness**: the ability of a business ecosystem to survive changes caused by the environment. How are the participant affected by a change or a disruption in the ecosystem? Are they able to face and survive these changes?
- **Nice creation**: The level of capacity to create diversity and new value in the business ecosystem. To support this a certain level of variety in participants (traditional versus new players) is needed.

Based on these three factors den Hartigh et al. (2006) created an operational measurement framework for business ecosystem health. This framework is resulted in two new determinants:

- **Partner Health:** the strength of partner management and the competence of using opportunities that come up within the ecosystem to create a better or new partnerships.
- **Network Health**: The performance level of how a partner is embedded in the ecosystem together with the level of the impact this partner has on the network.

Another framework is the sub-ecosystem model of Heikkilä and Kuivaniemi (2012). In this research the ecosystem health is measured by dividing the ecosystem in sub-ecosystems. Each sub-ecosystem has a different effect on the three layers of a business ecosystem. The model of Heikkilä and Kuivaniemi (2012) research is presented in Figure 3.6.

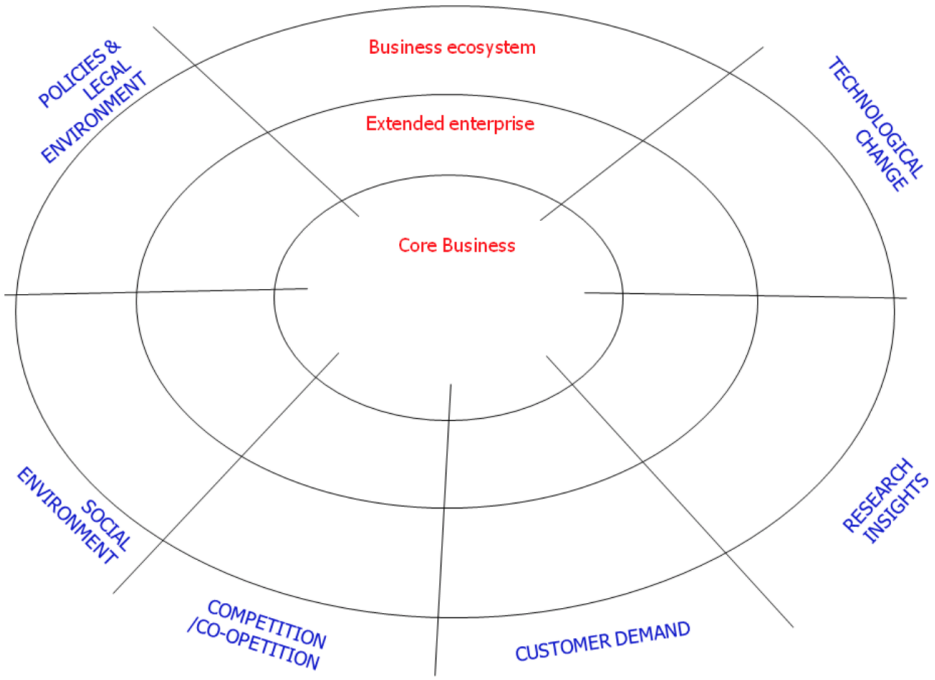

FIGURE 3.6: Sub-ecosystem health model of Heikkilä and Kuivaniemi (2012). The effects on the ecosystem are divided by sub-ecosystems over three layers.

3.4 Conclusion - Research Gap

Based on the systematic literature review in the two research fields it can be concluded that a widely adopted model for the adoption of a new regulation techstandard in a business ecosystem is lacking literature. This research will propose a new model so the effects of both research ares can be better understood. By this model the impact of a new introduced regulated techstandards on the life cycle of a business ecosystem can be researched.

The introduced techstandards are decomposed by making use of technology adoption models. Due to this decomposition the introduced techstandard can be split into measurable sub variables that could influence the actors in the business ecosystem in a different way. As these effects could differ per actor, business ecosystem health models are used to represent the health changes in the whole ecosystem.

The model will connect the two research fields and provide new insights. The companies in the business ecosystem can thereby see if, the to be introduced regulated techstandard, is beneficial or disadvantageous for the company itself.

Chapter 4

The Conceptual Model

This chapter introduces the conceptual version of the Regulated Standard Ecosystem Effect Model (RSEEM). Before this conceptual model is presented, this chapter provides an overview of cross references in literature based on the SLR of Chapter 3. These cross references are presented in Section 4.1 and provide links between the two used research fields. In the second Section 4.2 the underlying implementation themes and variables of the two research fields are discussed. How the variables eventually are used and linked between the two research fields is discussed in Section 4.3. After this the stakeholders of the RSEEM are discussed in Section 4.4. Finally in Section 4.5 the conceptual version of the RSEEM is presented.

4.1 Cross References in Literature

Based on the research fields that are discussed in Chapter 3, cross references are drawn in this section. Before presenting these references in the resulting Figure 4.3, an explanation is given for choosing the specific research fields and implementation themes.

The Two Research fields

To define the RSEEM in current research, two research fields are chosen to measure the effects of a regulated techstandard being adopted into a business ecosystem. These two research fields are the first dimension of the RSEEM. The first research field that is chosen is "Technology Adoption" more specific the TOE framework of Tornatzky et al. (1990) and the Iacovou et al. Model of Iacovou et al. (1995). The second research field is "Business Ecosystem Health" of Iansiti and Levien (2002). Together these two research fields are forming the first dimension of the RSEEM. This is presented in Figure 4.1.

The technology adoption research field elaborates on the adoption of technology on an individual or firm level. As explained in Chapter 3 multiple theories exist that explain technology adoption on a firm level. This research chooses to adopt the technology adoption TOE framework of Tornatzky et al. (1990) as this includes the environmental context of technology adoption. Besides this framework this research also uses the Iacovou et al model of Iacovou et al. (1995), as this includes more business ecosystem related variables for the organizational readiness implementation theme.

Secondly the business ecosystem health research field is chosen because this research field uses measurable variables that indicate the health of a business ecosystem. Furthermore by using the framework of Iansiti and Levien (2002) the business ecosystem health can be

Research Field	Business Ecosystem Health
Technology Adoption	**Business Ecosystem Health Measurement** Iansiti and Levien (2002) **TOE Framework** Tornatzky et al. (1990) **Iacovou et al. Model** Iacovou et al. (1995)

FIGURE 4.1: First dimension of the RSEEM, the two research fields including the underlying related frameworks and models on which the conceptual model is based.

divided into three main determinants which all have their own indicators of a change in health.

The Implementation Themes of the Research Fields

The second dimension of the RSEEM is based on the underlying implementation themes of the two chosen research fields. The implementation themes technology (A1) and environment (A3) are based on the TOE framework of Tornatzky et al. (1990). The implementation theme organizational readiness (A2) is based on the research of Iacovou et al. (1995). The implementation themes productivity (B1), robustness (B2) and niche creation (B3) are all based on the research of Iansiti and Levien (2002). In total the second dimension of the RSEEM exist out of six different implementation themes. The two lists below show an overview of these implementation themes:

- **A - Technology Adoption:**
  - A1 - Technology
  - A2 - Organizational Readiness
  - A3 - Environment
- **B - Business Ecosystem Health:**
  - B1 - Productivity
  - B2 - Robustness
  - B3 - Niche Creation

The implementation themes of the technology adoption research field are labeled with class A and those of the business ecosystem health research field are labeled with class B. Each implementation theme of class A will be tested and researched on the implementation themes of class B. In total this will result in a matrix of nine new implementation sectors. The resulting matrix is presented in Figure 4.2. As can be seen in this Figure each implementation sector is marker with a S followed by an ascending number this results in the following numbering: S ($_{1...9}$). These marks are used in subsequent dimensions of the RSEEM.

As can be seen in the figure each resulting implementation sector is divided by a diagonal line. These lines represents the similarities, differences and relational aspects of the two different implementation themes. Section 4.2 will elaborate on these diagonal lines.

Results of Cross References

Based on the SLR of Chapter 3 multiple cross references are drawn between the implementation themes of the two research fields. Sometimes the implementation themes were not

Research Fields		**Business Ecosystem Health Business Ecosystem Health Measurement (Iansiti & Levien, 2002)**		
	Implementation Themes	**B1 Productivity**	**B2 Robustness**	**B3 Niche Creation**
Technology Adoption TOE Framework (Tornatzky et al., 1990 and Iacovou et al. Model Iacovou et al. (1995)	**A1 Technology**	B1 - Productivity S1 A1 - Technology	B2 - Robustness S2 A1 - Technology	B3 - Niche Creation S3 A1 - Technology
	A2 Organization	B1 - Productivity S4 A2 - Organization	B2 - Robustness S5 A2 - Organization	B3 - Niche Creation S6 A2 - Organization
	A3 Environment	B1 - Productivity S7 A3 - Environment	B2 - Robustness S8 A3 - Environment	B3 - Niche Creation S9 A3 - Environment

FIGURE 4.2: Second dimension of the RSEEM, in this dimension the implementation themes of the two research fields are included and tested against each other.

explicitly referred to in the literature, but were found by the researcher his interpretation. Figure 4.3 lists all the literature that was found about the cross references.

For the cross references between the two research fields not only scientific literature was used. For a more thorough understanding of the references sometimes grey literature was used to provide a more and thorough understanding. In Section 4.2 all these cross references are explained.

Research Fields		**Business Ecosystem Health Business Ecosystem Health Measurement (Iansiti & Levien, 2002)**		
	Implementation Themes	**B1 Productivity**	**B2 Robustness**	**B3 Niche Creation**
Technology Adoption TOE Framework (Tornatzky et al., 1990 and Iacovou et al. Model Iacovou et al. (1995)	**A1 Technology**	**S1** (Adner & Kapoor, 2010) (Iansiti & Richards, 2006)	**S2** (Thusman and Nadler, 1986) (Baker, 2012) (Iansiti & Levien, 2002)	**S3** (Nachira et al., 2007) (Chau and Tam, 1997) (Iansiti & Levien, 2002)
	A2 Organization	**S4** (Barua et al., 2004) (Iansiti & Levien, 2002)	**S5** (Iacovou et al., 1995) (Liu et al., 2015) (Stokmans, 2014)	**S6** (Iacovou et al., 1995) (Iansiti & Levien, 2004) (Heinink, 2017)
	A3 Environment	**S7** (Liu et al., 2015) (Wachsmuth & Weisler, 2017)	**S8** (Liu et al., 2015) (Abbot et al., 2017)	**S9** (Liu et al., 2015) (Aghion et al. 2005) (Blind, 2012)

FIGURE 4.3: Overview of the cross references in Research Fields.

4.2 The Implementation Themes and Variables Explained

This section elaborates on the nine implementation sections and the resulting implementation sectors of Section 4.1. This explanation is based on the found cross references presented Figure 4.3. Each subsection will explain a different implementation sector. Before this, all the implementation themes of the business ecosystem health research field are explained to prevent redundant referencing and writing.

4.2.1 Business Ecosystem Health implementation themes

The first business ecosystem health implementation theme is referred to as productivity (B1). When the members of the business ecosystem manage to use less inputs to create more outputs the productivity of the business ecosystem increases (Iansiti & Richards, 2006). This increasing productivity can be directly correlated to the earnings of the company (Iansiti & Richards, 2006). Iansiti and Levien (2002) uses three variables for the measurement of business ecosystem productivity. The first two of these variables are linked to technology adoptions in a business ecosystem: total factor productivity, delivery of innovations and productivity improvement over time.

The second business ecosystem health implementation theme is referred to as robustness (B2). According to den Hartigh et al. (2006) the robustness of a business ecosystem is determined by it's capability of survival and face disruptions in any kind, also technological disruptions. In the research of Iansiti and Levien (2002) five variables are related to the measurement of business ecosystem robustness: survival rates, persistence of structure, predictability, limited obsolescence and continuity. The adoption of a regulated standard that changes the technological grounding in the business ecosystem can have different effects on these five variables. In the research of Iansiti and Levien (2002) the effects of this technological change can directly be related to two of these five variables: persistence of structure and survival rates.

The third business ecosystem health implementation theme is called niche creation (B3). This indicator is explained by Iansiti and Levien (2002) as the capability of creating new diversities within the ecosystem and thereby increase the overall value. They used two variables to explain niche creation: variety and value creation.

In the following three subsections each implementation theme of technology adoption is researched on the three before mentioned business ecosystem health implementation themes. Each subsection is marked with one of the implementation sector marks, S ($_{1...9}$) for a better overview and traceability purposes.

4.2.2 Technology on Business Ecosystem Health

In this subsection the cross references of the technology implementation theme (A1) on the business ecosystem health implementation themes is explained. In the research of Tornatzky et al. (1990) two variables are related to the technology implementation theme: availability and characteristics. The availability variable refers to the internal and external technologies that are available to a company. Where the characteristic variable refers to the character and the relevance of the technology that could be used. The main question for this section that could be asked is "What are the effects of the technology availability or characteristics on the business ecosystem health?".

Technology and Productivity - S1

The first implementation sector (S1) is determined by the implementation themes technology (A1) and productivity (B1). A questioned that could be asked and corresponds to this first section is: How can the availability or characteristics of technology influence the total factor productivity and delivery of innovations in a business ecosystem?

According to Iansiti and Levien (2002, p. 36) the total factor productivity is determined as: "*Leveraging techniques used in traditional economic productivity analysis, ecosystems may be compared by the productivity of their participants in converting factors of production into useful work.*". These leveraging techniques are not only depending on their own leveraging power. According to Adner and Kapoor (2010) the success of innovating companies that are using these available leveraging technologies often depends on the efforts of other innovators in its environment.

The second variable delivery of innovations is explained by (Iansiti & Levien, 2002, p. 36) as: "*Does the ecosystem effectively deliver new technologies, processes, or ideas to its members? Does it lower the costs of employing these novelties, as compared with adopting them directly, and propagate access to them widely throughout the ecosystem in ways that improve the classical productivity of ecosystem members?*" If a regulated standard implies a change in the technological grounding and thereby delivers new technologies this regulated standard indirectly boosts the delivery of innovations. But this delivery of innovations could also have a turn side. As the characteristic of the technology could determine for each actor in the business ecosystem if the technology is of extra value.

The characteristic of these new technologies could imply for each actor in the business ecosystem a different added value. Which implies a different impact on the delivery of innovations and total factor productivity. Although the possibilities of large added value to the total factor productivity and delivery of innovations are there, if the characteristic of the technology is too disruptive, companies could argue that the costs of adopting the new technology are to high and thereby not adopt the technology.

Technology and Robustness - S2

The second implementation sector (S2) is explained by the cross references between technology (A1) and robustness (B2). In this implementation sector the effects of available technology and its characteristic on the survival rates and structure of the ecosystem is researched.

In the mid 80s Tushman and Nadler (1986) formulated that companies who are evaluating technologies that are delivering discontinuous change, have to classify these into "competence-enhancing" or "competence-destroying". Where competence-enhancing technology innovations extends the expertise of a company. These innovations can deliver a positive effect on the robustness of a business ecosystem as all companies can increase there expertise by adopting the technology. On the other side competence-destroying will replace existing technologies and expertise of the company. These kind of technology innovations can have a large impact on the robustness of a business ecosystem. An example of a competence-destroying technological innovation is the launch of the first generation iPhone by Apple in 2007. Which was the first smartphone model and causes a major shift in the business ecosystem of cellphones. To illustrate this shift in the cellphone business ecosystem see Figure 4.4.

According to Tushman and Nadler (1986) besides the innovations that deliver a discontinuous change there are also synthetic technological innovations. These innovations are

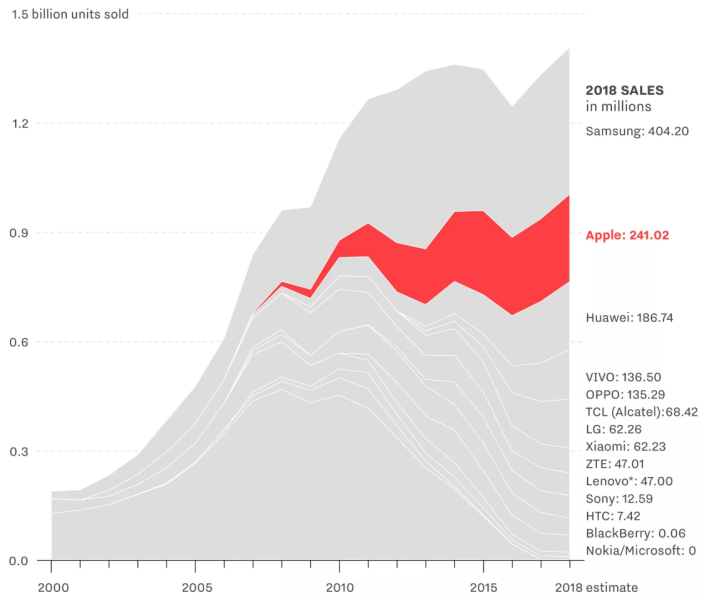

FIGURE 4.4: Example of competence-destroying technological innovation in a business ecosystem, Apple Iphone introduction in 2007 causes a major shift in the cellphone ecosystem, figure is used from the research of Molla (2017)

created by combining and using existing technologies for a new purpose. An example called by Baker (2012) is providing study and lectures via the internet. As these technological innovations are not classified as disruptive technologies there is a low change that they will influence the robustness of a business ecosystem. Although in some cases they can improve the efficiency and thereby still change the structure of the ecosystem.

The third technology innovation Tushman and Nadler (1986) described are incremental innovations. Incremental technological innovations are innovations that deliver upgrades or new features on the existing technologies. These incremental technology adoptions are representing the least impact on the robustness of the business ecosystem health. An example of an incremental innovation is the upgrade of Microsoft Office[1] 2013 to 2016.

If we link these characteristics of technology innovation to the three variables: persistence of structure, limited obsolescence and continuity Iansiti and Levien (2002). The technological innovations that are characterized by discontinuous change can have the largest and most impact full change to these variables.

Technology and Nice Creation - S3

The third and last implementation sector (S3), related to the technology implementation theme explains the cross references between technology (A1) and niche creation (B3). In this implementation sector the effects of technology on the variety and added value created in the ecosystem is measured.

New technologies and innovations in the business ecosystem are directly related to the business ecosystem health indicator, niche creation (Nachira et al., 2007). One of the things that is explaining the variety in the business ecosystem is the number of technological building blocks and/ or startups being created within the ecosystem in a given period of time (Iansiti & Levien, 2002). When a regulated standard increases the availability of technology

[1] https://www.office.com/

the possibilities for new technologies and innovations are opened up. An example of available technology that is creating variety in an existing business ecosystem is drive-less cars. In this case no clear regulated standard is created and thereby this blocks the way of creating real variety in the business ecosystem. Start-ups and new companies are not allowed to sell cars that are driving on the public road without a human driver seat. Until there is a clear regulated standard that supports this technology the drive-less cars without a driving seat can't be driving on the road.

When a new technology becomes available, the characteristics can determine the level of value creation (Iansiti & Levien, 2002). When a new technology have the characteristics of a discontinuous change and be competence-destroying the effects on the ecosystem can be twofold. According to Chau and Tam (1997) due to the factors that are influencing the adoption this new technology can be seen as a innovation with a negative value creation. As these innovations can increase knowledge barriers in the company and thereby exceed the potential benefits of adoption the technology adoption. On the other side these technologies can be seen as a starting point of the replacement of old legacy systems.

4.2.3 Organizational readiness on Business Ecosystem Health

In this second subsection the cross references between the second implementation theme organizational readiness (A2), and the business ecosystem health implementation themes is explained. Based on the research of Iacovou et al. (1995) two variables are called to be of influence of organizational readiness: IT resources and financial resources.

The introduction of a regulated standard can force every actor in the business ecosystem to adopt the underlying technology to stay compliant with the standard. As certain actors in the ecosystem are forced to adopt the regulation the questions remains: how ready in terms of financial and IT resources are the different actors in the business ecosystem, and how is this influencing the business ecosystem health?

Organizational readiness and Productivity - S4

The fourth implementation sector (S4) is determined by the implementation themes organizational readiness (A2) and productivity (B1). What are the cross references between the readiness of an organization on behave of IT and financial resources, and how is this related to the productivity of the ecosystem?

According to Barua, Konana, Whinston, and Yin (2004) integrated IT technologies improve the productivity of the company as it helps to improve the company it's performance by reducing cycle time in every process. Thereby the costs of running your company can be reduced. As stated by this equation the more integrated IT technologies the higher the productivity of the company can be.

These integrations of IT technologies can deliver innovations to the business ecosystem. An example is the integration of the IBAN name checking system developed by the dutch bank Rabobank [2]. This system prevents the customers of the bank to transfer money to a wrong bank account. This IT system checks the bank account number with the registered name of the bank account holder. After Rabobank integrated this into their own system they shared this with all other banks in the Netherlands. They delivered a new innovation

[2] https://www.rabobank.nl/

and increased the productivity of the banking ecosystem. An example of organizational IT resources that influencing the ecosystem productivity and delivery of innovations.

Besides the IT resources a organization needs also financial resources to adopt a new technology. This resources is directly influencing the productivity and delivery of innovations variables. As both are highly influenced by the costs that a new technology adoption brings (Iansiti & Levien, 2002). Although a company can have the financial resources for the adoption of a new technology the financial managers of a company will weight the costs and the benefits of adopting it. When this benefits are higher than the adoption costs the manager is more likely the spend the companies financial resources on this adoption.

In case of the regulated standard introduction the technology adoption which is needed to stay compliant can raise initiatives that reducing the financial costs for the whole ecosystem. The delivery of innovations is promoted by companies that are working together via an open initiative to reduce the costs of every actor in the business ecosystem. An example of a so called open initiative is the 'Berlin Group'[3] which currently has 25 members who are working together on the defining open and common scheme- and processor-independent standards.

Organizational readiness and Robustness - S5

The implementation themes organizational readiness (A2) and robustness (B2) are forming together the fifth implementation sector (S5). In this sector the effects of IT and financial resources on the structure and survival rates of the business ecosystem are discussed.

The organizational readiness of the companies in the business ecosystem can be determined by the level of IT and financial resources they (Iacovou et al., 1995). Two sub variables of IT resources that play a role during the adoption of a technology in a firm are human resources and IT legacy systems. The human resources are linked to the way of developing. Is the company using a waterfall development method or an Agile way of working. The IT legacy systems are referring to the capability of innovating the current IT systems in the company. Or are these not compliant anymore and do they have to be replaced. Both sub variables are having an impact on the persistence of structure. If both need to change to adopt a new regulated standard (Liu et al., 2015).

Example of these IT legacy systems that are influencing the structure of an organization are the IT systems at the Dutch governmental agencies. In the past years there are multiple projects raised and failed because the IT legacy systems were to big or complicated to replace. An example is the development of a new gathering and payment system (ETPM system) of the dutch tax authority. Due too complex IT legacy systems, the project failed and the final costs ended up on 200 million euro's (Stokmans, 2014).

Organizational readiness and Nice Creation - S6

The sixth implementation sector (S6) is based on the implementation themes organizational readiness (A2) and niche creation (B3). In this sector the effects of IT and financial resources on the variety and added value created in the ecosystem is measured.

Small firms are tending to lack financial and IT resources to adopt the available technologies (Iacovou et al., 1995). Besides this, these firms also tend to lack all the benefits of

[3] https://www.berlin-group.org/

adopting the technology that comes with the regulated standard. Because of this lack in resources it is expected by Iacovou et al. (1995) that the value creation for the small startups in the short run is harder than for the bigger established companies. In an healthy ecosystem environment it is critical to create new niches and to promote diversity, if this is not promoted enough a decreased diversity in an ecosystem can lead to niche creation in others (Iansiti & Levien, 2004). This can eventually lead to a disruption or even replacement of the entire ecosystem.

The bigger companies can promote the niche creation by providing financial resources in their ecosystem in order to achieve more diversity and value creation. An example of a dutch established bank, the ING[4], who has made funding available for smaller and fintech companies in the banking ecosystem. By this funding they hope to promote more innovation and diversity in the ecosystem. The fund has a total amount of 300 million euro's (Heinink, 2017).

Another example that is more related to the IT resources is the cooperation between the BBVA bank[5] and startups in Spain. This bank started in 2007 to replace their legacy systems by cooperating with smaller and startup companies in the ecosystem. By using these companies the spanisch bank tries to transform from a traditional banking model into a digital business (Casadesus-Masanell & Ricart, 2010).

4.2.4 Environment on Business Ecosystem Health

In the third and last subsection the cross references between the third implementation themes environmental context (A3), and the business ecosystem health implementation themes is explained. Iacovou et al. (1995) two variables are formulated that are of influence on the environmental context: the availability of technology service providers and the governmental regulatory environment (Baker, 2012).

