# MANAGING CUSTOMER INNOVATION IN THE FINANCIAL SERVICES INDUSTRY

## A TECHNOLOGY ACCEPTANCE PERSPECTIVE

MASTER'S THESIS

REMCO WESTENBERG
*Business Information Technology*
Faculty of Electrical Engineering,
Mathematics and Computer Science

October 24, 2014
Enschede

UNIVERSITY OF TWENTE.

Deloitte.

# MASTER'S THESIS REMCO WESTENBERG

## MANAGING CUSTOMER INNOVATION IN THE FINANCIAL SERVICES INDUSTRY

### A TECHNOLOGY ACCEPTANCE PERSPECTIVE

Enschede, October 24, 2014


*Author*

***Remco Westenberg***

| | |
|---|---|
| Programme | Business Information Technology,<br>School of Management and Governance |
| Student number | 0199036 |
| E-mail | r.m.westenberg@alumnus.utwente.nl |

*Graduation committee*

***dr. N. Sikkel***

| | |
|---|---|
| Department | Computer Science |
| E-mail | k.sikkel@utwente.nl |

UNIVERSITY OF TWENTE.

***dr. M.E. Iacob***

| | |
|---|---|
| Department | Industrial Engineering and Business Information Systems |
| E-mail | m.e.iacob@utwente.nl |

UNIVERSITY OF TWENTE.

***C. Maas, MSc***

| | |
|---|---|
| Department | Deloitte Consulting B.V.,<br>IT Strategy |
| E-mail | CaMaas@deloitte.nl |

Deloitte.

***ir. R. van de Hoef***

| | |
|---|---|
| Department | Deloitte Consulting B.V.,<br>Deloitte Digital, Strategy |
| E-mail | RvandeHoef@deloitte.nl |

Deloitte.

# PREFACE

The thesis before you is the final product of my time as a student, it is the result of my graduation research to conclude my master study 'Business Information Technology' at the University of Twente. This thesis is not all that I take with me from this period in my life, there are also the skills, experiences and memories I take with me and of course my degree. Most important though are the friends I made during this time, for which I am eternally grateful. Without friends this thesis would not have been completed successfully, or possibly even started. I look forward to applying the knowledge and skills I gained during my time as a student in practice.

There are a lot of people I would like to thank for their assistance in completing this thesis. Let me start by thanking my supervisors from the University of Twente, Maria Iacob and Klaas Sikkel. I am grateful for your support, supervision and guidance and admire your ability to find the time to do so in the nooks and crannies of a schedule filled to the brim.

This project is done in cooperation with Deloitte Consulting in Amstelveen, I thank them for providing me the opportunity and support to complete my graduation. Thanks go to Wouter van Walbeek and Andries van Dijk for their help in scoping the research and completing the proposal. Special thanks go to Camiel Maas and Raoul van de Hoef, their excellent counselling, guidance and feedback was invaluable. Writing a thesis knows its highs and lows, I would like to thank my fellow interns Ruurd de Schipper, Sander van den Bosch, Sebastiaan Koenen and Erik Bookholt for their advice, support and good times, over many cups of coffee. Thanks also go to the people that granted me an interview, providing me with the necessary data and new directions. For confidentiality I cannot name them, but know I am grateful.

Finally, there are three more people I would like to thank. Thanks go to both my parents for their support, help and care throughout my years of study. Lastly I would like to thank Laura van Leijden, for always listening , thinking with me, for sharing in the joyful moments and for her boundless optimism in other moments.

I hope you enjoy reading this thesis and that you will learn as much from reading it as I did writing it. If you have any questions, feel free to contact me.

Regards,

Remco Westenberg

# MANAGEMENT SUMMARY

The capability to innovate is often a key competitive advantage for organizations. Being able to mobilize knowledge, technological skills and experience to create novel