Environment and Productivity - S7

The seventh implementation sector (S7) is based on the implementation themes environment (A3) and productivity (B1). This sector tries to elaborate on the effects of a government regulatory environment and the availability of technology service providers on total factor productivity and delivery of innovations.

According to the research of Liu et al. (2015) the governmental regulatory environment variable can be split into two classes. The 'regulation-driven innovations' they occur when regulators want to ensure minimum revenue, reduce risk and compliance costs for the companies in the ecosystem. Second there is the 'regulation-delayed innovations' these regulations occur when a regulator want to restrict cooperation between companies, especially on the research and development department.

When a regulation driven innovation is put into place by the regulator they may try to adopt the new innovation and thereby improve their productivity and avoid immitation by other companies (Liu et al., 2015). An example a regulation-driven innovation that has increase the productivity and deliver innovations in the European financial ecosystem is the European payments-integration initiative, Single Euro Payments Area (SEPA). The SEPA regulation introduced by the European Commission, made all electronic payments across the Euro area possible. This included the credit card, debit card, bank transfers and direct

[4]https://www.ing.nl
[5]https://www.bbva.es/

debit transactions. As simple as domestic transactions in each European country (European Commission, 2012).

These two classes of governmental regulatory environment can also be linked to the technology service providers. An example is the disruptive technology innovation in the short-term hotel and accomodation rentals. As can be seen in Figure 4.5 the revenue of hosts as a percentage of total residential rents in New York is increased due to the Airbnb[6] platform (Wachsmuth & Weisler, 2017). The regulator in New York introduced a 'regulation-delayed innovation law as there were to many violations of zoning and other laws (Liu et al., 2015).

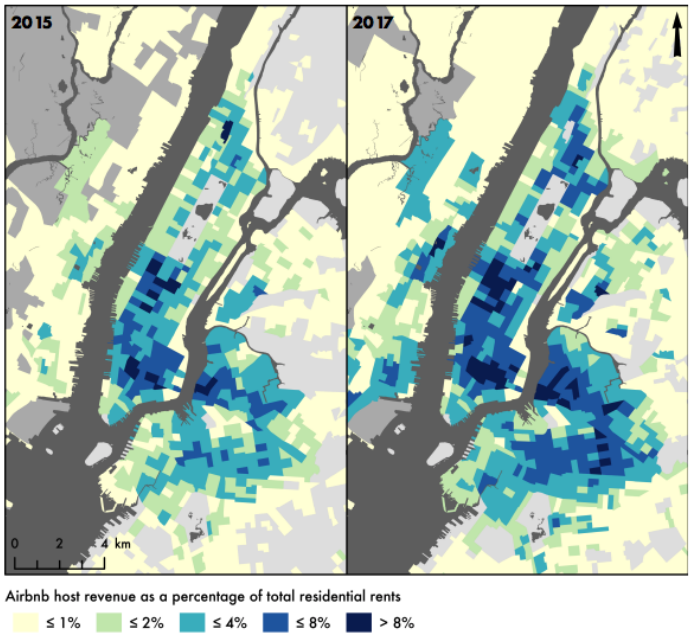

FIGURE 4.5: The revenue increase of hosts as a percentage of total residential rents in New York is increased due to the technology service provider Airbnb based on the research of Wachsmuth and Weisler (2017)

Environment and Robustness - S8

The eighth implementation sector (S8) is based on the implementation themes environment (A3) and robustness (B2). This sector tries to elaborate on the effects of government regulatory environment and the availability of technology service providers on the persistence of structure and survival rates in the ecosystem.

The persistence of structure can be change due to digital convergence (Liu et al., 2015). According to a business report of Accenture written by Abbott, Flynn, Abbey, and Grund (2017) the availability of technology service providers can be a threat to the persistence of structure and eventually to the survival rates of the business ecosystem. They call the example of new technology service providers, iZettle[7] and Square[8] that extent the capabilities of smartphones and thereby turn these devices into point-of-sale checkout devices. By this transition it becomes available for companies to perform customer check-outs without a point-of-sale hardware device.

[6] https://www.airbnb.com/
[7] https://www.izettle.com/
[8] https://squareup.com/

These technology service providers can due to these technological innovations change the persistence of structure. The ecosystem can become a more fragmented market. The lack of an technological standard or conflicts between companies can cause an destructive environment for all companies (Liu et al., 2015). Government regulations can in these cases setup a technological standard to ensure clear understanding how the ecosystem could proceed and implement the technological innovations.

Environment and Nice Creation - S9

The ninth implementation sector (S9) is based on the implementation themes environment (A3) and niche creation (B3). This sector tries to elaborate on the effects of a government regulatory environment and the availability of technology service providers on the variety and added value created in the ecosystem is measured.

Also in this implementation sector the two classes (regulation-driven and regulation-delayed innovations) of the government regulatory environment variable have an effect on the niche creation implementation theme. Regulation-driven innovations can improve the variety in the ecosystem as by these regulations the regulator can liberalize and privatize markets that have been dominated by public organizations (Liu et al., 2015).

On the other side the regulator can introduce a regulated-delayed innovation. An example is a market entry regulation that puts up entry barriers for companies. By these entry barriers a conditional change in a marketplace or business ecosystem can cause a negative value creation for companies to adopt the technology (Aghion, Bloom, Blundell, Griffith, & Howitt, 2005). Due to this negative impact on the value creation, the variety in the ecosystem can decrease (Blind, 2012).

Regulators can introduce these regulated-delayed innovations in order to ensure a more efficient but fair, stable and secure marketplace (Liu et al., 2015). An example is the regulations that are put into force, in several countries all over the world, related to the new technology service providers. Taxi services like Uber[9] and Grab[10].These services are disrupting the traditional taxi industry in a high ratio and is in be in conflict with the national laws related to be an official taxi driver.

4.3 How the Variables are Used in the Conceptual Model

The implementation themes and the variables explained in Section 4.2 form the third dimension of the RSEEM. For each implementation theme of the technology adoption research field two variables are chosen that are most related towards the implementation themes of the business ecosystem health research field. This has also been done for the business ecosystem health implementation themes. For these themes the variables are chosen that are being most related to the technology adoption research field.

The variables that have been chosen for the third dimension of the RSEEM, together with the corresponding implementation themes and research fields are showed in the lists presented on the next page. The variables are numbered with as $V_{(1...12)}$:

[9] https://www.uber.com/
[10] https://www.grab.com/

- **A - Technology Adoption:**
  - A1 - Technology
    - V1 - Availability
    - V2 - Characteristics
  - A2 - Organizational Readiness
    - V3 - IT Resources
    - V4 - Financial Resources
  - A3 - Environment
    - V5 - Government Regulation
    - V6 - Availability of Technology Service Providers
- **B - Business Ecosystem Health:**
  - B1 - Productivity
    - V7 - Total Factor Productivity
    - V8 - Delivery of Innovations
  - B2 - Robustness
    - V9 - Persistence of structure
    - V10 - Survival rates
  - B3 - Niche Creation
    - V11 - Variety
    - V12 - Value Creation

The implementation sectors S$(_{1...9})$ are now each being divided by four underlying measurements, see Figure 4.6 for a representation of these new measurements. Each implementation theme of both research fields has two variables. These will will be tested against each other to measure the effects of the implementation themes in a more accurate way. This results in a two times two matrix per implementation sector. In total the RSEEM now has 36 new measurements. Each new measurement has been given the letter R with a corresponding ascending number R$(_{1...36})$. An Table overview of all 36 measurements including their underlying variables is added as Appendix E.

Research Fields			Business Ecosystem Health Business Ecosystem Health Measurement (Iansiti & Levien, 2002)					
	Implementation Themes		B1 Productivity		B2 Robustness		B3 Niche Creation	
		Variables	V7 - Total Factor Productivity V8 - Delivery of Innovations		V9 - Persistence of Structure V10 - Survival Rates		V11 - Variety V12 - Value Creation	
Technology Adoption TOE Framework (Tornatzky et al., 1990 and Iacovou et al. Model Iacovou et al. (1995)	A1 Technology	V1 - Availability V2 - Characteristics	R1 V1 x V7	R2 V1 x V8	R5 V1 x V9	R6 V1 x V10	R9 V1 x V11	R10 V1 x V12
			S1		S2		S3	
			R3 V2 x V7	R4 V2 x V8	R7 V2 x V9	R8 V2 x V10	R11 V2 x V11	R12 V2 x V12
	A2 Organization	V3 - IT Resources V4 - Financial Resources	R13 V3 x V7	R14 V3 x V8	R17 V3 x V9	R18 V3 x V10	R21 V3 x V11	R22 V3 x V12
			S4		S5		S6	
			R15 V4 x V7	R16 V4 x V8	R19 V4 x V9	R20 V4 x V10	R23 V4 x V11	R24 V4 x V12
	A3 Environment	V5 - Government Regulation V6 - Availability of Technology Service Providers	R25 V5 x V7	R26 V5 x V8	R29 V5 x V9	R30 V5 x V10	R33 V5 x V11	R34 V5 x V12
			S7		S8		S9	
			R27 V6 x V7	R28 V6 x V8	R31 V6 x V9	R32 V6 x V10	R35 V6 x V11	R36 V6 x V12

FIGURE 4.6: Third dimension of the RSEEM, in this dimension the variables of the implementation themes are included into the model. These variables resulted into 36 new measurements that are being labeled as R$(_{1...36})$.

4.4 Stakeholders in the Business Ecosystem

The fourth dimension of the RSEEM is determined by the stakeholders in the business ecosystem. As explained in Section 3.2.1 and based on the research of Iansiti and Levien (2004) companies in the business ecosystem can choose three strategies: as keystone, physical dominator or niche player. The RSEEM indicates the effects of a regulated standard introduction on the whole business ecosystem. Therefore the opinions of all three actors has to be taken into account to gather a representative view of the effects.

For each implementation sector $S_{(1...9)}$ the opinion of these three stakeholders has to be taken into account. As can be seen in Figure 4.7 each implementation sector now has three underlying views.

Research Fields			Business Ecosystem Health Business Ecosystem Health Measurement (Iansiti & Levien, 2002)								
	Implementation Themes		B1 Productivity			B2 Robustness			B3 Niche Creation		
		Variables	V7 - Total Factor Productivity V8 - Delivery of Innovations			V9 - Persistence of Structure V10 - Survival Rates			V11 - Variety V12 - Value Creation		
Technology Adoption TOE Framework (Tornatzky et al., 1990 and Iacovou et al. Model Iacovou et al. (1995)	A1 Technology	V1 - Availability V2 - Characteristics	S1			S2			S3		
			Niche	Keystone	Physical Dominator	Niche	Keystone	Physical Dominator	Niche	Keystone	Physical Dominator
	A2 Organization	V3 - IT Resources V4 - Financial Resources	S4			S5			S6		
			Niche	Keystone	Physical Dominator	Niche	Keystone	Physical Dominator	Niche	Keystone	Physical Dominator
	A3 Environment	V5 - Government Regulation V6 - Availability of Technology Service Providers	S7			S8			S9		
			Niche	Keystone	Physical Dominator	Niche	Keystone	Physical Dominator	Niche	Keystone	Physical Dominator

FIGURE 4.7: Fourth dimension of the RSEEM, in this dimension the different stakeholders in the business ecosystem are included. Taken into account these stakeholders puts the RSEEM in a position to determine the different opinions in the ecosystem about the regulated standard that is introduced.

Besides the possibility of measuring the opinions of the three different stakeholders in the business ecosystem. By classifying these three stakeholder groups it becomes more clear which company is suited to give their opinion on the regulated standard that is researched and thereby sets a certain threshold. This brings us to the second reason why the fourth dimension is of importance, as by this threshold the determination of the ecosystem borders is more clear to set.

4.5 Conclusion - The Conceptual RSEEM

In this chapter the cross references of the technology adoption and business ecosystem research fields were researched. This cross references form the first dimension of the RSEEM. Based on three implementation themes per research field, nine implementation sectors were formed which resulted in the second dimension. After this the third dimension of the RSEEM was created by underlying variables of the implementation themes. These variables dived each implementation sector into four different measurements. In total the third dimension has 36 measurements. Finally the fourth dimension involves the three different stakeholders of the business ecosystem.

Figure 4.8 represents the conceptual version of the RSEEM. It has the shape of a matrix in which the corresponding research fields are related to each other by explaining the different effects the variables have on each other. To confirm these effects the implications and considerations of these effects are confirmed and described in Chapter 5. Before evaluating the conceptual model by the expert reviews, a pre-evaluation was conducted with practitioners and scientists of Utrecht University.

Research Fields	Implementation Themes	Variables	Business Ecosystem Health Business Ecosystem Health Measurement (Iansiti & Levien, 2002)		
			B1 **Productivity**	**B2** **Robustness**	**B3** **Niche Creation**
			V7 - Total Factor Productivity **V8 - Delivery of Innovations**	**V9 - Persistence of Structure** **V10 - Survival Rates**	**V11 - Variety** **V12 - Value Creation**
Technology Adoption **TOE Framework (Tornatzky et al., 1990** **and** **Iacovou et al. Model Iacovou et al. (1995)**	**A1 Technology**	**V1 - Availability** **V2 - Characteristics**	R1 R2 **S1** R3 R4 N K P	R5 R6 **S2** R7 R8 N K P	R9 R10 **S3** R11 R12 N K P
	A2 Organization	**V3 - IT Resources** **V4 - Financial Resources**	R13 R14 **S4** R15 R16 N K P	R17 R18 **S5** R19 R20 N K P	R21 R22 **S6** R23 R24 N K P
	A3 Environment	**V5 - Government Regulation** **V6 - Availability of Technology Service Providers**	R25 R26 **S7** R27 R28 N K P	R29 R30 **S8** R31 R32 N K P	R33 R34 **S9** R35 R36 N K P

FIGURE 4.8: Final Conceptual Version of RSEEM includes nine sector with 36 underlying measurements and viewpoints of three different actors.

Chapter 5

Model Evaluation and Key Considerations

This chapter evaluate the conceptual Regulated Standard Ecosystem Effect Model (RSEEM) on the content and key considerations. This has been done by interviewing nine experts who passed the selection criteria. All the key considerations about the RSEEM are discussed. Each expert is labeled with a number $E_{(1...9)}$, in order to trace the different experts. A list of possible experts was collected during the "Toekomst van het betalingsverkeer event" on April 19, 2018. Based on this list, related papers and blogs of these experts where researched to acquire more experts. All interviews were conducted in July and August 2018 and had a duration of maximum one hour. Appendix B includes the interview protocol. The results of the interviews are summarized in Appendix F.

This chapter is structured in the following order: Section 5.1 will elaborate and evaluate the key considerations of the RSEEM related to the implementation themes and variables. The second Section 5.2 evaluates the threshold that has been set for the expert reviews. These two sections lead to the last Section 5.3, in which the revised conceptual version of RSEEM is presented and the chapter is concluded.

5.1 Evaluation of the Implementation Themes and Variables

The interviews where not conducted in a strict order of the implementation sectors, as this causes a more natural flow of the conversation with the interviewees. For tracking purposes the summaries of the interviews are written in the order of the actual conversation. These summaries can be found in Appendix F. Each interviewee gave his opinion about the underlying implementation themes of the implementation sectors. Based on these opinions the sections are verified, changes or marked as a possible threat to the validity of the RSEEM. A minimum of three expert opinions is needed for a measurement to be valid. Based on these three opinions a sub-conclusion in the form of a summarized group statement is represented. Appendix G represents the results of these exploratory expert interviews. Each table in this appendix represents the results of a different implementation sector, within these tables the results are ordered per measurement. The expert numbers of the experts are included after each statement so the opinions could be tracked.

The nine implementation sectors $S_{(1...9)}$ of the RSEEM are being evaluated by the expert reviews. The evaluation per implementation sector is provided in more detail below:

Evaluation of Implementation Sector S1

The evaluated considerations for the S1 implementation sector: in this sector the variables of the technology and productivity implementation themes are tested against each other. By testing these themes the effects of technology availability and characteristics on the total factor productivity and delivery of innovations can be justified. This sector shows several considerations. First, in general all experts think that the availability of technology on the short term will not improve the total factor productivity of the ecosystem. They think that the adoption of technology takes time and can cause a delay to processes. Although on the long term the experts think the availability of technology has a positive effect on the total factor productivity. As they are available for the whole ecosystem, everybody has the option to benefit from this (R1).

Second, the expert opinions about the availability of technology due to the introduction of a regulated standard and the delivery of innovations is divided. The experts explain this by dividing the ecosystem into established companies and startups. Regulations that make technology unavailable in the form of making current technologies illegal are in favor of established companies. An example called by experts E2, E8 and E9, is the 'Screen Scraping' [1] technique that Sofort is using. By the PSD2 regulation this becomes officially illegal. Thereby the compatitive advantage of Sofort is being limited. This company has to delivery new innovations to gain competitive advantage again (R2).

Third, the characteristics of technology can be of impact on the total factor productivity. Although this depends on the companies view towards this technology. Expert E4 states that characteristics of technology can be compared to LEGO [2] building blocks. Although the technology has a very disruptive character if there is no possibility to use this building block simply because it doesn't fit on your platform it will never deliver extra productivity (R3).

Fourth, the relationship between the characteristics of the technology and the delivery of innovations is strongly depending on the regulation that is related to it. When a regulated standard introduction implies the possibilities for disruptive and innovative technologies. The experts expect that this will influence the delivery of innovation in a brought sense. Expert E2, calls the example of PSD2 and the expected destructive new payment methods. This expert thinks that eventually these new payment methods will replace current methods (R4).

Evaluation of Implementation Sector S2

The evaluated considerations for the S2 implementation sector: in the second implementation sector the implementation themes technology and robustness are tested against each other. The corresponding variables availability and characteristics of technology are tested towards the variables; persistence of structure and survival rates in the business ecosystem. By testing these variables several considerations have been found: The first consideration is related towards the availability of technology and the persistence of structure in a company. Technology that comes available by the introduction of a new regulated standard is according to the experts (E3, E5, E6) of different impact on the different actors in the business ecosystem. Due to the regulation that is related to the available technology sometimes a deadline is being set. Therefore companies need to adopt the technology before the deadline otherwise the are taking the risk to get a fine or even worse cannot perform business due

[1] https://nordicapis.com/fintechs-want-save-screen-scraping/
[2] https://www.lego.com/

to compliance issues. Expert E6 thinks that this last argument is of most importance for the established companies (R5).

The second consideration is related to the availability of technology and the survival rates in the ecosystem. According to expert E4 and E9 the startups will be faster in the adoption of available technology. This gives them a head start compared to the established companies. Although this head start he doesn't think that this will be of negative influence on the survival rates of an ecosystem. On the long rung it can be of influence, he calls the example of the payment industry. Twenty years ago most of the banks in the Netherlands where responsible for all payment traffic. Now a days we see that startups have taken over this part of the business (R6).

The third consideration related to the second implementation sector is related to the characteristics of technology towards the persistence of structure in the business ecosystem. Multiple experts (E1, E5) think that these characteristics will not change the entire structure of companies. They think that the structure of developing will be changed. They call the example of the 'Spotify development method'[3] compared to the 'Original development methods of certain banks'. Due to the disruptive character and in case of certain regulations the open availability of technology. Companies have to developed in other methods and thereby change their structure to keep aligned with other actors in the business ecosystem (R7).

The fourth and last consideration related to the second implementation sector is related to the characteristics of technology and the survival rate within the business ecosystem. The experts E1 and E7 think that the characteristics of technology will be of negative impact on the survival rates of the established companies. They think that the keystone and physical dominator actors will lose market share to the niche creators. They both called the example of the first goal of PSD2 regulation which is 'Create more competition in the Ecosystem'. They expect that companies will stop with certain departments (R8).

Evaluation of Implementation Sector S3

The considerations for the S3 implementation sector: in the third implementation sector the implementation themes technology and niche creation are tested against each other. The first consideration is related to the availability of technology and the variety in the ecosystem. Three experts (E3, E4, E5) agree on the relation between availability of technology and the increasing variety in the ecosystem. They explain this relation due to the fact that a regulated standard can stimulate the availability of technology. Due to this stimulation the entry barriers for technology adoption can be lowered and thereby startup companies can easier enter the business ecosystem. This increasing entry to market can result in a larger variety (R9).

The second consideration is related to the availability of technology and the value creation variables. This relationship is being fully supported by all experts for all actors in the ecosystem. This support can be summarized by a statement made by expert E1 "the availability of technology and thereby the road to innovation always lead to value creation" (R10).

The third consideration related to the third implementation sector is based on the variables characteristics of technology and the variety in the business ecosystem. Multiple experts (E4, E6, E7) state that the characteristics of technology can be disruptive but also create more openness. The openness build due to the API movements. Expert E4 and E9 calls

[3] https://labs.spotify.com/2014/03/27/spotify-engineering-culture-part-1/

the example of the Nordea bank[4] which uses the API movement to promote startups in the ecosystem. This is an example of a physical dominator that uses the characteristics of technology to increase variety in the ecosystem (E4) (R11).

The last consideration of the third implementation sector is based on the variables characteristics of technology and the value creation in the business ecosystem. Based on the research of Nachira et al. (2007) one would expect that technologies with a disruptive characteristic would not create immediately create value for all the actors in the ecosystem. The experts E1 and E5 agree with this, as they argue that disruptive technologies can also cause a large shift in the ecosystem and thereby indirectly have a negative value creation for all actors. Secondly they argue that in the short run these disruptive technologies have to prove themselves first (R12).

Evaluation of Implementation Sector S4

The considerations for the S4 implementation sector: in the fourth implementations sector the effects of the themes organization and technology are being researched. This resulted in several considerations, the first is related to the variables IT resources and the total factor productivity. The total factor productivity is according to the experts (E1, E3 and E5) being influenced in two phases. First when the introduction of the regulated standard is started there is an compliance phase. In this phase the companies are performing an investigation how they can become compliant. Based on the state of their IT resources they are going to setup a plan. If the company has big legacy systems than the 'becoming compliant phase' is expected to take a long time and thereby decrease the productivity. If there are no big legacy systems it is expected that a company become compliant fast and thereby go to the next phase. During this next phase companies can start innovating and increase productivity, the sooner they can enter this phase the faster the can start increasing their total factor productivity (R13).

The second consideration is related to the variables IT resources and the delivery of innovations for the company. During the evaluation the experts linked this consideration towards the considerations stated in the previous paragraph (R13). Experts E3 and E5 think the faster the companies can enter the second phase the faster they can deliver innovations. Also they both argue that their is a relation between the financial resources that are needed for this. They both think that there is a connection between these two resources and that they are closely connected. Expert E2 states states that these are 'fully linked' and that the more financial resources a company has the more IT resources can be hired (R14).

The third consideration of the fourth implementation theme is related to the financial resources and total factor productivity of a company. Multiple experts (E2, E6, E9) agreed on the fact that this consideration is strongly related to one that is explained in the previous paragraph. They argue that if a big company needs to replace big legacy systems this is probably going to cost them a lot of IT resources. Thereby this is also costing them financial resources (R15).

The fourth and last consideration is about the effects of financial resources on the delivery of innovations in the company. The same as the previous two considerations are explaining, the experts agreed on the point that this is strongly related to the level of IT resources of a company. If they first have to spend a lot of financial resources in replacing their legacy

[4]https://www.nordea.com/en/

systems than this is having a other effect on the delivery of innovations than when a company does not have to spend a significant part of their financial resources on the replacement (R16).

Evaluation of Implementation Sector S5

The considerations for the S5 implementation sector: the fifth implementation sector is related to the implementation themes organization and robustness. Four main considerations are being evaluated. The first consideration is related to the variables IT resources and the persistence of structure. According to expert E4 the companies in the business ecosystem can use a regulation to change the their structure. As these regulation can be seen as accelerator for innovating their old legacy systems. In order to use the regulations as a accelerator two other experts (E1, E7) agreed with E4 that the human resources in the company should be in the right positions and have to work with the right methodology (R17).

The second consideration related to the fifth implementation sector is based on the variables IT resources and survival rates. The IT resources that are needed to become compliant with the introduced regulated standard are being expected to influence the survival rates on the long term of the established companies in the business ecosystem. Due to high costs of replacing IT legacy systems multiple experts (E1, E4, E8) think that this will influence the survival rates. An example called by E4 is the fact that the 'Van Landschot bank'[5] has decided to outsource all their payment activities, thereby they stopped with these activities and only having this department as they are mandatory to have this department of the 'De Nederlandse Bank'[6]. Thereby the experts think that other banks in the Netherlands will also stop with certain activities because of these legacy systems (R18).

The third consideration is arguing the variables financial resources and the persistence of structure. This consideration is related to the third consideration of the fifth implementation theme (R19). The experts (E1, E3) think that the structure of the established companies is not being influenced by the financial resources. Although these companies can have legacy systems that cost relatively a lot of money they can afford it. But on the other side the startup companies in the ecosystem can because of the financial costs choose to change their structure. Change their development structures or start a cooperation with other companies in order to share the costs.

The last consideration of the fifth implementation sector is about the financial resources and the survival rates in the business ecosystem. According to expert E4, the implementation of government regulations could be expensive, in some cases these cost are that high that it difficult for start ups to survive the complete implementation phase. Also according to E6: "Where we see that new startups have problem with hiring people, the traditional companies have to restructure the teams". Concluding this result in the startups that can see the financial resources as a threshold for doing business have traditional companies more money but troubles to attract new people (R20).

Evaluation of Implementation Sector S6

The considerations for the S6 implementation sector: the sixth implementation sector is related to the implementation themes organization and niche creation. The first consideration related to this sector is the effects of IT resources on the variety in the business ecosystem.

[5] https://www.vanlanschot.nl/
[6] https://www.dnb.nl/home/

The experts expect due to the legacy systems of the established keystone and physical dominator companies that they will eventually will promote the niche creator companies. They call the example of the ING[7] and the Rabobank[8] who are actively are promoting the fintech startups in the Netherlands. These are examples variety creation in the business ecosystem in order to acquire more or better IT resources (R21).

The second consideration of the sixth implementation sector is related to the IT resources and the value creation in the business ecosystem. According to expert E2 there is a clear split between how companies can spend their IT resources to create value out of the introduced regulation. As startups are not forced to become compliant with the regulation they can decide to not implement the standard of the regulation. Where the established companies that are obligated to become compliant have to spend IT resources on this. With this argumentation he expects that the opinion of value creation related to the IT resources we be two folded (R22).

The third consideration is related to the financial resources and the variety of the business ecosystem. Experts E4 and E6 think that because of the introduction of a regulated standard the need for certain financial resources to implement an IT system will be decreasing. They think it becomes easier to implement IT systems and therefore the entry barriers to the business ecosystem will decrease (R23).

The fourth and last consideration of the sixth implementation sector is related to the financial resources and the value creation in the business ecosystem. This consideration can be summarized by the statement expert E7 has made: "If a company does not see added value of the regulation that this company will not spend financial resources on it. Just as simple as it sounds it is." (R24).

Evaluation of Implementation Sector S7

The considerations for the S7 implementation sector: the seventh implementation sector researches the implementation themes environment and productivity. The first of the four considerations researched is related to the government regulation and the total factor productivity variable. The general conception of the experts is that on the short term there will be a negative impact on the total factor productivity of the companies. As they need to become compliant and spend therefore resources. On the long run these investments can have a productivity increasing effect. Summarized, regulated standards initiated by the government that change the technological grounding are having an effect on the total factor productivity. In general on the short term negatively and on the long term positive (R25).

The second consideration is related to the government regulations and delivery of innovations. Expert E5 states the following: "government regulations can increase the market on a horizontal part that will result in an increasing number of new startups which in his place deliver new innovations." The consencis of the experts (E4, E6, E9) is an increasing effect on the delivery of innovations (R26).

The third consideration of the seventh implementation sector is related to the availability of technology service providers and the impact they have on the total factor productivity. Two experts (E1, E5) call the example that in the financial business ecosystem it is due to security regulations very hard to use third party technology service providers. Therefore it is expected that the availability of technology service providers will not deliver a large

[7] https://www.ing.com/
[8] https://www.rabobank.nl/

impact on the total factor productivity. Although it can decrease the costs by the wider supply of technology service providers (R27).

The last consideration is related to the availability of technology service providers and the delivery of innovations. The experts think this is related to the previous considerations (R27). The keystone and physical dominator companies have to create software themselves because of the security regulations. Therefore they do not think the delivery of innovations will increase significantly (R28).

Evaluation of Implementation Sector S8

The considerations for the S8 implementation sector: the eighth implementation sector is related to the implementation themes environment and robustness. Based on four considerations the experts evaluated this sector. The first considerations is related to the variables government regulation and persistence of structure. The regulated standard that change the technological grounding cannot easily change the structure of doing business. Reasons for this are the connections between actors and the possibilities for cooperation instead of complete structure changes. An example called by expert E4 is: "the structure of doing business is not that easily changed. He thinks that we are not going to use our bank account in an Uber way" (R29).

The second consideration is related to the government and survival rates variables. The impact on the survival rates has a divided opinion across the experts. According to the more niche actor related experts government regulations can have a ' positive' impact on the survival rates as these actors think that old established companies can't use the regulations in their advantage and therefore will die. When these established companies die the niche creators will try to take over this market share. The experts that are more related to the established companies think that the survival rates will be negatively affected. In terms of the niche actors are getting to much benefits compare to them and therefor they stop performing there business related to the regulated standard (R30).

The third consideration is related to the availability of technology service providers on the persistence of structure in the business ecosystem. Because of security regulations, not all the companies in the business ecosystem can use the available technology service providers. The expectation of the experts (E2, E4, E6) is that this will not be of a great impact. They do think that there is a possibility of a small shift in structure (R31).

The last consideration of the eighth implementation sector is testing the variables availability of technology service providers and the survival rates. The same as considerations R27, R28 and R31 due to security regulations the experts (E1, E5 and E6) do not think these technology service providers will have a large impact on the survival rates in the business ecosystem (R32).

Evaluation of Implementation Sector S9

The considerations for the S9 implementation sector: the ninth and the last implementation sector researches the effects of environment and niche creation implementation sectors. The first consideration, if government regulations have impact on the variety in the business ecosystem. A general interpretation of the experts on this consideration is that "A regulated standard that change the technological grounding has impact on the variety in the business ecosystem. According to the experts this is due to a decrease of entry barriers." (R33).

The second consideration related to the ninth implementation sector is based on the government regulation and value creation variables. According to the experts (E1, E5 and E7) the value creation by the companies in the business ecosystem is according to the experts harder for the established companies than for the startups (R34).

The third consideration is based on the availability of technology service providers and the variety in the business ecosystem. The opinion of the experts (E2, E5, E9) is that it is not always caused by a government regulation that technology service providers increase the variety in the business ecosystem. They think it is hard to measure if due to a government regulation there is a relation between the service providers and the variety in the business ecosystem (R35).

The last consideration of the ninth implementation sector researches the availability of technology service providers and the value creation in the business ecosystem. According to expert E7, the traditional players will try to take the lead in this value creation, but as she has seen in the past this will probably not work for all of these actors and new companies will rise and takeover these market shares. He expects that the technology service providers will be the first that rise and takeover (R36).

5.2 Threshold Evaluation

The threshold for including a consideration has been set on a minimum of three experts. This minimum has been set to exclude the detailed and outlying considerations of the experts. But not to exclude to many the threshold has been set to three. To test the assumption of three experts this hypothesis is tested. As can be seen in Figure 5.1 a decrease of the threshold to two experts would have an expected 50 measurement considerations that shall be found according to the calculated trend line. As this research tries to found 'key' considerations related to the measurements, it could be argued that 50 measurements are not all key anymore. Increasing the threshold to four experts delivers 20 measurements. With this number one could argue if the RSEEM is still representative for all 36 measurements. Concluding this research used three experts as the threshold to achieve the adequate results.

5.3 Conclusion - Defining the RSEEM in Research

The first conceptual model proposed in Section 4.5 has been evaluated by making use of ten expert reviews. The result of this evaluation is presented in Figure 5.2, as can be seen in the figure two variable squares are marked orange. Based on the expert review results that are presented in the Table G.1 till Table G.9 three variables changed and one new is added. Based on these changed variables the composition of the related measurements in the third dimension of RSEEM, are also changed. See Appendix H for the new composition.

The first variable that is changed is 'V11 - Variety', as can be read in the result Tables G.3, G.6 and G.9 the experts quoted multiple times that the variety of actors in the business ecosystem is caused by a change in the ease of entry. Because variety is an indirect result of the ease of entry, this variable is changed into the direct effect 'V11 - Ease of Entry'.

The second and third variable that changed are 'V3 - IT resources' and 'V4 - Financial resources'. Based on the findings that are presented in Tables G.4, G.5 and G.6 it could be concluded that these two variables are in almost every case strongly related towards each

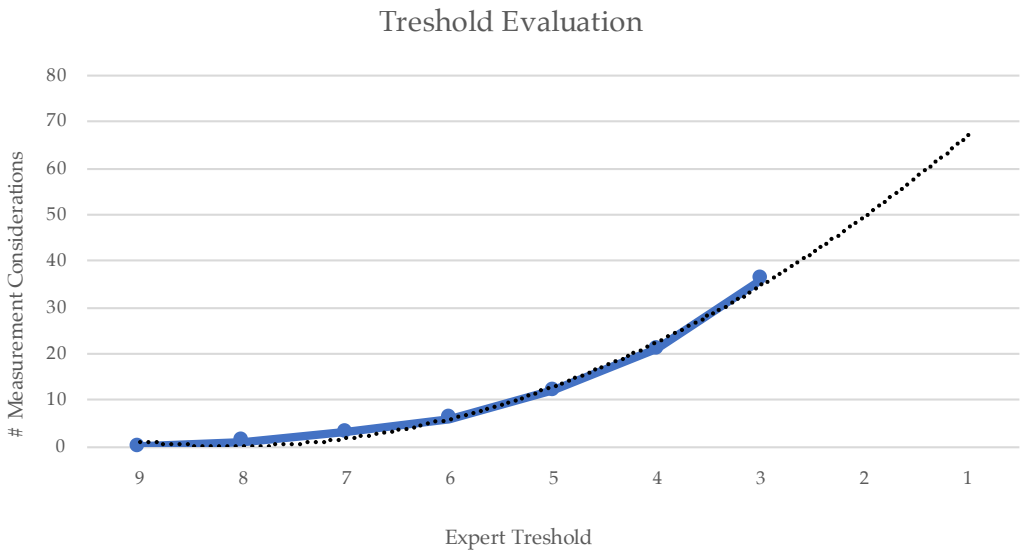

FIGURE 5.1: Threshold evaluation of experts and the number of measurement considerations found out of the interviews.

other. Therefor it is decided that these two variables are merged into one new variable 'V3 IT & Financial Resources'.

The fourth change is the addition of a new variable. Which is called 'V4 - Human Resources'. Multiple experts referred this as a missing factor in the RSEEM. This variable refers to the human resources a company needs to handle the change caused by the regulated standard.

Research Fields	Implementation Themes	Variables	Business Ecosystem Health Business Ecosystem Health Measurement (Iansiti & Levien, 2002)		
			B1 **Productivity**	**B2** **Robustness**	**B3** **Niche Creation**
			V7 - Total Factor Productivity **V8 - Delivery of Innovations**	**V9 - Persistence of Structure** **V10 - Survival Rates**	**V11 - Ease of Entry** **V12 - Value Creation**
Technology Adoption **TOE Framework (Tornatzky et al., 1990** **and** **Iacovou et al. Model Iacovou et al. (1995)**	**A1 Technology**	**V1 - Availability** **V2 - Characteristics**	R1 R2 S1 R3 R4 N K P	R5 R6 S2 R7 R8 N K P	R9 R10 S3 R11 R12 N K P
	A2 Organization	**V3 - IT & Financial Resources** **V4 - Human Resources**	R13 R14 S4 R15 R16 N K P	R17 R18 S5 R19 R20 N K P	R21 R22 S6 R23 R24 N K P
	A3 Environment	**V5 - Government Regulation** **V6 - Availability of Technology Service Providers**	R25 R26 S7 R27 R28 N K P	R29 R30 S8 R31 R32 N K P	R33 R34 S9 R35 R36 N K P

FIGURE 5.2: Evaluated conceptual version of RSEEM, based on the expert interviews the model and the key considerations are evaluated. The changed variables are underlined and the corresponding variable square is marked with an orange color.

Chapter 6

Model Adoption in Practice

A retrospective case study is conducted in order to evaluate the RSEEM and give actionable insights for practitioners. As described in Section 2.6 this case study is based on the protocol described by (Yin, 2009). The conceptual RSEEM was used as a theoretical framework. With respect to the selection criteria the Revised Payment Service Directive (PSD II) is selected as the introduced regulated techstandard for this case study.

This chapter provides first an explanation of the case study setup in Section 6.1. After this, Section 6.2 provides background information about the selected regulated techstandard PSD II and the affected business ecosystem. In Section 6.3 the case study results are presented. In the concluding Section 6.4 the analysis of the results is presented.

6.1 Case Study Setup

In order to evaluate the RSEEM in practice and give actionable insights for practitioners the case study used a Likert-type scale questionnaire. This has been done by questioning the nine experts, $E_{(1...9)}$, presented in Chapter 5. The questionnaire was conducted after the evaluation interview. An overview of all the experts can be found in Table **??**. The questionnaire consists out of 36 statements, for each measurement $R_{(1...36)}$, one statement. The interviewee could answer the statement with a full disagree (-2) till a full agree (+2). The full protocol including the 36 statements can be found in Appendix C.

Before the statements were asked to the interviewees, two base questions were asked. First, how they define themselves in the ecosystem: "Are you defining yourself as a keystone, niche or physical dominator?". By answering this question the experts could be divided into the three stakeholders groups. Secondly the interviewees were asked: "How do you define the relation between the adoption of PSD II and changing the technological grounding?". By asking this question the research was able to identify how the interviewees think about the regulation and the change towards the technological grounding on which they perform their business.

6.2 Background Information on the Regulated Standard

For the case study the introduction of the PSD II regulated standard was used. This regulated standard is introduced in the financial and banking ecosystem. Before the results of the case study are presented, background information about the regulated techstandard and the affected ecosystem is given.

6.2.1 A New Regulated Standard in the Payment Ecosystem

From 13 January 2018 each member in the European Union (EU) was expected to implement PSD II into national law (The European Commission, 2015). Current transposition status of PSD II in the EU is 61%, seventeen member states (The European Commission, 2018b). This rate indicates that there is diversity in the adoption of PSD II in the Single Euro Payments Area (SEPA). Besides the diversity in regulatory adoption, there is also difference in the technology adoption. With the incorporation of PSD II, banks in the SEPA are forced to provide access to certain parts of their systems. They can provide this by an application programming interface (API). Nevertheless, a large amount of banks in Europe has not finished the development of these API's (Folcia & Firnges, 2017; Brich, Majewski, Scott, & Gallo, 2018).

With the new PSD II regulation put into force, the European Commission wants to achieve three main goals (The European Commission, 2018a). Firstly they want to open up the European financial market more than was meant with the first payment service directive (PSD I). The market for payment methods is dominated by a small number of players that operate the schemes (De Lange, Longoni, & Screpnic, 2012). According to R. Anderson (2012) this domination resulted in a high concentration of market power for these scheme operators. In order to increase the openness in the market, the European Commission wants to lower the entry barriers for new players. Thereby they want to increase competition and contribute to a more integrated, efficient European payments market. By opening up the market, the European Commission want's to increase the possibilities for new innovative, affordable products and services for consumers. Secondly the European Commission wants to improve the level playing field for payment service providers (including new players). PSD II will cover rules which are related to the new innovative and low cost payment solutions also called "payment initiation services". By including these rules into PSD II the providers of these payment initiation services are regulated on a EU level and thereby improve the level playing field. The third goal of PSD II is to better protect consumers against fraud, other abuses and payment incidents by improving the security measures in place.

6.2.2 Relationships and New Actors in the Payment Ecosystem

When consumers buy products in a physical store or online, money has to be transferred from the consumers bank (issuer) to the bank of the merchant (acquirer). The issuer and acquirer are connected by schemes examples are Visa, Mastercard or American Express[1]. A merchant can use a payment service provider (PSP), to connect his webshop or pin-terminal to his acquirer. By making use of this connection the merchant can offer different payment methods to the consumer. Examples of these different payment methods are a credit card, Paypal[2] or iDEAL[3]. For a graphical representation of the described payment flow, see Figure 6.1

In order to achieve all three goals of the PSD II regulation, the European Commission introduced the possibility of using a third party layer. A layer which creates an extra connection between the consumer, issuer and the payment service provider. This connection is based on third parties who are also called third party payment service providers (TPP). When a consumer initiates a payment the TPP will transfer the money by making use of

[1] https://www.americanexpress.com
[2] https://www.paypal.com/
[3] https://www.ideal.nl/

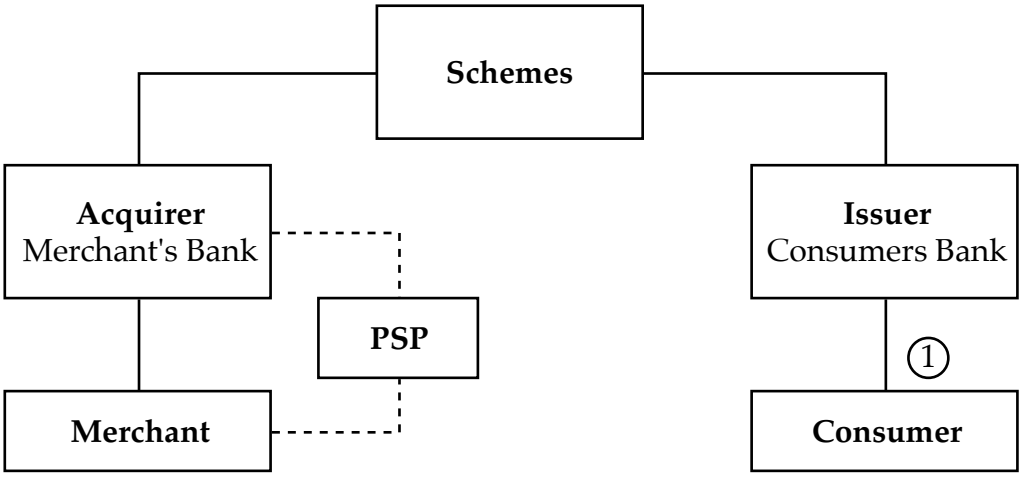

FIGURE 6.1: Four corner payment model, the consumer has option to pay for his products of the merchant. Therefore he has to use the schemes.

SEPA credit transfer schemes instead of the traditional schemes. Examples of payment methods that the TPP can offer to the consumer for these payments are: Sofort[4] or Trustly[5]. For a graphical representation of this introduced TPP layer on the four corner payment model see Figure 6.2. As can be seen in the figure the consumer has now two options to perform there payments. The first option is through the traditional way and make use of the schemes. The second option the consumer can use is the new TPP layer bypass the schemes.

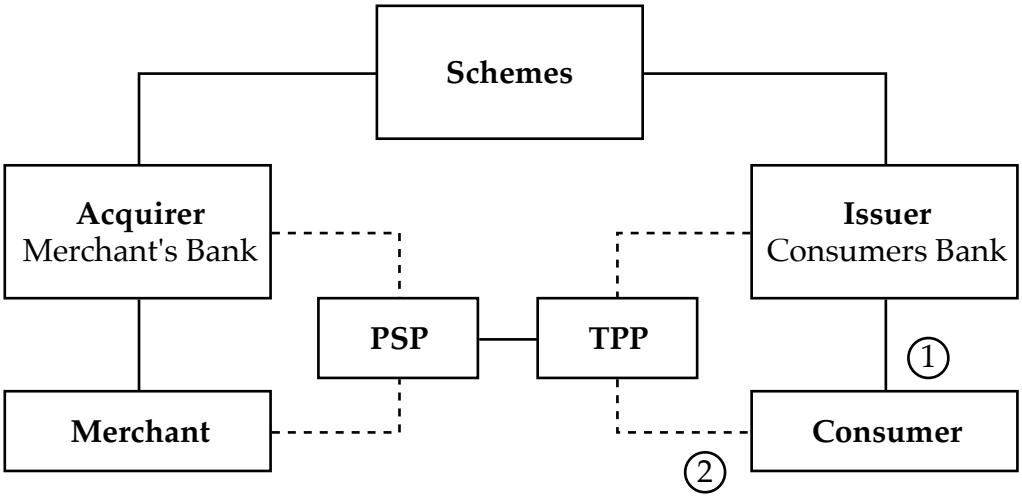

FIGURE 6.2: Four corner payment model extended with the TPP layer, the consumer has now two possibilities to perform their payments. The first traditional way that is by making use of the schemes. Second the consumer can use the TPP layer and bypass the schemes.

[4]https://www.sofort.com/
[5]https://trustly.com/

When the consumer want's to use the second option and bypass the schemes, the TPPs need access to a consumer's online banking environment. Hereafter the TPP can initiate a payment by making use of a software bridge between the bank accounts of a consumer and a merchant. This service is called a payment initiation service (PIS). The software bridge is based on two API's: on the TPP side and on the PSP or acquirer side.

Besides the payment initiation service through the TPP layer a second service becomes available. This service is based on the collection and consolidation of consumers information. This information can be gathered from different consumer bank accounts and finally will be presented in a single place. These services are called account information services (AIS). Hereby consumers are able to have a globel insight into their financial situation (The European Commission, 2018a).

These two new possibilities are expecting to transform the universal banking and payment models. Financial technology companies (fintechs) and startups are targeting specific chains of the traditional banking value chain by using these new possibilities in order to improve their own business models (Cortet, Rijks, & Nijland, 2016). They could provide new alternatives for the current payment methods or banking information apps.

6.2.3 Payment Ecosystem Actors Linked to the RSEEM Stakeholders

Based on the research of Iansiti and Levien (2004) this research indicates three kinds of actors in the business ecosystem; the keystone, physical dominator and the niche actor. These actors are the fourth dimension of the RSEEM, see Figure 4.7. By using the 'level of turbulence and innovation' and the 'complexity of relationships' presented in Figure 3.4, this research divides the payment ecosystem into three main actors. First there are the banks (issuer and acquirer banks) which have large complexity of relationships but do not have to have a high level of turbulence and innovation. Secondly there are schemes which have high levels of complexity of relationships and high level of turbulence and innovation. Third there are fintechs which are having a high level of turbulence but do not have to have complex relationships.

6.3 Case Study Results

As stated in Section 6.1 a questionnaire of 36 statements was conducted by nine interviewees. Of these nine interviewees three identified themselves as niche, three as physical dominator and three as keystone actor. The results per interviewee can be found in Appendix I. The individual scores were summed per measurement, $R_{(1...36}$, of the different stakeholders (banks, schemes and fintechs). Next the average score per measurement of all these stakeholders is calculated.

This resulted in a RSEEM including calculated scores per actor, as be seen in Figure 6.3. The highest score in the figure is 1,7 (Fintechs, S2) which indicate that on average these actors almost fully agreed with the statement. On the other side the lowest score is -1,7 (Banks, S7) which indicate an average these actors almost fully disagree with the statement. To present the differences between the low and high scores a color scale is used in the Figure. The totally agree scores (+2) were marked with a green color, were the totally disagree scores (-2) were marked with a red color.

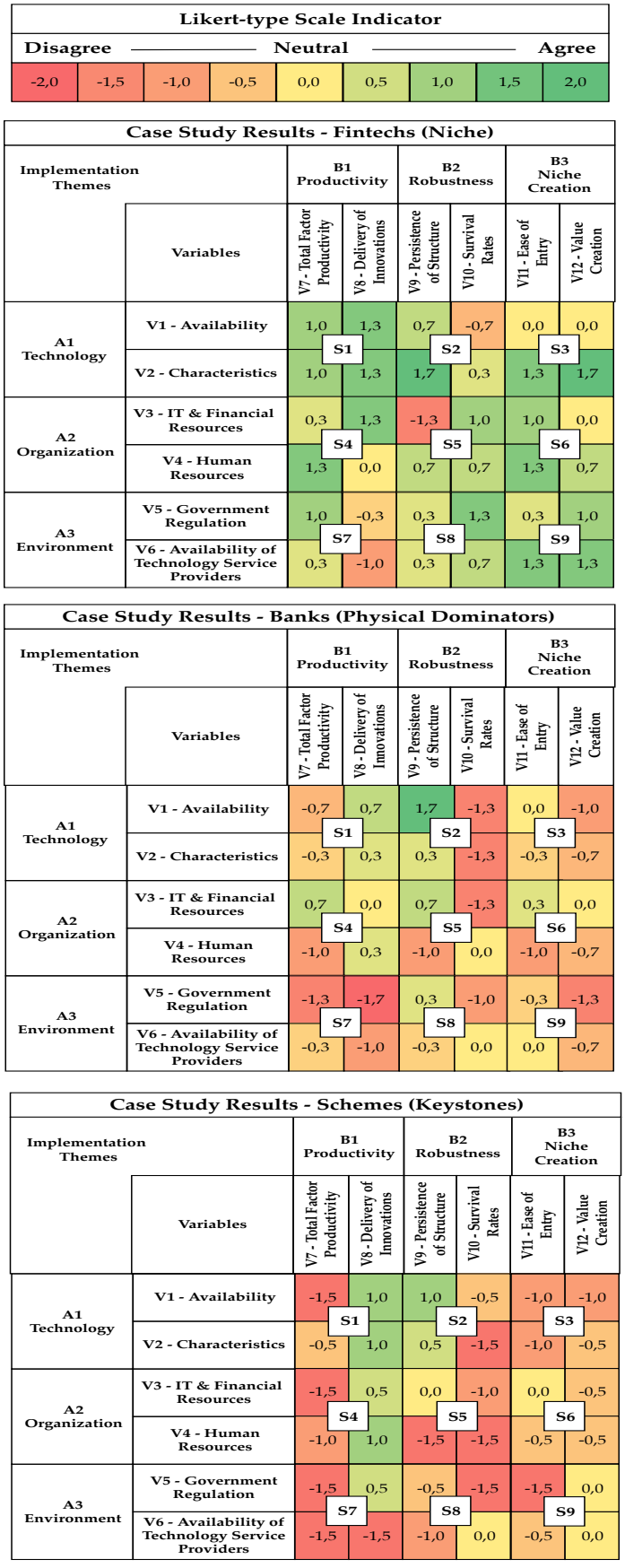

FIGURE 6.3: Case study results divided over the three different actors in the business ecosystem. The results are average numbers, presented in a Likert-type scale from -2 (red) till +2 (green).

Differences of Conceptions in the Business Ecosystem

Per measurement the average score is calculated over all three stakeholders. This has been done to measure the largest difference between the average and the score per stakeholder. This difference indicates were the actors in the business ecosystem are divided most in their opinions about the effects of the introduced regulated techstandard. The scores were converted into absolute numbers to measure the difference between the average numbers and the related score.

Three measurements were equal or scored above a 1,6 score difference. The largest difference is measured in measurement R18 (S5), effects of IT and financial resources on the survival rates in the business ecosystem, with a score of 1,8. This score is based on the fintechs that agreed with the IT and financial resources that are needed for PSD II, will have a positive influence on the survival rates in the business ecosystem. The schemes and banks disagree with this statement. Second biggest difference is measured in measurement R30 (S8), effects of government regulations on the survival rates, with a score of 1,7. In this measurement the fintechs almost fully agreed that due to the PSD II as a regulatory government regulation some companies will stop to exist. Where the schemes and banks do not agree and think it has no impact on the survival rates. The third and last score that scored above 1,6 was measurement R25 (S7), the effects on government regulation on the total factor productivity in the business ecosystem. The difference measured is 1,6. Also in this third largest difference, the score is based on a agreement of the fintechs and a disagreement of the schemes and banks. Where the fintechs think that the government regulation PSD II will increase the productivity, the schemes and banks are of opinion that it will not increase the productivity.

In general the differences in conceptions in the business ecosystem are largest between the fintechs and the other two actors: schemes and banks.

Agreements of Conceptions in the Business Ecosystem

The same calculation as the calculation of the differences in conceptions, has been done to measure the agreements of conceptions in the business ecosystem. This resulted in one measurement that was on average equal or lesser than a 0,4 score difference. The measurement corresponding to this score is R2 (S1). The statement asked to the interviewees was: 'The availability of the open API's will change the structure of doing business for your company'. All actors in the ecosystem agreed with the statement. Although the banks agreed less with this statement than the fintechs. The conceptions in the ecosystem differ between the three actors. If this is linked to the adoption process of PSD II, it is expected that the collaboration in adopting the regulation is small due to the different opinions.

6.4 Case Study Analysis

Based on the case study results per actor a new figure is created that presents the results in one overview, see Figure 6.4. By using this figure each implementation sector is analyzed to explain the effects of PSD II as a regulated techstandard on the business ecosystem health of the financial payment ecosystem.

Implementation Themes		B1 Productivity						B2 Robustness						B3 Niche Creation					
	Variables	V7 - Total Factor Productivity			V8 - Delivery of Innovations			V9 - Persistence of Structure			V10 - Survival Rates			V11 - Ease of Entry			V12 - Value Creation		
A1 Technology	V1 - Availability	1,0	-1,5	-0,7	1,3	1,0	0,7	0,7	1,0	1,7	-0,7	-0,5	-1,3	0,0	-1,0	0,0	0,0	-1,0	-1,0
	V2 - Characteristics	1,0	-0,5	-0,3	1,3	1,0	0,3	1,7	0,5	0,3	0,3	-1,5	-1,3	1,3	-1,0	-0,3	1,7	-0,5	-0,7
A2 Organization	V3 - IT & Financial Resources	0,3	-1,5	0,7	1,3	0,5	0,0	-1,3	0,0	0,7	1,0	-1,0	-1,3	1,0	0,0	0,3	0,0	-0,5	0,0
	V4 - Human Resources	1,3	-1,0	-1,0	0,0	1,0	0,3	0,7	-1,5	-1,0	0,7	-1,5	0,0	1,3	-0,5	-1,0	0,7	-0,5	-0,7
A3 Environment	V5 - Government Regulation	1,0	-1,5	-1,3	-0,3	0,5	-1,7	0,3	-0,5	0,3	1,3	-1,5	-1,0	0,3	-1,5	-0,3	1,0	0,0	-1,3
	V6 - Availability of Technology Service Providers	0,3	-1,5	-0,3	-1,0	-1,5	-1,0	0,3	-1,0	-0,3	0,7	0,0	0,0	1,3	-0,5	0,0	1,3	0,0	-0,7
	ACTORS	Fintechs (N)	Schemes (K)	Banks (P)	Fintechs (N)	Schemes (K)	Banks (P)	Fintechs (N)	Schemes(K)	Banks (P)	Fintechs (N)	Schemes (K)	Banks (P)	Fintechs (N)	Schemes (K)	Banks (P)	Fintechs (N)	Schemes (K)	Banks (P)

S1 S2 S3 S4 S5 S6 S7 S8 S9

FIGURE 6.4: Case study results divided over the three different actors in the business ecosystem. The results are average numbers, presented in a Likert-type scale from -2 (red) till +2 (green).

Case Study Analysis on Sector S1

In the first implementation sector (S1) all actors see the availability and characteristics of the new technology, the new API's that have to be provided by the acquirer and issuer banks, as a positive factor for the delivery of innovations. Although the fintechs see this more positive as the schemes or the banks. A reason for this difference can be that the fintechs can benefit from the open API's directly and are not obligated or forced to implement these API's where the other actors are. This can also be linked to the scores related to the total factor productivity. During the adoption of PSD II the interviewees who represented the schemes and the banks, stated that the productivity will decrease with the introduction of the new open API's. The reasons they gave for this are compliance costs, maintaining security and the forced dedication of development resources who cannot be spend on other projects.

Case Study Analysis on Sector S2

Based on the results of the second implementation sector (S2) it can be concluded that the persistence of structure will change due to the availability of the new API's and their open characteristics. All actors in the business ecosystem agreed with this. Although the schemes indicated the lowest score on the statement related to the open characteristics of the API's and the impact on the structure. They argued that current schemes and payment methods are trusted by the consumers and that on the short term these consumers are not directly choose another TPP payment method.

Secondly the results related to the effects of the availability and characteristics of technology towards the survival rates are more disagreed. The actors in the ecosystem disagreed with the statement that the availability and characteristics of the API would positively influence the survival rates. The actors think due to the new TPP layer 'muliple' actors will stop with a certain business unit or stop completely. They think that the PSD II regulation is the catalyst for a new wave of companies that will takeover market share.

Case Study Analysis on Sector S3

In the third implementation sector (S3) the banks and schemes disagree with the increasing ease of entry and value creation due to the availability of new API's with an open characteristic. These actors think that the API's will decrease the value and will not have a positive effect on the ease of entry. Both actors think that the fintechs still have to obtain a lot of licenses to enter the market, that are not easy to obtain.

On the other side due to open characteristics these actors think that the value creation will decrease because of security concerns. They are afraid of increasing fraud rate and misuse of the information that becomes available. The fintechs think the characteristics of the technology will have a positive influence on the value creation because they are now able to use information of the banks with more ease.

Case Study Analysis on Sector S4

In the fourth implementation sector (S4) there is agreement between the effects on the delivery of innovations. In S1 the availability and characteristics were also positively influencing the delivery of innovations. Almost the same agreement is achieved in S4. All three actors think the IT and financial resources, and human resources can lead to more delivery of innovations. Also all actors state that more resources will lead to delivery of innovations.

About the effects of IT, financial and human resources on the total factor productivity the opinions are divided. Based on the results this research concludes that the fintechs see a clear positive relation between, more human resources in the company will result in bigger total factor productivity. Compared to the schemes and the banks who are of opinion that more human resources will not help them in the long run to achieve a higher total productivity ,when adopting PSD II. An example they gave is the speed in which other companies work with lesser human resources. They think that the teams in their companies need a cultural shift not an increase in volume.

Case Study Analysis on Sector S5

In the fifth implementation sector (S5) there is a split in the opinion about the effects of the IT, financial and human resources on the survival rates. The fintechs think that the needed resources to implement PSD II are positively correlated to the survival rates. So they think that there will be no companies that stop to exists due to, for example a lack of financial resources when implementing PSD II. On the other side the schemes and the banks think that these resources will impact the survival rates. They gave examples of large IT legacy systems that are not capable to implement the mandatory API layers on.

The effects of the IT, financial and human resources on the persistence of structure is divided over the three actors. Where the fintechs think that the structure of their company does not need a change because of human resources do the banks and schemes think they have to change the complete culture of their way of working. They have this opinion because they are afraid of working too slow compared to the fintechs. The IT & financial resources that are needed for implementing the PSD II regulation are according to the banks and schemes not of influence on the persistence of structure. The fintechs think that it will have no impact at all.

Case Study Analysis on Sector S6

In the sixth implementation sector (S6) the overall opinion of the fintech is more 'agreeing' with the statements and the schemes and banks are more 'neutral' or 'disagreeing'. Fintechs see both the IT, financial and human resources as a positive factor on the ease of entry. They think that the PSD II regulation will lower possible entry barriers and that necessary resources are not of a size that they will increase entry barriers. The banks and the schemes on the other side think that the three resources will not be of that large impact on the ease of entry. They argued that it is not the resources that are needed to enter the market but certain licenses that are hard to acquire.

The opinions about the effects of the organization variables on value creation is almost the same as the previous discussed effects. The value creation is according to the actors not depending on the organizational variables but more on the technology variables.

Case Study Analysis on Sector S7

In the seventh implementation sector (S7) the opinion of the three actors about the influence of government regulation and the availability of technology service providers on the total factor productivity, can be compared to the scores of S4 and S1. In all these three sectors the fintechs are more on the side of agreeing, where the schemes and banks are more on the side of disagreeing. The fintechs think that the government regulation in general will improve the total factor productivity as they can provide the consumers with faster and better ways of paying. Where the banks and the schemes think that this regulation will decrease the total factor productivity as they will have to put more effort into the extra payment layer (TPP) without direct benefits.

The opinion of the banks about the effects of the environment variables on the delivery of innovations is in general disagree. The banks disagree almost full with the statement 'PSD II will deliver useful innovations for my company'. They think that the consumers and third parties will benefit from the regulation, but that there is not direct benefit for the banks.

The availability of technology service providers is not expected to be usefull on the delivery of innovations related to PSD II. All actors gave the reason they have to build the applications themselves in order to be secure and create added value.

Case Study Analysis on Sector S8

The opinions in the eighth implementation sector (S8) are divided. The actors have a neutral opinion about the effects of government regulation and the availability of technology service providers on the persistence of structure. Some fintechs and bank interviewees gave an explanation of this. They said that the PSD II regulation can be a catalyst but is not the only reason why the companies in the ecosystem are changing there structures.

On the other side the actors are totally not agreeing with each other on the statement related to the effects of government regulation on survival rates. The statement corresponding to this is: 'Due to PSD II regulation some companies or payment methods will stop to exits'. The banks and schemes argued that for example iDEAL is a payment method in the Netherlands that is so trusted by the consumer that they are not going to switch to a new payment method initiated by a new party in the market. Where the fintechs argue that payment methods like iDEAL will stop to exists within the next five years.

Case Study Analysis on Sector S9

The results of the ninth and last implementation sector (S9) presents two main findings. The first is the strong disagreement of the schemes on the effects of government regulation on the ease of entry. The corresponding statement is: PSDII will result in a lower ease of entry of companies in the payment ecosystem. The schemes are of an opinion that PSD II wil make it on a technology part easier but the companies that want to enter the ecosystem, for example in the Netherlands, still have to acquirer licenses with very strong requirements. These licenses are according to the schemes not easily obtained at 'De Nederlandse Bank'[6].

Second the general opinion of the fintechs compared to the opinion of schemes and banks is more agree than disagree. This is related to the environment variable effects on the value creation. According to the experts this is related to the direct usability of the PSD II regulation by the fintech. Where to banks have to provide entry ways to their systems for which they are not allowed to ask money for and thereby cannot directly add value such as the fintechs can.

[6]https://www.dnb.nl/

Chapter 7

The Regulated Standards Ecosystems Effect Model

This chapter answers **SQ3:** *How can a model be defined that provides actionable insight for practitioners?*, by presenting the final and a light version of the Regulated Standards Ecosystem Effect Model (RSEEM). The final RSEEM serves as prescribing model for researching the effects of a regulated techstandard introduction on a business ecosystem. As supported by the experts the RSEEM will help scientists and practitioners in measuring these changes. The final model includes all initial dimensions and implications for all three different actors. This version of the RSEEM will be presented in Section 7.1. During the evaluation by the experts, multiple experts requested a 'light' version of the RSEEM. With this version they could adopt the model with more ease. Based on this feedback a light version is created and will be presented in Section 7.2.This chapter will be concluded by answering SQ3 in section 7.3 and thereby place the RSEEM in the current research fields and into practice.

7.1 The final RSEEM version

The final version of the RSEEM is presented in Figure 7.1. Based on the evaluation in Chapter 5 and adoption in practice presented in Chapter 6 the final model is constructed. The final RSEEM exists out of four dimensions: the research fields, implementation themes, variables and actors. These dimensions resulted into nine implementation sectors and 36 corresponding measurements. These sectors and measurements have all different effects on the different actors. The nine sectors in the RSEEM are including reference numbers $S_{1...9}$.

7.2 A Light version of RSEEM

The light version of the RSEEM is presented in Figure 7.2. This version represents a high level overview model to indicate the changes for a business ecosystem caused by the introduction of a regulated techstandard. This light version exist out of two dimensions: implementation themes and variables. As can be seen in Figure 7.2 the original first dimension 'research fields' is not included. This dimension is an underlying layer that act as a theoretical foundation. Therefore this dimension is not included in the light version. Secondly the original fourth dimension 'actors' is not included. The dimension is used in another way, in the light version.

The light version is based on the practical usage of the RSEEM and show the results focused on a specific actor in the ecosystem. The results of the nine implementation sectors

Research Fields			Business Ecosystem Health Business Ecosystem Health Measurement (Iansiti & Levien, 2002)		
	Implementation Themes		B1 Productivity	B2 Robustness	B3 Niche Creation
		Variables	V7 - Total Factor Productivity V8 - Delivery of Innovations	V9 - Persistence of Structure V10 - Survival Rates	V11 - Ease of Entry V12 - Value Creation
Technology Adoption TOE Framework (Tornatzky et al., 1990 and Iacovou et al. Model Iacovou et al. (1995)	A1 Technology	V1 - Availability V2 - Characteristics	R1 R2 S1 R3 R4 N K P	R5 R6 S2 R7 R8 N K P	R9 R10 S3 R11 R12 N K P
	A2 Organization	V3 - IT & Financial Resources V4 - Human Resources	R13 R14 S4 R15 R16 N K P	R17 R18 S5 R19 R20 N K P	R21 R22 S6 R23 R24 N K P
	A3 Environment	V5 - Government Regulation V6 - Availability of Technology Service Providers	R25 R26 S7 R27 R28 N K P	R29 R30 S8 R31 R32 N K P	R33 R34 S9 R35 R36 N K P

FIGURE 7.1: The final version of the RSEEM, including all dimensions.

Implementation	Themes	B1 Productivity	B2 Robustness	B3 Niche Creation
	Variables	V7 - Total Factor Productivity V8 - Delivery of Innovations	V9 - Persistence of Structure V10 - Survival Rates	V11 - Ease of Entry V12 - Value Creation
A1 Technology	V1 - Availability V2 - Characteristics	S1	S2	S3
A2 Organization	V3 - IT & Financial Resources V4 - Human Resources	S4	S5	S6
A3 Environment	V5 - Government Regulation V6 - Availability of Technology Service Providers	S7	S8	S9

FIGURE 7.2: A light version of the final RSEEM, exluding the first and fourth original dimension.

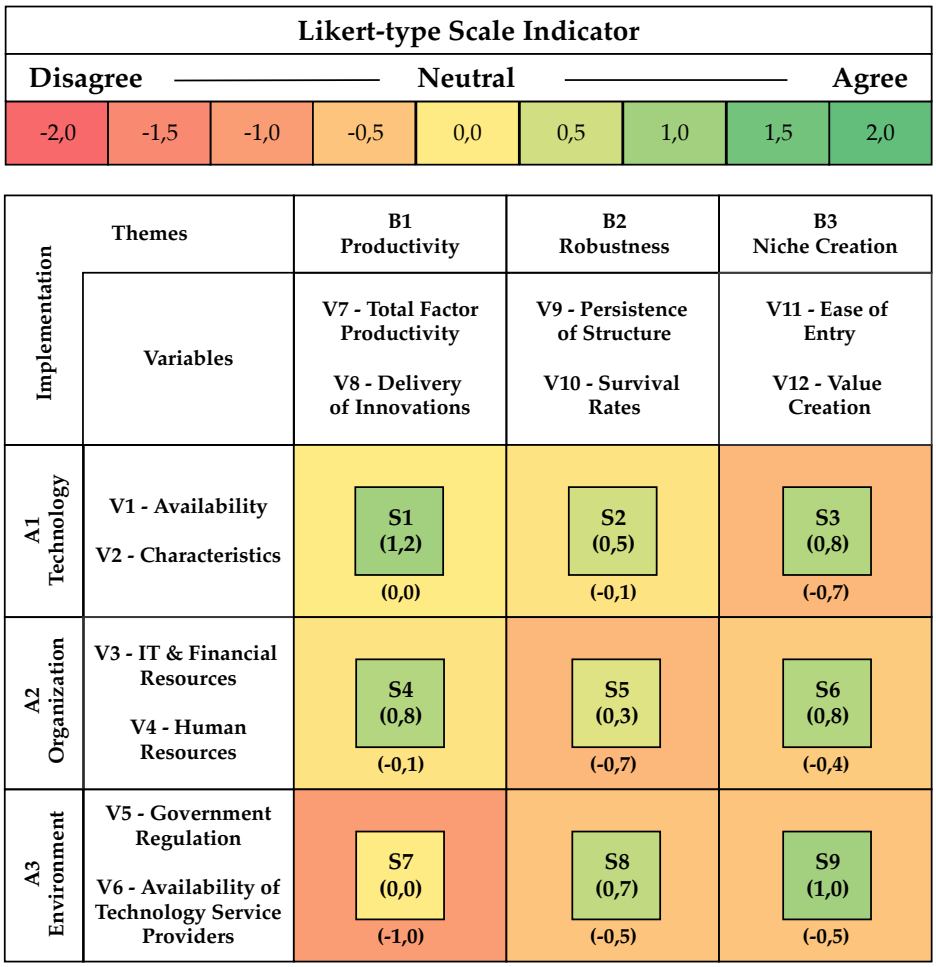

FIGURE 7.3: A light version of the final RSEEM, for a niche actor. Based on the case study of Chapter 6. The inner squares are the average opinions of the niche actors (fintechs) and the outer square is the average general opinion of the other actors in the ecosystem.

are presented for the specific actor compared to the ecosystem. As can be seen in Figure 7.2 each implementation sector has two squares, one small square within a big square. The model present the average results of the specific actor in the small square. In the outer bigger square the model shows a summarized opinion of the other actors in the ecosystem. Thereby the actor can see how companies of his kind are thinking about the implementation sector compared to the ecosystem. Based on the case study of Chapter 6, an example light model for a niche actor (fintechs) is created to show how this light model could work. See Figure 7.3 for the resulting light RSEEM for a niche actor.

The scores in Figure 7.3 are based on the statements that were asked to the different actors in the case study. The average scores of the four statements per implementation sector represents the average scores in each squares. By making use of the Likert-type scale Indicator of Chapter 6 the scores are linked to a colour. Thereby a general conclusion can be drawn for the niche actors (fintechs) in the payment ecosystem. The fintechs in the payment ecosystem expect that the PSD II regulation will be of a more positive influence on the ecosystem as the other actors (schemes and banks) do.

7.3 Conclusion - RSEEM in Research and Practice

Two versions of the RSEEM are divined in order to provide actionable insight for practitioners. The RSEEM final version and the RSEEM light version. The final model can be used by scientists to research the effect of regulated techstandard introduction on a business ecosystem. This model includes all dimensions of the original model and provides a direct insight of the whole ecosystem.

On the other side practitioners can use the light version of the RSEEM to acquire actionable insights. The model is focused on the view of one specific actor. Based on the feedback of the expert interviews and the case study, this study used the one sided view for practitioners.

Chapter 8

Discussion

In order to improve the scientific value of this thesis report, it is important to be transparent about the limitations. Therefore this section will discuss the limitations and create insights for other researchers to evaluate the project findings on soundness. After the limitations the recommendations for future work are presented.

8.1 Limitations of the research

The first limitation of this thesis project is the fact that the data gathering is fully based on a qualitative research techniques. Although this research has tried to prevent threads to the validity that qualitative research brings. It is possible that the input of the experts had a subjective bias on the results.

The second limitation of this research is the setup location. This had a large influence on the selection of the experts and the case study results. As all experts that were interviewed are conducting their work in the Netherlands, the results of this research cannot be generalized to regulated standards that are introduced in other countries. Although, the results of this research can still be used as a reference for studies that are conducted in other countries.

The third limitation of this research is with respect related to the case study. First of all, among researchers often a 'single case study' is seen as a serious thread to the validity. Because of this reason researchers have a general opinion that a 'multiple case study' reduces the thread to the validity. Because of time and resources limitations this limitation could not be easily overthrown. The experts that were interviewed for the case study were specialist in the regulation that is introduced. These same experts could not answer the same questions for another regulation. This implies that for every case study, a different regulation has to be tested, so new experts need to be interviewed. Because of the time constraints of this project, this was not possible.

The next and fourth limitation to this research, with respect to the RSEEM measurements, is the phase of technology adoption in which the measurements are measured. The RSEEM measures the effects of a regulated techstandard introduction on the business ecosystem during the initiation phase of the introduced regulation. During this phase the companies have to decide how and on what level they have to implement the new standard. To validate the effects of the RSEEM, more research during the different technology adoption phases should be conducted to see what the effects between the different adoption phases are.

A fifth limitation is related to the fact that this research only involves one researcher. As this researcher is gathering the data, conducting the interviews and performing the data analysis. If a second researcher was involved during the interviews, this would increase the

validity of the research and the reliability of gathered results. When including this second researcher possible researcher bias could have been excluded.

The last limitation of this research is related to the fourth dimension of the RSEEM. Because of the qualitative approach and the time limitations. One stakeholder in the business ecosystem was not taken into account. The opinion of the consumers that consume the products of the companies in the business ecosystem. This limitation can be overcome by adding the consumer stakeholder into the model and conduct a large survey to gather their opinion about the introduced regulation. As the opinions of consumers can vary more than the three current stakeholders this requires also a statistical analysis.

8.2 Recommendations for Future work

The direct opportunities for future research are related to the previous mentioned limitations of this research. A quantitative based research could increase the reliability of the research results. This could be performed by setting up a survey among a large set of companies and practitioners from different countries, of the case study related business ecosystem. By making use of this quantitative research the key considerations related to the implementation themes can be tested of relatively importance and significance levels. The results could bring more focus to the RSEEM.

Besides the direct possibilities for future research this research also triggers some indirect possibilities. As this study focuses, due to the sponsoring company and the researchers interest, on the payment business ecosystem, the regulated standards in this ecosystem are researched. For a wider adoption range of the RSEEM it could be of interest to research the model in other business ecosystems. Examples are regulated techstandards that are introduced into the cryptocurrency market or into the supply chains (new electric cars). An example research question is: ***What are the effects of an regulated standard introduction related to cryptocurrencies influence the financial business ecosystem?***

The previous called indirect opportunity is more related to the effect of a regulated standard. Besides this opportunity there are also possibilities from a business ecosystem point of view. As this research field could link the relation of entry barriers in the business ecosystem towards the introduction of a regulated standard. One could argue that differences between entry barriers could have complete different effects on the introduction of a regulated techstandard. The possible research question that could be asked is: ***What are the effects of entry barriers in the business ecosystem, and the introduction of a regulated techstandard?***

The last indirect possibility for research future work is the broader adoption of the RSEEM over different ecosystem. This research focuses on the business ecosystem, but an extension could be towards the software ecosystems. As the inter operation of software and business is close, this could of be an added value to the RSEEM as an extra dimension.

Chapter 9

Conclusion

In this chapter all sub questions and the main research question are answered. The sub research questions are contributing to the answer of the main research question, therefore a summary of the answers to these questions will be given separately. After this an answer to the main research question will be given.

9.1 Sub questions

This section will answer the sub questions of the research. The answers to these questions will contribute together to the answer of the main research question of this research. Each sub question addresses another part of the main research question.

SQ1: *What are the factors of the different technology adoption models related to the adoption of new standards?*

In scientific literature three main factors of technology adoption models are identified that are related to the adoption of new standards. The first two factors are based on the research of Tornatzky et al. (1990): technology and environmental context. The third factor is based on the research of Iacovou et al. (1995): organizational readiness. By using these three factors the regulated standard that is introduced can be researched on three different aspects on a company level. Each stakeholder company in the business ecosystem can thereby identify how the regulated standard is influencing the company.

SQ2: *How does business ecosystem health influences the adoption of new standards?*

Based on the systematic literature study of Chapter 3, three main factors in business ecosystem health research are identified. The first factor is productivity that measures the efficiency of the business ecosystem. Second is the robustness, the ability to survive changes such as the introduction of a regulated techstandard caused by the environment (government institutions). Third is the niche creation, the level of capacity to create diversity and value creation in the business ecosystem. These three factors have been implemented as a second dimension of the final model.

SQ3: *How can a model be defined that provides actionable insight for practitioners?*

By combining the technology adoption and the business ecosystem health research fields, this research defines a model that can deliver actionable insights for practitioners. Based on these research fields 9 implementations sectors with 36 corresponding measurements were identified. Based on the input of experts reviews three variables of the Regulated Standard Ecosystem Effect Model (RSEEM) conceptual version were changed. After the evaluation the model was used in a retrospective case study to show the practical implications. The final RSEEM, as can be seen in Figure 7.1, shows these implementations sections and corresponding measurements in one figure. As can be seen the figure the RSEEM takes three different actors into account in the business ecosystem: niche, keystone and physical dominators.

9.2 Research question

The main research question of this research was formulated as follows:

RQ: *What factors influence the adoption of new standards in a business ecosystem?*

This study reveals several factors that influence the adoption of new standards in a business ecosystem. These factors are not as straight forward that they can be explained by using traditional technology adoption or business ecosystem health models. Hence, the RSEEM fills the gap between these research fields and makes it possible to identify the factors and underlying effects that influence the adoption of a new standard in the business ecosystem. The RSEEM will support project managers who are facing the business challenges that rise from the regulated standard that is introduced in the business ecosystem.

Based on this conclusion several recommendations can be derived. First when a regulated techstandard is introduced in the business ecosystem, the different actors should not underestimate the implementation time. As multiple implementation sectors have indicated the effects are divided into short and long term effects. Only becoming compliant with a regulated techstandard implies in most cases a drop in market share, which is bad for the whole ecosystem. Second, the companies in the business ecosystem should use the RSEEM to update their thoughts about the strategy of other actors in the business ecosystem. By doing so the actors can find possibilities for new collaborations within the business ecosystem, to implement the regulated techstandard together. This can be beneficial for the whole ecosystem.

In addition to the main research question this research also showed how these answers were gathered by formulating all steps that were needed to construct the RSEEM. The first step was a literature study, the next step was a formulating a conceptual model of which the key considerations were verified by expert reviews. Last the model was used in a case study to determine the practical usefulness. The used case study approach can also be used to answer comparable research questions: "What are the effects of regulated techstandard introduction related to cryptocurrencies influence the financial business ecosystem?"

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Appendix A

Systematic guide to a literature review

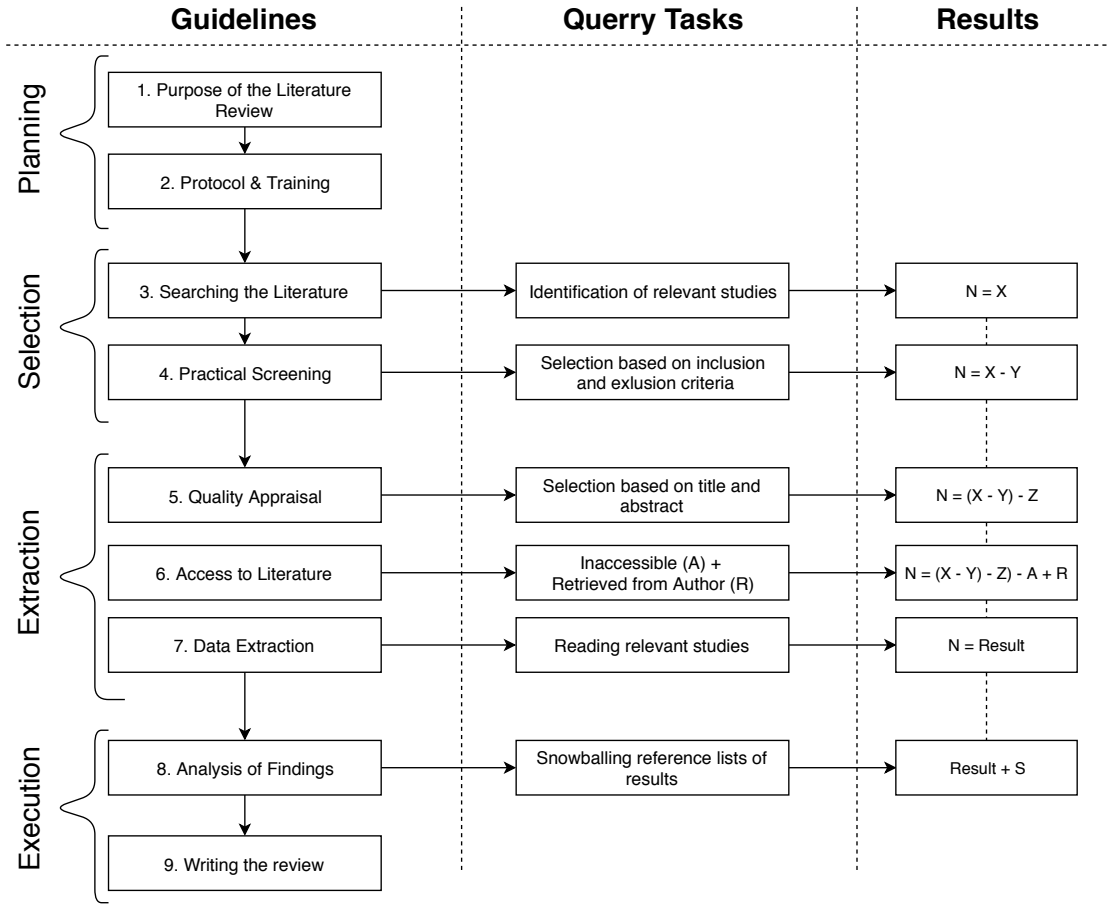

FIGURE A.1: Visualization of systematic guide to literature review development based on Okoli and Schabram (2010).

Appendix B

Expert Interview Protocol

This expert interview protocol was followed for the semi-structured expert interviews. As the structure of the interview is based on a semi-structured nature follow-up questions where asked ad-hoc. When transcribing the interview these ad-hoc questions where included.

Introduction

- Introduction of researcher and the context of the research.
- Introduction of the interviewee and ask to elaborate on his background.
- Definition of the research goals and problem statement.

Base Questions

1. How do you define the relation towards the adoption of a new standard and changing the technological grounding?
2. Can you give some examples of new standards that have been adopted in the ecosystem?

Implementation Theme Questions

Based on my systematic literature review on the research fields: Technology adoption and Business Ecosystem Health I defined several themes which are related to each other. I would like to know your vision and thoughts about these themes and the relationships towards these themes.

S1 - Technology and Productivity

3. Do you think that their is a relationship between technologies that come available will improve the productivity and delivery of innovations in the ecosystem?
4. Do you think that the character of a technology has a different effect on the productivity of a company and further delivery innovations?

S2 - Technology and Robustness

5. When we take a look into the availability and characteristics of technology, do you think these will change the structure of the business in the ecosystem? and the survival rates?

6. The more technology their is available the more value there will be created. Could you agree with this statement? If yes why? What do you think of this statement but than for the variety in the business ecosystem?

S3 - Technology and Niche Creation

7. The characteristic of a certain technological change can have an impact on the value created and variety in the ecosystem?

S4 - Organization and Productivity

8. Are there relationships you know of between IT and Financial resources and the productivity or delivery of innovations of a company?

S5 - Organization and Robustness

9. How do you think the relation between IT and Financial resources and the structure of a company is? And to the survival rates?

S6 - Organization and Niche Creation

10. The more financial and IT resources the more value creation and variety in the ecosystem. Agree or disagree with this statement? Why?

S7 - Environment and Productivity

11. What relationships do you see between the government regulations and the productivity and delivery of innovations of a company?

12. Do technological service providers have impact on the productivity and delivery of innovations?

S8 - Environment and Robustness

13. Are there regulations, that are in your opinion, changing the structure of the businesses in the ecosystem?

14. Could these regulations have an impact on the survival rates of your business ecosystem?

S9 - Environment and Niche Creation

15. How do you see the relationship between technology service providers and the structure and survival rates of the business ecosystem?

16. Could we argue that government regulations are positively correlated to the value creation and added value for your company?

End of the Interview

Did I forget any important themes or relationships related to the adoption of a new standard?

Have you any further remarks or questions for me?

Appendix C

Case Study Protocol

This case study protocol was followed for the semi-structured expert interviews. As the structure of the case-study interview is based on a semi-structured nature follow-up questions where asked ad-hoc.

Introduction

- Introduction of researcher and the context of the research.
- Introduction of the interviewee and ask to elaborate on his background.
- Definition of the research goals and problem statement.
- Explain the goal of the statements and in what scale they could be answered.

Base Questions

1. How do you define the relation towards the adoption of PSD2 and changing the technological grounding?
2. Are you defining yourself as a keystone, niche or physical dominator?

Case Study Statements

The questions asked are statements that could be answered on a likert scale base. The interviewee can answer the statements by fully agree (+2) score to fully disagree (-2).

S1 - Technology and Productivity

1. The availability of the new API's will increase our productivity.
2. The availability of the new API's is the starting point of new innovations.
3. The characteristics (Open/ AISP / PISP) of the new API's are positive for the productivity for my company.
4. The characteristics (Open/ AISP / PISP) of the new API's will deliver new innovations for my company.

S2 - Technology and Robustness

5. The availability of the open API's will change the structure of doing business for your company.

6. The availability of the new API's will have a positive influence on the survival rates of our kind of business.
7. The open characteristic of the new API's have an impact on the structure of doing business.
8. The open characteristic of the new API's have a positive impact on the survival rates.

S3 - Technology and Niche Creation

9. PSD2 increases the availability of certain technologies which increase the ease of entry to the business ecosystem.
10. PSD2 increases the availability of certain technologies which increase the value creation.
11. The characteristics of the new Open API's are positive for the ease of entry to the business ecosystem.
12. The characteristics of the new Open API's are positive for the value creation in the business ecosystem.

S4 - Organization and Productivity

13. The more IT and financial resources a company has for PSD2 the more productivity it eventually will deliver.
14. With more IT and financial resources we can deliver more innovations out of the adoption of PSD2 will come.
15. The more human resources a company has for PSD2 the more productivity it eventually will deliver.
16. With more human resources we can deliver more innovations for PSD2.

S5 - Organization and Robustness

17. The IT and financial resources that are needed for PSD2 will change the structure of doing business in my company.
18. The IT and financial resources that are needed for PSD2 will have a positive influence on the survival rates in by business ecosystem.
19. The human resources that are needed for PSD2 will not change the structure of doing business in my company.
20. The human resources that are needed for PSD2 will have a positive influence on the survival rates in by business ecosystem.

S6 - Organization and Niche Creation

21. PSD2 requires new API's for banks where new startups can work with, the IT and financial resources that are needed for this will positively influencing the ease of entry in the payment ecosystem.
22. The IT and financial resources that are needed for PSD2 will create more value in the payment ecosystem.

23. PSD2 requires new API's for banks where new start ups can work with, the human resources that are needed for this will positively influencing the ease of entry in the payment ecosystem.
24. The human resources that are needed for PSD2 will create more value in the payment ecosystem.

S7 - Environment and Productivity

25. PSD2 increases the totale factor productivity for my company.
26. PSD2 will deliver usefull innovations for my company.
27. Technology service providers are usefull with impementing PSD2 and increase productivity of my company.
28. Technology service providers are usefull with impementing PSD2 and increase the delivery of innovations for my company.

S8 - Environment and Robustness

29. PSD2 will change the structure of doing business in my business ecosystem.
30. Due to the PSD2 regulation some companies or payment methods will stop to exist.
31. The availability of the new third party AISPs and PISPs will have a positive influence on the persistence of structure of the payment ecosystem.
32. The availability of the new third party AISPs and PISPs will have a positive influence on the survival rates of the payment ecosystem.

S9 - Environment and Niche Creation

33. PSD2 will result in a lower ease of entry of companies in the payment ecosystem.
34. PSD2 will create more value for my company (Agree), or we see it as a mandatory regulation (Totally not agree).
35. The availability of the new AISPs and PISPs will result in a lower ease of entry, and thereby more third parties will enter the payment ecosystem which is positive for my company.
36. The availability of the new third party AISPs and PISPs will add more value for my company.

End of the Interview

Did I forget any important themes or relationships related to the adoption of PSD2?

Have you any further remarks or questions for me?

Appendix D

Milestones and Deliverables

Week	Date	Deliverable
1	01.02.2018	Start date graduation project
3	14.02.2018	Chapter 1: Introduction
5	01.03.2018	Chapter 2: Research approach
9	09.04.2018	Feedback MBI student on long proposal
11	23.04.2018	Chapter 3: Theoretical background
12	01.05.2018	Deadline long proposal
15	24.05.2018	Feedback on first colloquium slides
16	28.05.2018	First colloquium presentation
16	29.05.2018	Feedback and final long proposal
17	01.06.2018	Chapter 4: Conceptual model
20	18.06.2018	Chapter 5: Model evaluation
21	21.06.2018	Feedback and final conceptual model
23	01.07.2018	Chapter 6: Model in practice
25	19.07.2018	Chapter 7: Final model
26	20.07.2018	Feedback on second colloquium slides
27	23.07.2018	Second colloquium presentation
27	24.07.2018	Feedback and final results
28	01.08.2018	Chapter 8: Discussion
28	01.08.2018	Chapter 9: Conclusion
30	11.08.2018	Last version thesis and paper structure
33	01.09.2018	Final thesis and final scientific paper
33	06.09.2018	Graduation

TABLE D.1: Milestones and deliverables

Appendix E

Composition of Measurements of Third Dimension RSEEM

In Table E.1 a representation can be found of the third dimension and the corresponding 36 measurements.

Measurement	Sector	Implementation Theme Technology Adoption	Corresponding Variable	Implementation Theme Business Ecosystem Health	Corresponding Variable
R1	S1	A1 - Technology	V1 - Availability	B1 - Productivity	V7 - Total Factor Productivity
R2	S1	A1 - Technology	V1 - Availability	B1 - Productivity	V8 - Delivery of Innovations
R3	S1	A1 - Technology	V2 - Characteristics	B1 - Productivity	V7 - Total Factor Productivity
R4	S1	A1 - Technology	V2 - Characteristics	B1 - Productivity	V8 - Delivery of Innovations
R5	S2	A1 - Technology	V1 - Availability	B2 - Robustness	V9 - Persistence of Structure
R6	S2	A1 - Technology	V1 - Availability	B2 - Robustness	V10 - Survival rates
R7	S2	A1 - Technology	V2 - Characteristics	B2 - Robustness	V9 - Persistence of Structure
R8	S2	A1 - Technology	V2 - Characteristics	B2 - Robustness	V10 - Survival rates
R9	S3	A1 - Technology	V1 - Availability	B3 - Niche Creation	V11 - Variety
R10	S3	A1 - Technology	V1 - Availability	B3 - Niche Creation	V12 - Value Creation
R11	S3	A1 - Technology	V2 - Characteristics	B3 - Niche Creation	V11 - Variety
R12	S3	A1 - Technology	V2 - Characteristics	B3 - Niche Creation	V12 - Value Creation
R13	S4	A2 - Organization	V3 - IT Resources	B1 - Productivity	V7 - Total Factor Productivity
R14	S4	A2 - Organization	V3 - IT Resources	B1 - Productivity	V8 - Delivery of Innovations
R15	S4	A2 - Organization	V4 - Financial Resources	B1 - Productivity	V7 - Total Factor Productivity
R16	S4	A2 - Organization	V4 - Financial Resources	B1 - Productivity	V8 - Delivery of Innovations
R17	S5	A2 - Organization	V3 - IT Resources	B2 - Robustness	V9 - Persistence of Structure
R18	S5	A2 - Organization	V3 - IT Resources	B2 - Robustness	V10 - Survival rates
R19	S5	A2 - Organization	V4 - Financial Resources	B2 - Robustness	V9 - Persistence of Structure
R20	S5	A2 - Organization	V4 - Financial Resources	B2 - Robustness	V10 - Survival rates
R21	S6	A2 - Organization	V3 - IT Resources	B3 - Niche Creation	V11 - Variety
R22	S6	A2 - Organization	V3 - IT Resources	B3 - Niche Creation	V12 - Value Creation
R23	S6	A2 - Organization	V4 - Financial Resources	B3 - Niche Creation	V11 - Variety
R24	S6	A2 - Organization	V4 - Financial Resources	B3 - Niche Creation	V12 - Value Creation
R25	S7	A3 - Environment	V5 - Government Regulation	B1 - Productivity	V7 - Total Factor Productivity
R26	S7	A3 - Environment	V5 - Government Regulation	B1 - Productivity	V8 - Delivery of Innovations
R27	S7	A3 - Environment	V6 - Availability of Technology Service Providers	B1 - Productivity	V7 - Total Factor Productivity
R28	S7	A3 - Environment	V6 - Availability of Technology Service Providers	B1 - Productivity	V8 - Delivery of Innovations
R29	S8	A3 - Environment	V5 - Government Regulation	B2 - Robustness	V9 - Persistence of Structure
R30	S8	A3 - Environment	V5 - Government Regulation	B2 - Robustness	V10 - Survival rates
R31	S8	A3 - Environment	V6 - Availability of Technology Service Providers	B2 - Robustness	V9 - Persistence of Structure
R32	S8	A3 - Environment	V6 - Availability of Technology Service Providers	B2 - Robustness	V10 - Survival rates
R33	S9	A3 - Environment	V5 - Government Regulation	B3 - Niche Creation	V11 - Variety
R34	S9	A3 - Environment	V5 - Government Regulation	B3 - Niche Creation	V12 - Value Creation
R35	S9	A3 - Environment	V6 - Availability of Technology Service Providers	B3 - Niche Creation	V11 - Variety
R36	S9	A3 - Environment	V6 - Availability of Technology Service Providers	B3 - Niche Creation	V12 - Value Creation

TABLE E.1: Composition of Measurements of the third dimension RSEEM

Appendix F

Interview Summaries

For a natural flow of the interview the questions related to the sections, are asked not in a strict order. Therefore, as can be seen in the summaries of the interviewees, each summary has a different order of the discussed sections.

Interview 1

- Interviewee: Expert E1
- Date and Time: 26 July 2018, 13:30 - 14:30 (UTC + 2)

S7 - Environment and Productivity
The first implementation section discussed is related to the environment and productivity implementation themes. When asking E1 the effects of governmental regulations on the productivity of the business ecosystem he speaks of an increasing traction but on the long term the productivity will increase (**total factor productivity**). On the short term there will be an increasing variety in environment that already is very dynamic. To compete with these varieties the actors in the ecosystem have to reroute there changing capacities and will thereby reduce the productivity on the short term. As they cannot focus on new innovations but have to focus to become compliant in the first place (**delivery of innovations**).

S4 - Organization and Productivity
E1 thinks that the adoption of a regulated standard will change the distribution of the IT and financial resources, but also the capacity of the teams in the organization. First of all to become compliant with the regulated standard secondly because the companies want to increase there position in the ecosystem and thereby there productivity. These reroute of capacities will almost have a crippling effect on the short term productivity of the company (**productivity**). But when the companies are finally are compliant he expects that these regulations can improve the productivity and deliver more innovations (**delivery of innovations**).

E1 also thinks that there is a big difference between the IT and financial resources needed for the adoption of a regulation. As larger companies need more resources to become compliant it will take them longer to achieve increasing productivity out of it.

S9 - Environment and Niche Creation
Related to the short term effects of the government regulation E1 expects an increasing variety of the business ecosystem due to lowering entry barriers(**variety**). He expects that because of change in the flows between the companies in the payment ecosystem entry barriers will be lowered and thereby make it more easy for new start ups to enter the market.

He almost puts out an equation between the lowering entry barriers and the possibility for start ups to enter the ecosystem. E1 expects that the actor which can create the largest value will become the dominator in the ecosystem (**value creation**).

S1 - Technology and Productivity
E1 thinks that for example the PSD2 regulation is the start of a new revolution. When it is finally settled it will be the starting point of delivery of innovations and will have an reinforcing effect on the delivery of innovations (**delivery of innovations**). Due to regulations new flows in the market could be started which are sometimes needed. In addition to this E1 was asked what he thinks of the open API's of PSD2 and the new flows that this is creating, will this be beneficial for the ecosystem productivity? He thinks that productivity will be increased due to the easier access to information (**productivity**).

S8 - Environment and Robustness
Related to the government regulations and the persistence of structure E1 thinks that regulations can for example in the financial and payment ecosystem not change that much (**persistence of structure**). He calls the example that there always be a bank, on the one side on the merchant side and on the other side on the consumer side. These banks will control there money. Although the structure of the business ecosystem can change not on the actor side it could change the flows between the actors. This shift in flows can be encouraged by a government regulation and thereby set as a baseline for new innovations. When asking E1 if due to government regulations companies will stop to exist, he answers yes. But than not complete sectors but companies that cannot adapt due to the regulation (**survival rates**).

S5 - Organization and Robustness
Based on the regulation E1 thinks that it is very important to shift along with the market. If you see as a company, that there is a shift in the ecosystem and you don't dedicate to that shift with the right resources this could have impact on the structure but also on the survival rates (**survival rates**). E1 states that it is also important that although technology is available and all the mandatory actors are compliant it doesn't have to be that the customers of the actors have the resources and the will to change there structure for adoption of the new regulated standard. As these customer are not obligated to adopt the regulated standard they could leave the world as it is (**persistence of structure**). E1 gives an example of the possibility of using a new app for the representation of you bank account information. He thinks that it is possible to see this information through a new app not that many customers will use it right away as it is not that much trusted as your own bank. Because of this trust, E1 thinks that some banks will not go along with all the new innovations that come to the market. But leave it to the market, be compliant with the regulations and play the strategy of the trusted party where the consumer can store there money.

S3 - Technology and Niche Creation
When asking E1 if the availability and character of technology are having effects towards the value creation of the ecosystem he thinks that innovation always leads to value creation (**value creation**). Although he points out an important factor which is the actor who will benefit from this. Is this the industry of the end user, consumer in the payment industry? Due the availability of technology customers of our company (merchants), are happy with

these new availability as thereby they can increase the value creation due to new use cases. But these new use cases are sometimes not that impact full, E1 gives an example of the new payment methods that could arise from the PSD2 regulation. If these payment methods are just an addition to the 250 payment methods we already have on our platform than the value creation due to the availability of the technology is not that big (**variety**). Also a new available technology such as the PISP API's in PSD2 are so new that they have to prove itself in the market before it can really add value.

S2 - Technology and Robustness

E1 puts a relation between the availability and characteristics of a technology and the structure of the ecosystem. He sees that the ecosystem can change due to a innovate disruptive role, this can be caused due to an actor such as Adyen who enters the market. But this can also be caused by the underlying regulation that makes these disruptions possible. On the other side if a company is performing there business on a world scale and Europe is one of the markets they are performing there business in, than the availability and characters of the new technology due to a introduction of a regulated standard are not changing the structure or survival rates at all (**structure and survival rates**). Because than it is just an addition to the platform for this world wide performing company. When asking E1 the expectations of PISP and the survival rates of the current payment methods he expects that the current SEPA and bank transfer solutions will first stop to exist. Credit cards will thereby not be of directly threat as they have also an added value of provide credit to shoppers. Where the current SEPA and bank transfer solutions just transfer money.

S6 - Organization and Niche Creation

As mentioned before in S4 and S7 on the short term the IT and Financial resources will have limited effect. But E1 expects that on the long term regulation can lead to complete new service levels which causes an increasing effect on the variety and value creation in the business ecosystem (**variety and value creation**). But these effects are different between small and large organizations. E1 expects that large organizations have big legacy systems and thereby have to put in significantly more resources into play before they are compliant with the regulated standard. Where on the other side small new companies can achieve the same with less as they don't have these legacy systems. These start ups can for example just do business with the mind set of trial and error. Where banks have to be compliant and to live up to expectations of their current customers.

Interview 2

- Interviewee: Expert E2
- Date and Time: 26 July 2018, 15:30 - 16:30 (UTC + 2)

S7 - Environment and Productivity
E2 don't think that in general governmental regulations will increase the total factor productivity of companies. He explains this with the PSD2 example, where he tells that this regulation will brings new technologies that replace older ones but not in general increase the productivity (**total factor productivity**). The technology service providers in the ecosystem will also not have that much influence on the productivity although they will deliver new innovations they are just replacements of current technologies (**delivery of innovations**). Which eventually the consumer can chose to use or not to use.

S1 - Technology and Productivity
Based on the technology that comes available out of regulations, Francses thinks that this will not change the total factor productivity of the ecosystem (**total factor productivity**). He thinks that these technologies will replace the current technologies and thereby not increase productivity. He gave an example of the PSD2 regulation that is bringing the possibility of PISP payments and iDEAL. He thinks that iDEAL will work with the PISP framework and will not replace it (**delivery of innovations**).

S8 - Environment and Robustness
New regulations creates in general two thinks, new opportunities and new challenges. New opportunities will create new players. In case of PSD2 new competitors that will deliver new technology. On the other hand the existing parties in the payment ecosystem may transform into bigger companies which see these regulations as new challenges. The other side of new regulations is the fact that current actors have to adapt to the regulation and adopt it to become compliant or die. Concluding adopt or die (**survival rates**). When asking E2 what he means with adopt or die, he concluded that he don't think that full companies will die but he thinks that some branches of the company can stop to exist. The successful of this last is uncertain. He makes the comparison towards SEPA, when this regulation was put into force no parties stopped doing business. Although these parties had a very hard time (**persistence of structure**).

S9 - Environment and Niche Creation
E2 thinks that due to government regulations the variety in the ecosystem can increase. This is on the short term not of influence on the value creation for our company. If the case is just as with the local payment methods these new actors are becoming larger and a potential threat to the value creation for our company than we could integrate these actors into our platform and thereby start an alliance and embrace them. It is not a threat it is an opportunity (**Variety**). Can these goverment regulations be of added value for your company? E2 answers this by 'Yes' if the right decisions are being made. Which is following the merchant demand and not play along with the market, as that can be just market consolidation without the best goals (**Value creation**).

S3 - Technology and Niche Creation

E2 states that in some markets the available technology will have a big impact and in some markets not. He gives an example of the technology that comes available in Germany where it will be an increase in the value creation. Where in other markets it will just be an replacement without extra value creation (**value creation**). Creating value out of the API's is not only based on the current availability or the characters of technology. But most actors in the ecosystem that are embracing the movement of more API's are developing even more API's than just the open API's of PSD2 (**variety**).

S6 - Organization and Niche Creation
After the technology question E2 was asked to elaborate on the IT and Financial resources which is according to him of different impact on the value creation between the actors. Because when talking about PSD2 and the openness of API will impact the banks and schemes more than your company. As we are open already and don't have to comply but have the option to do so. So in terms of the resources we can chose to put them in for the implementation of the regulation, where the banks are forced to do so as they have to become compliant (**value creation**).

S5 - Organization and Robustness
The structure of companies and also the survival rates are according to E2 being influences by the IT and Financial resources. He gives an example from the PSD2 case. This will be different for each bank. Some banks are already working on all the API's and thereby don't need extra resources to implement the PSD2 regulation. So the structure of these banks is not changing (**structure**). Where other banks which are now waking up due to the regulation have to change their structure in order the even become compliant. These banks need to launch new projects to reach this compliance. He thinks that there will be two groups, on the one side there will be innovators and on the other side there will be banks that just become compliant (**survival rates**).

S2 - Technology and Robustness
As E2 called in the previous implementation sector discussing he thinks that there will be as split into the market and thereby also a split in the companies that see the availability of technology and characteristics of this in a positive way. The companies don't see this in a positive way will not change there structure and stay the same (**persistence of structure**). The companies that will change because of the available technology will probably also longer exist in the ecosystem (**survival rates**).

S4 - Organization and Productivity
The resources of organizations are according not having that much of influence on the productivity. But they do have direct influence for your companies revenue. As if the resources are put into the right new innovation the revenue of your company could increase (**total factor productivity**).

Interview 3

- Interviewee: Expert - E3
- Date and Time: 26 July 2018, 09:00 - 10:00 (UTC + 2)

S7 - Environment and Productivity
The interview with E3 starts about the regulations that can influence the productivity of the ecosystem. He states that for example the PSD2 regulation on general is not directly influencing the productivity of the companies. As by this regulation payments in the ecosystem are not becoming more and more efficient. Also if we look towards this government regulation in a compliance perspective the banks in the payment ecosystem have to do extra stuff to become compliant. And for this extra work there is not directly extra revenue. Due to this compliant aspect E3 sees a negative effect on the government regulation (**total factor productivity**). E3 thinks that the availability of technology service providers is not directly influencing the productivity of the companies. The reason for this is that the companies will develop the needed services by themselves instead of using them from the market (**delivery of innovations**).

S1 - Technology and Productivity
E3 thinks that the availability of technology and the characteristics are not directly increasing the productivity of the company in the ecosystem. He calls an example of the AISP and PISP possibilities initiated due to the PSD2 regulation. Although these are available still when using the PISP functionality the same amount of steps, when performing a payment, has to be taken. And therefor this technology will not directly improve the productivity of the company (**productivity**). Also E3 thinks that there will be companies in the ecosystem that just become compliant with the regulations, and will not use the available technologies to deliver new innovations. He thinks that some companies even stop with some support of certain technologies and focus even more on there core product to increase productivity (**total factor productivity**).

S8 - Environment and Robustness
Government regulations can have a change in the persistence of structure. E3 call multiple examples of companies that are being founded based on past regulations and joint ventures between banks. As he calls Yolt which is a daughter company of ING and our company the initiative of multiple banks as new payment method based on the PSD2 regulation. By these initiatives the structure of doing business changes (**persistence of structure**) .

The structure of the companies in the ecosystem can change due to governmental regulations. If we look into the PSD2 regulation and thereby the effects on the structure of companies, E3 don't think this will change enormous changed in structures.

When asking E3 if there will be a negative impact of PSD2 on the survival rates of banks he agrees with this statement. But he is not sure if this regulation is the last straw that breaks the camel's back (**survival rates**).

S9 - Environment and Niche Creation
The PSD2 example of a government regulation is explained by E3 as a regulation that will increase innovation and thereby the variety in the market. An example of this is the ING bank in the Netherlands that tries to present themselves in the press as the next go to bank

for financial related IT services. They try by this presentation to create more value out of the government regulation PSD2 than other banks (**value creation**).

Another thing that E3 states is the increasing number of start ups in the market due to government regulations, he expects that these numbers are more and more taking offer very small parts of the legacy banks and will thereby lose market share. But these start ups are not only there because of the regulations. E3 states that Adyen, Stripe and Transferwise would also be founded without the regulations. So the growing numbers of the variety are not only being determined by the government regulations. What a regulation such as PSD2 does is possible be an accelerator of these numbers (**variety**).

Together with an master student they performed a market study and the expectations of the participating companies is expecting that the variety in companies will increase due to of PSD2. Be more specific he thinks that the AISP related companies will be entering the market in biggest numbers (**variety**).

S2 - Technology and Robustness

The availability of technology and the open character also causes according to E3 an interesting shift of structures for the companies as in the Netherlands Bunq has for example made open API's available where other banks can profit from. Where bigger companies can use this by big marketing campaigns to use this available technology although they are not the founders and creator of these technologies (**structure**).

So instead of changing the structure to a development company they are using the available technologies and create more market share due to a market campaign. What E3 also sees in the market is that due to the regulation technologies come available which in some cases companies will use to take the next step in their company structure. They will use this to start the needed digital revolution. But this will go beyond the PSD2 regulation, as this is just one of the steps you have to take to transform your business into a new one (**survival rates**).

S4 - Organization and Productivity

When asking E3 to the resources of companies and thereby the result in delivery of innovations and productivity he sees a difference between large and middle size companies. Where the large companies are getting relatively easier compliant have the middle size banks way more trouble to go beyond compliance. And thereby don't increase productivity and deliver innovations (**Productivity and delivery of innovations**).

Elaborating more on these resources and specially on the IT resources and legacy systems E3 sees differences between the resources needed for large and small companies. Where small companies are often limit by these resources are big companies not. Also E3 thinks that the IT and Financial resources are fully linked and cannot be seen apart from each other. Although infinite financial resources do not have to have a increase productivity. To give an example with 30 employees working in a small bathroom upgrade will not deliver the bathroom earlier in time. As there are too many people in the same room (**productivity**).

S5 - Organization and Robustness

When having more IT and Financial resources it is for the company easier to choose a structure instead of having little resources and perform your business with only the things you have at that moment. Companies with lots of resources can just buy extra development

power and don't have to change the whole structure of the company (**persistence of structure**).

But according to E3 having a lot of IT resources and also being a large company can also cause in the future legacy systems which are costing a lot of money to maintain and also to innovate. This can even be so expensive that this will influence the survival rates in the payment ecosystem (**survival rates**).

S6 - Organization and Niche Creation

The value creation and variety in the ecosystem is according to E3 dependent of the financial and IT resources but also of organizational resources. So are there enough teams in your company and are there enough support teams to create out of the available resources new added value. He supports these questions by the fundamental change in resources allocation in teams. For example the need for agile development in companies to really develop fast and create value out of the regulated standard (**value creation**).

On the other side E3 thinks that the implementation of government regulations could be expensive, in some cases these cost are that high that it difficult for start ups to survive the complete implementation phase. As larger companies are often in a better position related to IT and Financial resources to survive this phase (**variety**).

S3 - Technology and Niche Creation

E3 makes a statement about the availability of technology and the actors in the ecosystem that have to work together before they actually can do something with the technique. He calls the example of the PISP and AISP functionality of the PSD2 regulation where he thinks that although these technologies are available they will not create real value if there are not being used together (**variety**). A practical example is an European company that want's to see his full European cash flow over multiple banks. After these insights this company want's immediately transfer all the money to one bank account instead of visit all the separate banks. But this is not possible with PSD2. Thereby the real value creation is not as big as expected (**value creation**).

Interview 4

- Interviewee: Expert - E4
- Date and Time: 26 July 2018, 14:30 - 15:30 (UTC + 2)

S7 - Environment and Productivity
The first implementation sector discussed with E4 is related to the implementation sectors environment and productivity. Where E4 this that regulations can positively influence the productivity of the ecosystem (**total factor productivity**). He names the PSD2 regulation as an example. Where he states that this regulation will influence the productivity positively although it is geographical dependent. The government regulation can have a twofold effect on the delivery of innovations. Current parties can due to regulations start activities that where not possible before. In the PSD2 context banks can get information access to the accounts of customers of other banks. But new start ups will be more innovative and therefor deliver more or better innovations (**delivery of innovations**).

S1 - Technology and Productivity
The availability and the character of technology is not directly related to the productivity of the ecosystem (**total factor productivity**). E4 explains this with the PSD2 regulation and the banks becoming compliant with the standard. He said that they could not wait for the standards that are introduced, they had to start innovating already. As the competition is high in the market they can't wait until the Berlin Group or the Open Banking UK initiative are fully finished.

On the other side Vicent, tells that the availability and characteristics of technology due to the regulated standard, will not have a that much impact on the survival rates of the banks. As the complete business of banks is not only related to payments but also to financial and saving accounts.

E4 calls the availability and characteristics of the API's that are come available due to for example PSD2 regulation are causing a shift of thinking. He calls these API's the LEGO building blocks of the future market. But it is very important that the companies see the added value of this instead of seeing it as a thread. An example is the Nordea bank in the Nordics which have pushed this way of thinking through the whole bank. Or the Bunq in the Netherlands who are pushing this through there customers (**delivery of innovations**).

S4 - Organization and Productivity
The IT and Financial resources are according to E4 related to productivity and delivery of innovations. Due to regulations E4 thinks that companies has to think over again about how there plans for the next 10 or 20 years will be. And because of thinking process the IT and Financial resources will be have a direct or indirect influence on the productivity (**total factor productivity**). The decision of a company to stay just compliant and do nothing more than that or be compliant and innovate. That decision is determining the IT and Financial resources and how a companies looks towards the resulting productivity and delivery of innovations. E4 explains this with an example about the Van Landschot bank in the Netherlands. This bank started late with performing payments, they just did it with a very defensive strategy. For all that is necessary they put in the resources for everything else they outsourced it, as they didn't see the productivity of it (**delivery of innovations**).

S5 - Organization and Robustness
Further talking about the Van Landschot bank, E4 called that they are on par related to payments. So every regulation that needs an innovation and thereby IT and Financial resources is outsourced to another company. When related this to the structure of the company they thereby are not changing. E4 states that this is an important example of a defensive bank (**persistence of structure**).

Regulated standards can have impact on the IT and Financial resources and the structure of the company. As they have to decide if they want to comply or innovate with new regulations. What we do see in the market is that companies are using these regulations as an accelerator for the innovation of their old legacy systems. And when that happens than the structure of the company is changing (**survival rates**).

S2 - Technology and Robustness
As new technologies become available due to a regulation E4 thinks that start ups will be faster adopters than the older actors in the ecosystem. As they are quicker and more innovate when adoption the technologies of the regulated standard. Although these new parties are faster adopters they also have a turn side. E4 called the example of Sofort in Germany which uses a technique that is called screen scraping. Due to this technique the structure of existing companies is disturbed. But although this technique is available the new regulated is going to mark this as illegal. As by using this screen scraping technique the bank account of a consumer is scraped in order to gather information and use this for business. The problem with this technique is that the bank who possesses the consumers account can't indicate which company is scarping the account (**persistence of structure and survival rates**).

S9 - Environment and Niche Creation
E4 sees clear connections between government regulations new variety and value creations in the market. Although just as the other implementation sectors this is geographical dependent. If we compare the Netherlands to other European countries than we will have less created value of the government regulation than Spain or France could have. Examples of these added values due to the PSD2 regulation are people that don't have access to a creditcard can due to this regulation use a new instant payment method (**value creation**).

Overall E4 thinks that the PSD2 regulation will relatively not bring that much new variety in the market. Because PSD2 open's the market but not in that extremes that thereby the variety of the market will increase in large numbers (**variety**).

When we look towards the availability of technology service providers E4 thinks that these parties are encourage to grow in numbers and creating added value. The example he called for this, is the bank account of consumers. He thinks that the consumer bank account will disappear as we know it and will become a software switch with all the API connections you can think of, therefor he thinks the variety will grow.

S8 - Environment and Robustness
Because of government regulations E4 thinks that the structure of doing business is not that easily changed. He thinks that we are not going to use our bank account in an Uber way. So the PSD2 regulation is not directly changes the structure of the payment business ecosystem. One of the reasons for this is that if an ecosystem is changing and a company want's to change with the ecosystem there will always be a way to change your structure. An example

is the ING bank that is completely entering their customers in a different way than the BUNQ bank (**persistence of structure**).

But this is also geographical dependent. Because if we look into countries like France and Spain where the credit card organizations are more dominant and the variety of alternative payment methods is not that large.

But when we come back to the point of the technology service providers, E4 thinks that these can have an impact on the survival rates and structure of the business ecosystems (**survival rates**). When the ecosystem is some more of an adult size precisely at that moment these parties can start changing the structure. At that moment they are not being disturbed by the possible immature parts of the regulated standard.

S3 - Technology and Niche Creation

E4 thinks that there is a relation between the availability of technology and value creation. Although sometimes like the PSD2 regulation is a regulation that makes current technologies legal or illegal. He thinks that eventually the value creation by the available technology of PSD2 is not that large and will be of the same value creation as iDEAL does in the Netherlands. But the character of the technology can have impact in the ecosystem as the it can be disruptive and open up channels that where closed before. E4 gives an example of the fact that due to the PSD2 regulation you can just with one click get access to your account. This creates extra value in the payment ecosystem and will ensure new entrants in to the payment ecosystem (**value creation**).

The availability and characteristics of a regulation, in case of PSD2, we see often that there are not enormous innovating. PSD2 will give the ecosystem some new possibilities. But this will be more in the corner of the improvement of the current technologies and not result in that much new actors in the market. So on the value creation side this will add value but on the variety this is not the case. Although this opinion E4 calls on the end an statement which changes contradicting towards the previous opinion which is 'If every bank in the Netherlands would do what the Nordea bank does' the ecosystem will explode in number of actors (**variety**).

S6 - Organization and Niche Creation

The IT and Financial resources have according to E4 different impact on the value creation for a company. He calls the example of variational costs of banks. In the Netherlands we don't pay for each bank transaction but a fixed amount per month of per quarter. But in for example Italy they do pay per transaction. These costs can't determine how the company deals with the regulation in terms of IT and Financial resources. If this regulation makes it possible to reduce the variational costs, the dedication of resources to create value and adopt new technology are easily met (**value creation**).

Interview 5

- Interviewee: Expert - E5
- Date and Time: 27 July 2018, 12:00 - 13:00 (UTC + 2)

S7 - Environment and Productivity
The interview started with the effects of government regulations on productivity, E5 found this difficult to explain. As he says the productivity variable could be explain in to brought sense. After explaining that this is could relate to the effort our company has to take to implement and be compliant, with for example the PSD2 regulation, and thereby will achieve more benefits with the implementation of this regulation. He explains that our company sees in common no short term productivity impact (**no increasing productivity**). The reason for this is that often government regulations extend the market on a horizontal part and this causes extra work for our company. As our company is a general player which acts as a central switch in the payment ecosystem. This increasing horizontal market is on the one site the increasing result of new startups due to the regulation (**increasing delivery of innovations**). The followup question if technology service providers have impact on the productivity and delivery of innovations E5 answer that these parties are helping but in the end our company has to build the software self (**availability of technology service providers**).

S1 - Technology and Productivity
E5 sees some relations between the availability and characteristics of technology and the productivity and delivery of innovations in the business ecosystem. He refers as an example to the PSD2 regulation where the availability of the technology will have positive influence on the delivery of innovations. As multiple new companies in the business ecosystem get easier possibilities for entering the market (**increasing delivery of innovations**). But there is one important downside of the availability of technology which also immediately leads to a possible followup regulation PSD3. Which is "to much availability of technology" the market needs one standard open API which ensures security and one possibility for connecting the different companies. Concluding, an open character of the API's which are to much available will not be of a positive effect for the productivity of the ecosystem.

S4 - Organization and Productivity
After the discussion about the need for a standard Open API, the discussion about the organization and the productivity started. Where the legacy systems of companies (**IT resources**), play an important role in the adoption of the regulated standard, thereby indirectly to the productivity of the companies in the business ecosystem. E5 called the example of the Benelux countries that had to fight very hard for the implementation of the 13 number digit bank account. If we compare that implementation with for example the PSD2 change, than this was just a minor change compared what the companies in the ecosystem now have to change for this PSD2 regulation. So concluding the IT resources and with a special focus on the legacy part are playing an important role towards the productivity of the company (**IT resources, legacy systems, have an effect on productivity**). E5 explains that these resources of course are therefor deliver new innovations as this is needed to replace the legacy system. But this is related to the financial resources and strategy of a company to dedicate these resources to the right department (**Financial Resources**). He makes a comparison betweem

the Netherlands, Germany and France. Although we are together discussing now the possible lack of innovations ad some banks here, in these two countries the innovation is even more behind.

S5 - Organization and Robustness
To elaborate more on these IT and financial resources, the next question asked to E5, is about the relation between these resources and the structure and survival rates of the companies in the business ecosystem. Do you think due to the regulated standard these resources which are needed to become compliant are of that grade that this will influence the structure and survival rates of companies? E5 answers this question in twofold. On the one side the regulation causes a need for these resources which is positive for the structure of the companies because they need to innovate. But on the other side this causes competition of new actors which eventually will possible can't get along (**persistence of structure**). E5, don't think that this will be of that large influence that complete companies will stop to exist (**survival rates**).

S8 - Environment and Robustness
So in the extremist case you don't think that the government regulations can cause enormous changes in structure and survival rates? Structure yes it can, survival rates no it cannot. The reason for this is for example that we ad our company accept the fact that there will be new players in the business ecosystem. So there will be an diversification of the players in the business ecosystem but not on definition a drop in survival rates (**survival rates**). Do you think that the availability of technology service providers plays a roll in this shift. E5, answers this question with a 'yes'. But as the providers of the standards. As the market is already seeking for one standard, this is really needed. Because a regulation such as the PSD2 regulation is not complete enough to ensure a full 100 percent solution that is usable by all actors (**persistence of structure**).

S2 - Technology and Robustness
The fact that the regulations can open up or make technology available that was not there before the regulation. Do you think this will influence the structure of survival rates of the business ecosystem? He answers this question by referring to the previous to sections. And added the fact that the availability of technology does not per definition has to be of that added value that decision of the management team is to change the structure of a company and adopt the available technology (**structure**). He called the example of the Nordea bank that is pushing to innovation from top level management to the whole organization, ad Nordea we see that the open characteristics and available technology of PSD2 has extra motivated this bank to innovate and change their structure.

S9 - Environment and Niche Creation
Does our company see added value of government regulations and will they create new value out of this? E5 is neutral about this case. As he indicates that our company is, as indicated before, a switch in the complete network. We often see that we are one step in front of the regulation. If we look a PSD2 this is just one step towards the complete Open Banking movement. So regulations can add value for us but sometimes we also see them as another rule that we have to be compliant with (**Create Value**). But if look to this PSD2 regulation, one of the goals is to open up the market and to provide the market with more

competition. We embrace this and try to help these new start-ups with possibilities. Also because we think that payments as they are today are not changing in just a couple of years. E5, calls the PSD2 regulation "a deconstruction of the payment flow, but than PSD2 proof." (**Variety**).

S3 - Technology and Niche Creation
How do you see the availability and characteristics of technology and the value creation and variety in the ecosystem? For our company we have to develop everything by ourselves. As our security and identity are of most important for us. So the availability of technology and the characteristics which are getting along with regulation does not immediately improve the value and variety for us (**value and variety**).

S6 - Organization and Niche Creation
Although this technological part is not being immediately improve the value creation or variety in the business ecosystem. Do you think there is a relation towards the IT and financial resources? So banks with more resources could add more value and create more value? No I don't think so (**create value**). What we see is again the legacy systems which are causing troubles in adding value or variety in the ecosystem. What banks are currently doing is promoting the startups and bind these towards the bank (**variety**).

Interview 6

- Interviewee: Expert - E6
- Date and Time: 2 August 2018, 14:00 - 15:00 (UTC + 2)

S4 - Organization and Productivity
The interview with E6 started with the relation between organization and productivity. She explains that the regulations has a different impact on the actors in the business ecosystem. She explains this by calling the example of three kind of banks in the financial ecosystem. First there are the traditional banks, you and I have probably started doing our banking stuff from our younger years on wards. In general these banks have a lot of legacy systems that are founded in the 1970s. Secondly we also have a group of banks that we call challenger banks. The are more active in the UK, examples are Monzo [1] and MoneyYou [2]. The regulations are effecting these banks in a different way. The challenger banks are quite agile in what the are doing and thereby the government regulation is not effecting the productivity of these banks that much. But the traditional banks do not have this agile way of working and also have legacy systems. (**Total factor productivity**).

S1 - Technology and Productivity
In some regulations the rules are vague and thereby don't provide enough information for the technology side. We see this with the PSD2 regulation that there are no technical standards defined. Due to this their are view technologies available that influence the productivity of the company positive on the short term. In the end I think they will be fine. She explains that the availability of technology and the characteristics will have an influence on the productivity and the delivery of innovations by giving an example. 'Looking at for example PSD2 an thinking that this is only a accounting aggregation and payment initiation regulation is looking to the internet and thinking it is just a file transfer protocol'. The availability of technologies and there characteristics that come forward out of the regulation will bring in the long term a lot of innovations (**total factor productivity and delivery of innovations**).

S7 - Environment and Productivity
The government regulations are influencing the productivity 'that is for sure' but this can be seen in twofold. On the one side we see that companies choose to just become compliant and on the other side we see that companies want to use the regulation to improve there productivity (**Total factor productivity**). In the second we see that the companies are improving there services based on the regulation. An example called by E6 is the PSD2 regulation that is now used as a catalysts. Due to this regulation a lot of new innovations will be made. Although we think that startups can create these services fast there are a lot of regulation that a startup have to be compliant with before they actually can provide customers these services. Thereby the availability of new technology service providers is not always of that large impact to the productivity and delivery of innovations. What we do see is that the banks are investing in there in own startup funds and thereby link these companies to there own company.

[1] https://monzo.com/
[2] https://www.moneyou.nl/

S5 - Organization and Robustness
The IT and financial resources that are needed for becoming compliant with the regulation and eventually increasing the services is depending the structure of the company. Where we see that new startups have problem with hiring people, the traditional companies have to restructure the teams (**Persistence of structure**). So the regulation is changing the structure of the companies. We see in these traditional companies that these restructurings bring problem for the people that are already working in the company for more than 20 years. An example of a traditional company in the Dutch banking ecosystem is the ING. In the past there where developing according to the phase model and thereby developing in a strict way, how to organize and budget everything. Although this is an Agile way of working it is still not that fast as other methodologies. Therefore they copied the Spotify methodology. The success of this methodology is that the management have to let loose their control on their developers and trust on their capacities (**Survival rates**).

S8 - Environment and Robustness
The government regulations should be seen as a kind of catalysts to changing the structure of the company. So we see large companies such as Spotify, Google and Facebook that are working in a very fast Agile way. They can act really fast on the regulations. Where the traditional companies have to change their structure also in the agile way of working like these big companies. The reason for this is that the regulation is not going to replace the legacy systems of the companies. They could choose to just ad a security layer or a new layer on your legacy system but this will not be of effective on the long term. They eventually have to create something new, in order to do this in the speed of the market the traditional actors have to change their structure (**Persistence of structure**).

E6 is expecting that the survival rates in the business ecosystem can be influenced because of the regulations. The main reason for this is the change of the consumer needs. 10 years ago everybody this his banking stuff on your computer now a days everybody is doing it on their phone. (**Survival rates**)

S2 - Technology and Robustness
The availability of certain technologies regardless of the regulations has already led to a shift in the persistence of structure. As the banks for example, instead of building there own payment methods they have used other companies such as paypal for that (**Persistence of structure**). Indirectly this is outsourcing parts of your company. If we link this to the regulations we see that companies in the ecosystem have to collaborate according to certain rules. In general we see that this is done by API's. Before these regulations the companies could think maybe these collaborations through the API's can work. Now the companies are forced to make it work. So in that case they have to change structure or they can get into troubles. Regulations that are creating more open technologies or create more API's are not influencing the survival rates. E6 explains this by stating that every company has the same access to these new technologies (**Survival rates**).

S9 - Environment and Niche Creation
Regulations are often the beginning of the value creation in the market. E6 thinks that the PSD2 regulation is just the beginning of the Open Banking movement. In the end due to this regulation she thinks that the value creation in the market will be of a enormous level (**Value**

creation). The traditional players will try to take the lead in this value creation, but as she has seen in the past this will probably not work for all of these players and new actors will rise and takeover these market shares. But this value creation can be disturbed by the traditional players. As they can disturb the needed open API access. Although it is clearly defined in the regulation that this is not allowed their is still no institution where these startups can file their complaints.

In the Netherlands E6 thinks that beside the introduction of a regulated standard we see that the 'De Nederlandse Bank' will increase the entry barriers to protect the traditional banks. This is different that is taking place in the Nordics where the banks are working strongly together with the banks and fintechs and have improving the total value creation and variety (**Variety**).

S3 - Technology and Niche Creation

The characteristics of technology are influencing the value creation in the market. E6 gives an example of a banking app although the technology has an very complicated and well developed IT infrastructure if it is not fast enough or user friendly the customer will delete the app (**Value creation**). So although a lot of technologies are becoming available due to the introduction of a regulated standard and the characteristics are potentially of create added value. The value creation of it is determined by the companies customers. This also influences the variety rates in the ecosystem. She thinks that new companies can determine this faster than the traditional players and therefore the new companies will enter the market (**Variety**).

Also due to these regulations E6 thinks that the entry barriers of adopting the new available technologies are lowered. As this lowering increases the variety in the ecosystem the traditional players will lose market share (**variety**). But not only market share will be lost sometimes we also see a lot of cooperation's which are actually improving the total value creation in the ecosystem (**value creation**).

S6 - Organization and Niche Creation

A trend what we see between the IT and financial resources and the value creation is that companies are changing the plans for these resources based on the customers needs (**Value Creation**). So in the past we saw that the companies where trying to add value by develop a lot of new apps and functionality and try be the first to add value. Where they now are measuring the needs of their own customers and create value specific in that corner.

In Spain we see an example that the IT and financial resources can be shared in across the ecosystem. Here there is a trend that banks and fintech are working together. An example is that a fintech has created an app based on the API of the bank where they can see the ATMs of the bank and also the customers use of these ATMs. On the one side the fintech can provide a new app to customers and on the other side we see that the bank can use the data the replace old slow ATMs or place extra for helping the customers with reducing the queues (**Variety**).

Interview 7

- Interviewee: Expert - E7
- Date and Time: 2 August 2018, 15:15 - 16:15 (UTC + 2)

S7 - Environment and Productivity
E7 thinks that government regulations opens up new possibilities for improving the productivity of the company. Due to these new possibilities the costs are expected to be drop (**Total factor productivity**). In the PSD2 example besides these new possibilities and lowering costs the long term benefits will be increased as due to the new API's that are forced to be set in place new kind of payments can be done. This results in a new payment model. So instead of the standard four corner model these regulations and API's make it possible to transform the ecosystem into a third corner model. So beside the increase in productivity we also see new innovations (**Delivery of innovations**).

S8 - Environment and Robustness
But are these government regulations changing the persistence of structure? E7 doesn't think that this will be changed in the short run, as current technologies in the payment industry, and especially the local schemes such as iDEAL and Carte Bancaire are already so cheap to use that their is on a costs perspective not really a benefit for changing to another payment method (**Persistence of structure**). Besides the structure E7 thinks that the survival rates will be depend on the mouse and cat play between the established companies and the new startups. He sees the banks as cats. With this statement he says that on the short run the cat will win if there is only one mouse. But if there are more the cats are going to have a hard time. What he is trying to explain is that the **survival rates** are going to change but in what rate can't be determined.

S4 - Organization and Productivity
Companies that eventually want to become compliant with the regulated standard than this will bring costs. Eventually this will divided the companies into 'only comply' and 'innovate and comply' (**Total factor productivity**). E7 thinks that the companies that chooses the second will deliver more innovations and will on the long run increase their total factor productivity (**Delivery of innovations**).

S2 - Technology and Robustness
The available technology and their characteristics are determining the structure of the companies. But especially the relationships between the companies (**Persistence of Structure**). E7 call the example of the four and three corner models. He says that if the regulated standard of PSD2 was being introduced earlier into the banking and payment ecosystem than a lot of banks and schemes had to change their structure of doing business sooner. As the PSD2 regulation makes it possible to use the three corner models which indicate that one actor in the payment transaction is not needed any more (**Survival rates**).

S1 - Technology and Productivity
E7 thinks that the pressure of fintechs will always be there. So the pressure on the delivery of new innovations by using the available technologies will also be there. This results in a supply and demand for new regulations. As the fintechs will request more regulations so

they can use their innovations legally in the business ecosystem. Where the established companies will try to hold this down in order to not lose market shares by the newly innovations of the fintechs. So the **total factor productivity** and **delivery of innovations** is depended on these kind of working supply and demand.

S3 - Technology and Niche Creation
E7 explains that the technology that becomes available through the regulated standard can have an impact in the value creation in the business ecosystem (**value creation**). As some will think that this is due to the new technology but other will explain this by an addition to the current flows of already existing technologies.

S5 - Organization and Robustness
When asking if the established companies have to spend more IT and financial resources to become compliant with the introduced regulated standard. E7 thinks that these companies for sure have to spend more resources. But in the long run these companies can benefit from this as they can replace there legacy systems at the same time. Because all established companies can't just but a new API layer on top of the legacy systems. As this is an large risk. Because of this change E7 explains that he expects that a lot of established companies will change their structure (**Persistence of structure**). ING is an example of a bank that changed their complete IT infrastructures.

In the short run the structures of the companies in the business ecosystem will not change. But in the long run they have to change the structure to implement all requested technologies.

S9 - Environment and Niche Creation
On the long run E7 thinks that the a regulation will prevent new value creations. As the regulations is making it harder for the established companies to keep creating value compared to the new start ups (**Value creation**). And if these established companies are getting behind in the payment industry they will get problems with their customers. As they will get problems with the customer interaction and customer connections. So if you mess this up you will mess up the relationship with the customers. So E7 thinks that the variety will increase but due to this increase in variety the total value creation will decrease.

S6 - Organization and Niche Creation
As some established companies do not see the innovation related to the introduced regulated standards they are not going to spend a lot of IT and Financial resources on this. This will result in a decrease of added value in the business ecosystem (**Value creation**). The gap of this decreasing added value will result in a possibility for new companies, startups. E7 thinks that especially there will be a lot of technology service providers that will create new API layers that eventually the banks can start using. And therefore they do not need that much IT resources more financial resources to buy these IT resources (**Variety**) .

Interview 8

- Interviewee: Expert - E8
- Date and Time: 7 August 2018, 11:00 - 12:30 (UTC + 2)

S7 - Environment and Productivity
The interviews started with the effects of the implementation themes environment and productivity. E8 argued that government regulations can be in general of impact on the productivity of companies. On the short term he expects for the larger and older companies in the ecosystem a drop in productivity due to the investigations into the regulation and plans how to become compliant. On the long term he expects that it could increase productivity but this is not due to the regulation but due to the secondary aspects such as new technologies or new companies in the ecosystem. He sees that multiple banks are funding a lot of small companies in order to achieve faster productivity out of the regulation. This account also for new innovations (**total factor productivity**).

E8 does not see a direct relationship between the availability of technology service providers and the total factor productivity of the companies in the ecosystem. He thinks that this is a variable that only can be of impact on the total factor productivity on the long term (**delivery of innovations**).

S1 - Technology and Productivity
Secondly, E8 was asked if he sees a relationship between technologies that come available will improve the productivity and delivery of innovations in the ecosystem. He answers yes there is a relationship. He sees in the banking industry a lot of new companies starting to do business. These new companies do not have the economics of scale that the big companies have. Therefore he expects that these small companies will have to use the new technologies to increase their productivity (**total factor productivity**).

The characteristics of the new technology determine how fast the disruption will take place. So thereby it is depending on the technology if this increase or decrease the total factor productivity in the ecosystem. If it is a disruptive technology than E8 expects that the big companies will try to bind as many as possible small disruptive companies to the organization (**delivery of innovations**).

S2 - Technology and Robustness
E8 calls a second effect of the availability of technology. When technology comes available in the ecosystem and a lot of companies will adopt this new technology and change with this technology their business model and structure (**persistence of structure**). There are lesser unique companies. Eventually the ecosystem can run into a problem which, E8 explained it by a dutch saying, when everybody in the village is doing the laundry for his neighbors nobody earns money. Concluding the availability and characteristics can be beneficial for the survival rates of the ecosystem but can also lead to a negative effect (**survival rates**).

S8 - Environment and Robustness
This effect on the survival rates is according to E8 not only depending on the technology aspect. When the effect of government regulation and the availability of technology service providers on the survival rates and persistence of structure was asked. He expects that regulations like PSD2 will create a more divers ecosystem do to the change of structure in

companies (**persistence of structure**). He calls the example of ING that adopted the Spotify development method and wants to be the distributor of its own digital financial services. The government regulations such as PSD2 can be a catalyst of these movements and thereby influence the structure of these companies. E8 expects that not every actor in ecosystem can due to the catalyst effect come along with the changes and will make the decision to stop with certain activities or merge with other companies. This will have a negative effect on the survival rate (**survival rates**).

S5 - Organization and Robustness
Following up on the previous question, E8 was asked if he sees effects of company resources on the persistence of structure or survival rates when adoption a new regulated techstandard. He doesn't think that financial or IT resources will be a problem ad the banks. But he does think that old legacy system will be a problem. And as a remark on the model he also think that some banks need a cultural shift in their company in order to be as agile as the tech companies. The latter two can be of impact on the survival rates (**persistence of structure and survival rates**).

S4 - Organization and Productivity
When asking E8 if he sees relationships between IT and financial resources and the productivity or delivery of innovations of companies. He thinks that the banks need these resources more to become compliant and thereby loose on the short term productivity. Also there is a second risk for banks, as they are trust partners for consumers they can loose a lot (**total factor productivity**). So they have to dedicate the correct amount of resource to be sure that when they are compliant they are also compliant with the security demands of the consumer. On the other side the start up companies don't have to take that much risk and thereby can increase their productivity and delivery of innovations quite fast (**delivery of innovations**).

S3 - Technology and Niche Creation
When asking E8 if "The characteristic of a certain technological change can have an impact on the value created and variety in the ecosystem?" He immediately called the example of the GDPR and PSD2 regulations. He calls these regulations, massive wake-up calls for the banks in the ecosystem. As they are obliged to adopt the new technology which has a open characteristics, they have to provide their own information to third parties. Thereby the are sponsoring the third parties and the variety in the ecosystem (**variety**). Due to these new information sharing the entry barriers in the ecosystem are slightly dropped. He expects that the banks have to innovate a lot of legacy system before they actually can create value out of the new available technology (**value creation**).

S9 - Environment and Niche Creation
The government regulations are according to E8 of too much influence on the payment ecosystem. He expects that the government regulation opens to much new variety in the market which can lead to new kinds of fraud (**variety**). The government regulations are often created for the consumers, but sometimes this increases also more risks. In general he is of an opinion that the government regulations can be of a positive influence on the value creation as this opens sometimes the market which has been closed for a very long time (**value**

creation).

S6 - Organization and Niche Creation
E8 does sees a small relation between the resources of the companies and the value creation in the ecosystem. He expects that small companies with little resources can sometimes just as productive as the big banks. But this will not in general be just as profitable as the banks. As these are still the companies that have the trust of the consumer (**value creation and variety**).

Interview 9

- Interviewee: Expert - E9
- Date and Time: 7 August 2018, 14:00 - 15:00 (UTC + 2)

S7 - Environment and Productivity
The interview started with the question: "What relationships do you see between the government regulations and the productivity and delivery of innovations of a company?". He sees the government regulation as something mandatory and thereby think that the banks will implement it as a compliance regulation on the short term. On the long term the banks will see some commercial aspects of it, when that moments come they will deliver new innovations and increase productivity (**total factor productivity and delivery of innovations**). He sees the government regulations as a catalysts in the market.

A lot of companies in the ecosystem would like to use the available technology service providers but they can't because of their own complex systems. Therefore this has no influence on the productivity or delivery of innovations (**total factor productivity**).

S4 - Organization and Productivity
E9 sees the resources of organization having effect on the productivity, as before the regulated techstandard introduction there where large complex IT systems that where on the long term bad for the productivity. Now a days he sees a decomposing of the services that results in new API based services. These new innovations will increase the productivity of the company (**total factor productivity**). But before this decomposition is a success the companies need a cultural shift in the human resources.

Besides this E9 thinks that the start ups are leaner and meaner in developing new technologies and therefor need less resources. These companies are not interesting to certain parts of big companies and can focus on the added value in increasing the total factor productivity. They can for example outsource some activities and do other activities by themselves. Where the banks and schemes because of security reasons need to develop everything by themselves (**delivery of innovations**).

S1 - Technology and Productivity
The availability and characteristics of technology are having an effect on the total factor productivity and delivery of innovations in the ecosystem. But he does not see direct effects on the total factor productivity as he thinks that it is a complete movement and culture shift in the complete ecosystem. So it is hard to say if this movement can be correlated to the availability of technology or their characteristics (**total factor productivity and delivery of innovations**).

But what E9 think is interesting is the increasing numbers in the development portals and the contributions that are being done by the developers. The availability of these portals can increase the productivity of the companies.

S2 - Technology and Robustness
These development portals are examples of banks that have changed their structure due to the availability of technology. E9 thinks this availability will definitely have impact on the persistence of structure and eventually even on the survival rates (**survival rates**). The bank

that use these portals will in the end have a stronger structure than the banks that doesn't have these portals (**persistence of structure**).

The fact that these portals are of an open technology characteristic can even deliver more innovations and productivity due the fact that not only the internal resources can work on the projects but the whole world (**survival rates**). But he does not think that their will be entire companies that stop to exist.

S5 - Organization and Robustness

The resources can have an impact on the persistence of structure and survival rates of the company. E9 thinks that the companies can have large IT legacy systems. Thereby these companies need a lot of financial resources to change these systems. On the other side he expects that for example banks can change their internal culture and change the dedication of human resources (**IT and financial resources**). If they do this than the need for financial resources to replace these IT legacy systems can be less needed.

S8 - Environment and Robustness

E9 thinks that the availability and characteristics of technology needs extra attention in the form of persistence of structure (**persistence of structure**). He thinks that the teams in the company need to work closer or different together in order to develop the more technical products. These products that come available cannot be developed in the old technical way of working.

He also expects that the customers of these products will change. That not only the consumers is for example using the products of banks but that also developers will use certain products. This also needs a change in the structure of the company, in terms of the support department (**survival rates**).

S6 - Organization and Niche Creation

The resources of companies can have an impact on the businesses in the ecosystem, E9 calls the example of PSD2. As due to this regulation certain actors such as banks and the schemes are forced to provide access to their systems. So the needed resources to become compliant as a startup or work with large companies is lowered do to this regulation (**variety and value creation**).

S3 - Technology and Niche Creation

The availability of technology will have an impact on the variety and value creation in the business ecosystem. He named the example of the PSD2 regulation and the availability of the new payments methods. This will result in so much new variety that iDEAL in the Netherlands will go the way of the dodo bird in a view years. Because the interaction with the customer will cost to many steps (**variety**).

Eventually the availability and characteristics of technology are the catalyst and create large added value to the ecosystem. Although related to PSD2 for the banks and schemes to will be negative (**value creation**).

S9 - Environment and Niche Creation

The government regulation will have an impact on the value creation in the business ecosystem. Even that much that E9 thinks that the volumes in payments will start to shift within

the next three years. This is due to the increasing numbers of volumes in variety. These government regulations lower the entry barriers and thereby will provide better and more access the ecosystem. E9 expects that government regulations will have for most an impact on the local technology such as iDEAL. The international schemes and technology will acquire extra companies to deal with the competition (**variety and value creation**).

Appendix G

Evaluation Implementation Themes

Based on the summaries of Appendix F the results per implementation sector and measurement are presented in Tables G.1 till G.9. These results are used in Chapter 5 for evaluating the RSEEM and the corresponding key considerations.

Results - S1 - Technology and Productivity

R(x)	Consideration of Measurement	Statements by Experts
R1	The availability of technology has influence on the total factor productivity.	"New technologies that come available will not in general increase productivity, as some replace old technologies that have a negative impact on productivity" (E2)
		"Sometimes the costs of adopting an avaiable technology are that expensive that it not outweight the benefits and thereby not improves productivity" (E3)
		"Regulations that make new technologies available will increase the productivity due to easier entry of the market, but to much technologies will lower the productivity as the need for one standard will thereby increase" (E5)
	Sub-conlusion: The availability of technology has influence on the productivity on the short term the experts do not think the productivity will increase. On the long term it could increase the productivity.	
R2	The availability of technology has influence on the delivery of innovations.	"The availability of technology due to a regulated standard will not always deliver more innovations, often the regulation is already behind the current technologies" (E4)
		"A regulation that makes technology available, when this regulation is finally settled it will be the starting point of delivery of innovations and will have an reinforcing effect on the delivery of innovations" (E1)
		"The availability of technologies and there characteristics that come forward out of the regulation will bring in the long term a lot of innovations" (E6)
		"The pressure of fintechs will always be there. So the pressure on the delivery of new innovations by using the available technologies will also be there" (E7)
	Sub-conlusion: Expected is that the regulations will bring innovations on the long term. In the short term the regulations is not expected to deliver innovations, as it needs time to settle.	
R3	The characteristics of technology have influence on the total factor productivity.	"Due to the open character of the new technology, information will be easier accessable. Thereby the productivity increases" (E1)
		Technologies can be seen as LEGO building blocks, when a companies sees them as threat they will never build with them. Thereby the productivity will not increase (E4)
		"Looking at for example PSD2 an thinking that this is only a accounting aggregation and payment initiation regulation is looking to the internet and thinking it is just a file transfer protocol" (E6)
	Sub-conlusion: The view of a company towards the introduced regulation and the characteristics of the technology it brings, determines how the company will turn this into productivity.	
R4	The characteristics of technology have influence on the delivery of innovations.	A disruptive character of a technology can cause a movement that companies just want to be compliant with and do nothing more than this (E3)
		Regulations that change the character of technologies, like PSD2 for payments does, will cause a shift in thinking processes. Due to this shift the delivery of innovations will be increased (E4)
		The character of a technology like PISP of PSD2 and iDEAL are almost the same, so although it has a disruptive character one will not replace the other (E2)
	Sub-conlusion: Based on the disruptiveness character level of the technology that becomes available, the current companies in the ecosystem will adopt it and deliver finally new technologies. Although no new technologies will be delivered as the new just replace the old.	

TABLE G.1: Results of Technology and Productivity considerations

Results - S2 - Technology and Robustness

R(x)	Consideration of Measurement	Statements by Experts
R5	The availability of technology has influence on the structure of my business.	"Companies that see the available technology as negative to their structure will not change their structure to adopt it" (E2)
		’"due to the regulation technologies come available which in some cases companies will use to take the next step in their company structure. They will use this to start the needed digital revolution." (E3)
		"the availability of technology does not per definition has to be of added value that decision of the management team is to change the structure of a company and adopt the available technology" (E5)
	Sub-conlusion: The availability of technology and the persistence of structure is related to each different actor in the ecosystem. Some see it as a need for change, some see it as an extra technology to their big system.	
R6	The availability of technology has influence on survival rates of the business ecosystem.	"Although technology becomes available due to a regulation if a company operates ad world scale this could not have on impact" (E1)
		’The companies that uses the available technology and see them as a positive change will adopt them, others don’t. The last will probably stop to exist" (E2)
		"As new technologies become available due to a regulation E4 thinks that start ups will be faster adopters than the older actors in the ecosystem" (E4)
	Sub-conlusion: Survival rates are being influenced by the availability of technology. This is depended how the different companies look towards the available technology. The general conception is that startups will easier adopt the technology but are not in rule a thread to the survival rates.	
R7	The characteristics of technology have influence on the structure of my business.	"Nordea we see that the open characteristics and available technology of PSD2 has extra motivated this bank to innovate and change their structure." (E5)
		"split in the companies that see the availability of technology and characteristics of this in a positive way. " (E2)
		"The available technology and their characteristics are determining the structure of the companies. But especially the relationships between the companies" (E7)
	Sub-conlusion: The characteristics of technology, especially the disruptive and open movement to API layers is expected to change the relationship between companies and thereby the structure.	
R8	The characteristics of technology have influence on the survival rates of the business ecosystem.	But this can also be caused by the underlying regulation that makes these technological disruptions possible. This will definitely have an impact on the survival rates (E1)
		"E4 called the example of Sofort in Germany which uses a technique that is called screen scraping. Due to this technique the structure of existing companies is disturbed." (E4)
		An example regulation is: the PSD2 regulation makes it possible to use the three corner models which indicate that one actor in the payment transaction is not needed any more. (E7)
		Regulations that are creating more open technologies or create more API’s are not influencing the survival rates. E6 explains this by stating that every company has the same access to these new technologies (E6)
	Sub-conlusion: The disruptive characteristics of technology can have an impact on the survival rates of the business ecosystem. Some expect that it will influence the survival rates in a broader sense than others.	

TABLE G.2: Results of Technology and Robustness considerations

Results - S3 - Technology and Niche Creation

R(x)	Consideration of Measurement	Statements by Experts
R9	The availability of technology has influence on the variety in the ecosystem.	"the availability of technology and the actors in the ecosystem that have to work together before they actually can do something with the technique." (E3)
		"the more technology becomes available due to regulations the more startups can enter the business ecosystem" (E5)
		"In some countries the entry barriers to enter the market will be lowered , in some countries the new available technology will do nothing." (E4) "This also influences the variety rates in the ecosystem. She thinks that new companies can determine this faster than the traditional players and therefore the new companies will enter the market" (E6)
	Sub-conlusion: The availability of technology is determining how easy the new actors can enter the business ecosystem. Although it can be geographical dependent. The easier the startups can enter the larger the variety.	
R10	The availability of technology has influence on the value creation in the business ecosystem.	"innovation always leads to value creation. Although he points out an the factor which is the actor who will benefit from this." (E1)
		"in some markets the available technology will have a big impact and in some markets not." (E2)
		"there is a relation between the availability of technology and value creation. Although sometimes like the PSD2 regulation is a regulation that makes current technologies legal or illegal." (E4)
	Sub-conlusion: Value creation due to the availability of technology is business ecosystem and actor dependent, in general the availability of technology leads to value creation.	
R11	The characteristics of technology have influence on the variety in the ecosystem.	"If every bank in the Netherlands would do what the Nordea bank does' the ecosystem will explode in number of actors. As they choses for an open character technological development which lowers the entry barriers" (E4)
		"example of a banking app although the technology has an very complicated and well developed IT infrastructure if it is not fast enough or user friendly the customer will delete the app" (E6)
		"entry barriers of adopting the new available technologies are lowered as the open characteristics make this more easy. Therefor I think the variety will increase" (E7)
	Sub-conlusion: The open disruptive characteristics wil increase the variety of the ecosystem by lowering the entry barriers and make technology more adoptable for all the companies in the business ecosystem.	
R12	The characteristics of technology have influence on the value creation in the business ecosystem.	"Also a new available technology such as the PISP API's in PSD2 are so new that they have to prove itself in the market before it can really add value." (E1)
		"we have to develop everything by ourselves. As our security and identity are of most important for us. So the availability of technology and the characteristics which are getting along with regulation does not immediately improve the value and variety for us". (E5)
		"Creating value out of the API's is not only based on the current availability or the characters of technology." (E2)
	Sub-conlusion: Although technology can have a disruptive character, on the short term these technologies have to prove themselves before real value creation will be achieved.	

TABLE G.3: Results of Technology and Niche Creation considerations

Results - S4 - Organization and Productivity

R(x)	Consideration of Measurement	Statements by Experts
R13	IT resources have impact on the total factor productivity of mycompany.	"Regulated standard will change the distribution of the IT and financial resources, but also the capacity of the teams in the organization. First of all to become compliant with the regulated standard secondly because the companies want to increase there position in the ecosystem and thereby there productivity." (E1)
		"Where the large companies are getting relatively easier compliant have the middle size banks way more trouble to go beyond compliance. And thereby don't increase productivity." (E3)
		"Where the legacy systems of companies, play an important role in the adoption of the regulated standard, thereby indirectly to the productivity of the companies in the business ecosystem." (E5)
		" But the traditional banks do not have this agile way of working and also have legacy systems. Thereby the government regulation is effecting these banks more on the productivity side. " (E6)
	Sub-conlusion: The total factor productivity of a company is being influenced by the IT resources. In the short term negatively as the compancies need to become compliant. In the long term it could eventually work out positively.	
R14	IT resources have impact on the delivery of innovations for my company.	"Small companies are often limit by these resources are big companies not. Also E3 thinks that the IT and Financial resources are fully linked and cannot be seen apart from each other." (E3)
		"These resources of course are therefor deliver new innovations as this is needed to replace the legacy system." (E5)
		"The delivery of innovations is in our company fully based on IT resources" (E2)
	Sub-conlusion: The delivery of innovations in companies are being influenced by the IT resources. The level of this influence is dependend on the level of legacy systems.	
R15	Financial resources have impact on the total factor productivity of my company.	"There is a big difference between the IT and financial resources needed for the adoption of a regulation. As larger companies need more resources to become compliant it will take them longer to achieve increasing productivity out of it." (E1)
		"Because of thinking process the IT and Financial resources will be have a direct or indirect influence on the productivity." (E4)
		"Eventually this will divided the companies into 'only comply' and 'innovate and comply'" (E7)
	Sub-conlusion: The financial resources that are needed to comply to the regulation will divide the companies in the business ecosystem into two halves. Only comply or innovate and comply.	
R16	Financial resources have impact on the delivery of innovations of my company.	"There is a relation between financial resources and deliver innovations, although it is limited. Working with 30 people in a small bathroom will not deliver 30 new bathrooms. Even not faster delivery as there are to many people hired." (E3)
		"these resources of course are therefor deliver new innovations as this is needed to replace the legacy system. But this is related to the financial resources and strategy of a company to dedicate these resources to the right department." (E5)
		"Financial resources are less needed than due to the movement of large open development portals which will leed to a kind of open source development." (E9)
		"Financial resources are needed for the replacement of legacy we think that the big companies have more than enough to become compliant and deliver new innovations." (E8)
	Sub-conlusion: Financial resources are needed for the development of new innovations, that all experts agreed upon. But some experts think on the long run this is less needed due open source.	

TABLE G.4: Results of Organization and Productivity considerations

Results - S5 - Organization and Robustness

R(x)	Consideration of Measurement	Statements by Experts
R17	IT Resources have impact on the persistence of structure of my company.	"It doesn't have to be that the customers of the actors have the resources and the will to change there structure for adoption of the new regulated standard." (E1)
		"Some banks are already working on all the API's and thereby don't need extra resources to implement the PSD2 regulation. So the structure of these banks is not changing." (E2)
		"What we do see in the market is that companies are using these regulations as an accelerator for the innovation of their old legacy systems. And when that happens than the structure of the company is changing" (E4)
	Sub-conlusion: On the short term IT resources and especially legacy systems have an impact on the persistence of structure of the company.	
R18	IT resources have impact on the survival rates of my company.	"on the one side there will be innovators and on the other side there will be banks that just become compliant." (E2)
		"Having a lot of IT resources and also being a large company can also cause in the future legacy systems which are costing a lot of money to maintain and also to innovate." (E3)
		"the regulation causes a need for these resources which is positive for the structure of the companies because they need to innovate. The companies who can't can stop to exists." (E5)
	Sub-conlusion: The survival rates are being expected to being influenced as companies need to become compliant which can costs them a lot of resources. Due to this high costs new innovations can be hold up. Which causes a negative compatitive advantage.	
R19	Financial resources have impact on the persistence of structure of my company.	"Companies with lots of resources can just buy extra development power and don't have to change the whole structure of the company." (E3)
		"So every regulation that needs an innovation and thereby IT and Financial resources is outsourced to another company. When related this to the structure of the company they thereby are not changing." (E4)
		"large organizations have big legacy systems and thereby have to put in significantly more resources into play before they are compliant with the regulated standard." (E1)
	Sub-conlusion: The persistence of structure in a company can be related to the financial resources but this related to the strategy of a company. As some companies outsource everything, where other companies develop in house.	
R20	Financial resources have impact on the survival rates of my company.	"On the other side E3 thinks that the implementation of government regulations could be expensive, in some cases these cost are that high that it difficult for start ups to survive the complete implementation phase." (E3)
		"thinks that these companies for sure have to spend more resources. But in the long run these companies can benefit from this as they can replace there legacy systems at the same time " (E7)
		"Where we see that new startups have problem with hiring people , the traditional companies have to restructure the teams" (E6)
	Sub-conlusion: The financial resources that are needed to replace legacy systems in the company. These resources can be spend on the systems itself but can also be spend on the human resources. This can impact the survival rates as not every company in the ecosystem has the same resources.	

TABLE G.5: Results of Organization and Robustness considerations

Results - S6 - Organization and Niche Creation

R(x)	Consideration of Measurement	Statements by Experts
R21	IT resources have impact on the variety in the business ecosystem.	"on the long term regulation can lead to complete new service levels which causes an increasing effect on the variety and value creation in the busi- ness ecosystem." (E1)
		" What we see is again the legacy systems which are causing troubles in adding value or variety in the ecosystem. What banks are currently doing is promoting the startups and bind these towards the bank" (E5)
		"There will be a lot of technology service providers that will create new API layers that eventually banks start using." (E7)
	Sub-conlusion: Because of legacy systems at the established companies it is expected that these will cause variety in the business ecosystem. As specific startup can provide services or IT systems that can replace these legacy systems.	
R22	IT resources have impact on the value creation in the business ecosystem.	"In terms of the resources we can chose to put them in for the implementation of the regulation, where the banks are forced to do so as they have to become compliant." (E2)
		"The value creation and variety in the ecosystem is according to E3 dependent of the financial and IT resources but also of organizational resources." (E3)
		So in the past we saw that the companies where trying to add value by develop a lot of new apps and functionality and try be the first to add value. Today they use more IT from each other.
	Sub-conlusion: The IT resources the legacy systems and the human resources are depending the value creation.	
R23	Financial resources have impact on the variety in the business ecosystem.	"By initiating regulations it could be more easy for startup to enter the business ecosystem. Also in terms of financial costs this can be reduced." (E4)
		"Financial and IT Resources are in my opinion fully related towards each other and will have a positive effect on the variety when a regulation causes a drop in price." (E5)
		" In Spain we see an example that the IT and financial resources can be shared in across the ecosystem." (E6)
	Sub-conlusion: Because of the possible high costs of the technology implementations of new standards, being put into force because of a regulation the actors in the ecosystem kan start working together and thereby increase the variety.	
R24	Financial resources have impact on the value creation in the business ecosystem.	"If this regulation makes it possible to reduce the variational costs, the dedication of resources to create value and adopt new technology are easily met" (E4)
		If a company doesn't see added value of the regulation that this company will not spend financial resources on it. Just as simple as it sounds it is. (E7)
		"The financial resources that are needed are of impact on the value creation of the companies in the ecosystem. As smaller companies are not obliged to spend these resources and big are." (E8)
	Sub-conlusion: The opinion about the financial resources need is divided by the experts. Where the experts that are more related to big companies think it is of negative impact do the experts related to the small companies think it is of positive impact	

TABLE G.6: Results of Organization and Robustness considerations

Results - S7 - Environment and Productivity

R(x)	Consideration of Measurement	Statements by Experts
R25	Regulated standards that change the technological grounding have impact on the total factor productivity of my company.	"the effects of governmental regulations on the productivity of the business ecosystem he speaks of an increasing traction but on the long term the productivity will increase." (E1)
		"in general governmental regulations will increase the total factor productivity of companies." (E2)
		"Due to this compliant aspect there will be a negative effect on the total factor productivity due to government regulations." (E3)
		"Government regulation will influence the productivity positively although it is geographical dependent." (E4)
		"in common no short term productivity impact. The reason for this is that often government regulations extend the market on a horizontal part and this causes extra work." (E5)
	Sub-conlusion: Regulated standards initiated by the government that change the technological grounding are having an effect on the total factor productivity. In general on the short term negatively and on the long term positive.	
R26	Regulated standards that change the technological grounding have impact on the delivery of innovations for my company.	"new start ups will be more innovative and therefore deliver more or better innovations " (E4)
		"government regulations can increase the market on a horizontal part that will result in an increasing number of new startups which in his place deliver new innovations." (E5)
		"Instead of the standard four corner model these regulations and API's make it possible to transform the ecosystem into a third corner model. So beside the increase in productivity we also see new innovations." (E6)
	Sub-conlusion: In general the perception of the experts is that the regulated standard will have a positive impact on the delivery of innovations for the companies in the business ecosystem.	
R27	The availability of technological service providers has impact on the total factor productivity of my company.	"The technology service providers in the ecosystem will also not have that much influence on the productivity although they will deliver new innovations they are just replacements of current technologies." (E2)
		"technology service providers do not have an impact on our productivity as we cannot use them because of security reasons." (E1)
		"Due to these new possibilities the costs of using a technological service provider are expected to be drop and thereby the total factor productivity will increase" (E7).
	Sub-conlusion: The availability of technology service providers is not expected to deliver a large impact on the total factor productivity. Although it can decrease the costs by the wider supply.	
R28	The availability of technological service providers has impact on the delivery of innovations of my company.	"The reason for this is that the companies will develop the needed services by themselves instead of using them from the market." (E3)
		" these parties are helping but in the end we have to build the software self." (E5)
		"Deliver no new innovations for our company, as we build our platform by ourselves. Although we can link them on our platform." (E2)
	Sub-conlusion: The availability of technological service providers are not influencing the delivery of innovations for companies. As most companies in the financial ecosystem wan't to develop the innovations themselves.	

TABLE G.7: Results of Environment and Productivity considerations

Results - S8 - Environment and Robustness

R(x)	Consideration of Measurement	Statements by Experts
R29	Regulated standards that change the technological grounding have impact on the persistence of structure of my company.	"Government regulations can for example in the financial and payment ecosystem not change that much. He calls the example that there always be a bank, on the one side on the merchant side and on the other side on the consumer side." (E1)
		"Government regulations can have a change in the persistence of structure. As we see in the current market there are multiple joint ventures like Yolt and ING" (E3)
		"Because of government regulations E4 thinks that the structure of doing business is not that easily changed. He thinks that we are not going to use our bank account in an Uber way." (E4)
	Sub-conlusion: The regulated standard that change the technological grounding cannot easalily change the structure of doing business. Reasons for this are the connections between actors and the possibilities for cooperations instead of complete structure changes.	
R30	Regulated standards that change the technological grounding have impact on the survival rates of my company.	"Due to government regulations companies will stop to exist. But not complete sectors but companies that cannot adapt due to the regulation." (E1)
		"New regulations creates in general two thinks, new opportunities and new challenges. New opportunities will create new players. The other side of a new regulation is the fact that current actors have to adapt to the regulation and adopt it, to become compliant if they don't they die. Concluding adopt or die." (E2)
		"But he is not sure if this regulation is the last straw that breaks the camel's back." (E3)
		"There will be an diversification of the players in the business ecosystem but not on definition a drop in survival rates." (E5)
	Sub-conlusion: Regulated standards that change the technological grounding are having impact on the survival rates. Niche actors are of an opinion that some actors will die. Where physical dominators are of opinion that it is not only the regulated standard that has influence on the survival rates.	
R31	The availability of technological service providers have impact on the persistence of structure of my company.	"He makes the comparison towards SEPA, when this regulation was put into force no parties stopped doing business. Although these parties had a very hard time" (E2)
		"that these can have an impact on the survival rates and structure of the business ecosystems" (E4)
		"They eventually they have to create something new and in order to do this in the speed of the market the traditional actors have to change their structure." (E6)
	Sub-conlusion: The availability of technology service providers will help to change the structure of the established older companies. By this help the structure of the banks in the business ecosystem will change.	
R32	The availability of technological service providers have impact on the survival rates of my company.	"Although the structure of the business ecosystem can change not on the actor side it could change the flows between the actors. This shift in flows can be encouraged by a government regulation and thereby set as a baseline for new innovations." (E1)
		"Answers this question with a 'yes'. But as the providers of the standards. As the market is already seeking for one standard, this is really needed." (E5)
		"the survival rates in the business ecosystem can be influenced because of the regulations. The main reason for this is the change of the consumer needs. 10 years ago everybody this his banking stuff on your computer now a days everybody is doing it on their phone." (E6)
	Sub-conlusion: The survival rates of the business ecosystem companies can change by the availability of technological service providers. These companies can help to innovate the older companies.	

TABLE G.8: Results of Environment and Robustness considerations

Results - S9 - Environment and Niche Creation

R(x)	Consideration of Measurement	Statements by Experts
R33	Regulated standards that change the technological grounding have impact on the variety in the business ecosystem.	"Related to the short term effects of the government regulation he expects an increasing variety of the business ecosystem due to lowering entry barriers." (E1)
		"due to government regulations the variety in the ecosystem can increase." (E2)
		"Overall E4 thinks that the PSD2 regulation will relatively not bring that much new variety in the market. Because PSD2 open's the market but not in that extremes that thereby the variety of the market will increase in large numbers." (E4)
	Sub-conlusion: A regulated standard that change the technological grounding has impact on the variety in the business ecosystem. According to the experts this is due to a decrease of entry barriers.	
R34	Regulated standards that change the technological grounding have impact on the value creation in the business ecosystem.	"On the short term there will be an increasing variety in environment that already is very dynamic. To compete with these varieties the actors in the ecosystem have to reroute there changing capacities and will thereby reduce the productivity on the short term." (E1)
		"So regulations can add value for us but sometimes we also see them as another rule that we have to be compliant with." (E5)
		"The regulations is making it harder for the established companies to keep creating value compared to the new start ups" (E7)
	Sub-conclusion: The value creation of the companies in the business ecosystem is according to the experts harder for the established companies than for the startups.	
R35	The availability of technological service providers has impact on the variety in the business ecosystem.	"The availability of technological service providers due to a regulated standard will increase, in general this is not a bad thing. As X2 can collaborate with them." (E2)
		"So the growing numbers of the variety are not only being determined by the government regulations. What a regulation such as PSD2 does is possible be an accelerator of these numbers." (E3)
		"We embrace this and try to help these new startups with possibilities. Also because we think that payments as they are today are not changing in just a couple of years" (E5)
	Sub-conlusion: The availability of technology service providers has impact on the variety in the business ecosystem. As it increases the variety and thereby the competition. The opinion of the experts is that it is not always caused by a government regulation.	
R36	The availability of technological service providers has impact on the value creation in the business ecosystem.	"the actor which can create the largest value will become the dominator in the ecosystem." (E1)
		"the availability of technology service providers, he thinks that these parties are encourage to grow in numbers and creating added value." (E4)
		"The traditional players will try to take the lead in this value creation, but as she has seen in the past this will probably not work for all of these players and new actors will rise and takeover these market shares." (E7)
	Sub-conlusion: The value creation in the business ecosystem will be increase mainly by the technology service provider. One of the reasons for this is the lowering entry barriers.	

TABLE G.9: Results of Environment and Niche Creation considerations

Appendix H

Updated Composition of Measurements

In Table H.1 an updated representation can be found of the third dimension and the corresponding 36 measurements.

Measurement	Sector	Implementation Theme Technology Adoption	Corresponding Variable	Implementation Theme Business Ecosystem Health	Corresponding Variable
R1	S1	A1 - Technology	V1 - Availability	B1 - Productivity	V7 - Total Factor Productivity
R2	S1	A1 - Technology	V1 - Availability	B1 - Productivity	V8 - Delivery of Innovations
R3	S1	A1 - Technology	V2 - Characteristics	B1 - Productivity	V7 - Total Factor Productivity
R4	S1	A1 - Technology	V2 - Characteristics	B1 - Productivity	V8 - Delivery of Innovations
R5	S2	A1 - Technology	V1 - Availability	B2 - Robustness	V9 - Persistence of Structure
R6	S2	A1 - Technology	V1 - Availability	B2 - Robustness	V10 - Survival rates
R7	S2	A1 - Technology	V2 - Characteristics	B2 - Robustness	V9 - Persistence of Structure
R8	S2	A1 - Technology	V2 - Characteristics	B2 - Robustness	V10 - Survival rates
R9	S3	A1 - Technology	V1 - Availability	B3 - Niche Creation	V11 - Ease of Entry
R10	S3	A1 - Technology	V1 - Availability	B3 - Niche Creation	V12 - Value Creation
R11	S3	A1 - Technology	V2 - Characteristics	B3 - Niche Creation	V11 - Ease of Entry
R12	S3	A1 - Technology	V2 - Characteristics	B3 - Niche Creation	V12 - Value Creation
R13	S4	A2 - Organization	V3 - IT& Financial Resources	B1 - Productivity	V7 - Total Factor Productivity
R14	S4	A2 - Organization	V3 - IT& Financial Resources	B1 - Productivity	V8 - Delivery of Innovations
R15	S4	A2 - Organization	V4 - Human Resources	B1 - Productivity	V7 - Total Factor Productivity
R16	S4	A2 - Organization	V4 - Human Resources	B1 - Productivity	V8 - Delivery of Innovations
R17	S5	A2 - Organization	V3 - IT& Financial Resources	B2 - Robustness	V9 - Persistence of Structure
R18	S5	A2 - Organization	V3 - IT& Financial Resources	B2 - Robustness	V10 - Survival rates
R19	S5	A2 - Organization	V4 - Human Resources	B2 - Robustness	V9 - Persistence of Structure
R20	S5	A2 - Organization	V4 - Human Resources	B2 - Robustness	V10 - Survival rates
R21	S6	A2 - Organization	V3 - IT& Financial Resources	B3 - Niche Creation	V11 - Ease of Entry
R22	S6	A2 - Organization	V3 - IT& Financial Resources	B3 - Niche Creation	V12 - Value Creation
R23	S6	A2 - Organization	V4 - Human Resources	B3 - Niche Creation	V11 - Ease of Entry
R24	S6	A2 - Organization	V4 - Human Resources	B3 - Niche Creation	V12 - Value Creation
R25	S7	A3 - Environment	V5 - Government Regulation	B1 - Productivity	V7 - Total Factor Productivity
R26	S7	A3 - Environment	V5 - Government Regulation	B1 - Productivity	V8 - Delivery of Innovations
R27	S7	A3 - Environment	V6 - Availability of Technology Service Providers	B1 - Productivity	V7 - Total Factor Productivity
R28	S7	A3 - Environment	V6 - Availability of Technology Service Providers	B1 - Productivity	V8 - Delivery of Innovations
R29	S8	A3 - Environment	V5 - Government Regulation	B2 - Robustness	V9 - Persistence of Structure
R30	S8	A3 - Environment	V5 - Government Regulation	B2 - Robustness	V10 - Survival rates
R31	S8	A3 - Environment	V6 - Availability of Technology Service Providers	B2 - Robustness	V9 - Persistence of Structure
R32	S8	A3 - Environment	V6 - Availability of Technology Service Providers	B2 - Robustness	V10 - Survival rates
R33	S9	A3 - Environment	V5 - Government Regulation	B3 - Niche Creation	V11 - Ease of Entry
R34	S9	A3 - Environment	V5 - Government Regulation	B3 - Niche Creation	V12 - Value Creation
R35	S9	A3 - Environment	V6 - Availability of Technology Service Providers	B3 - Niche Creation	V11 - Ease of Entry
R36	S9	A3 - Environment	V6 - Availability of Technology Service Providers	B3 - Niche Creation	V12 - Value Creation

TABLE H.1: Composition of Measurements of the third dimension RSEEM

Appendix I

Case Study Results per Expert

	Expert No.	E1	E2	E3	E4	E5	E6	E7	E8	E9
	Company	X1	X1	X2	X3	X4	X5	X6	X7	X8
Implementation Sector	Sort Actor / Measurement	Niche	Niche	Physical Dominator	Physical Dominator	Keystone	Physical Dominator	Niche	Keystone	Keystone
S1	R1	1	0	-1	-1	-1	0	2	-2	-1
	R2	2	1	0	1	1	1	1	1	1
	R3	1	0	0	-1	-1	0	2	0	0
	R4	1	1	0	1	1	0	2	1	1
S2	R5	1	1	1	2	1	2	0	1	1
	R6	-1	-1	-1	-2	0	-1	0	-1	0
	R7	2	1	0	0	1	1	2	-1	0
	R8	1	0	-1	-1	-1	-2	2	0	-1
S3	R9	0	0	-1	1	-1	0	0	-1	-1
	R10	0	0	-1	-1	-1	-1	0	-1	-1
	R11	1	1	-1	0	-1	0	2	-1	-1
	R12	2	1	-1	0	-1	-1	2	0	-1
S4	R13	0	0	0	0	-2	1	1	-1	-1
	R14	1	1	-1	0	1	0	2	0	1
	R15	1	1	-2	0	-1	-1	2	-1	-1
	R16	0	0	1	0	1	0	0	1	1
S5	R17	-1	-1	1	1	0	0	-2	0	0
	R18	1	1	-1	-1	-1	-2	1	-1	-1
	R19	1	0	0	-1	-2	-2	1	-1	-2
	R20	1	0	0	0	-1	0	1	-2	-1
S6	R21	1	1	1	0	0	0	1	0	0
	R22	0	0	0	0	0	0	0	-1	-1
	R23	2	1	-1	-1	0	-1	1	-1	-1
	R24	1	0	-1	-1	-1	0	1	0	0
S7	R25	2	0	-1	-1	-2	-2	1	-1	-1
	R26	0	0	-2	-1	1	-2	-1	0	0
	R27	0	0	0	0	-1	-1	1	-2	-2
	R28	-1	-1	-1	-1	-1	-1	-1	-2	-1
S8	R29	0	0	1	0	-1	0	1	0	0
	R30	2	1	-1	-1	-1	-1	1	-2	-1
	R31	1	0	0	0	-1	-1	0	-1	-1
	R32	2	1	0	0	0	0	-1	0	0
S9	R33	2	0	-1	0	-2	0	-1	-1	-1
	R34	1	1	-2	-1	0	-1	1	0	0
	R35	2	1	0	0	-1	0	1	-1	-1
	R36	1	2	-1	-1	0	0	1	0	0

TABLE I.1: Case study results per expert on a likert scale base from -2 to +2.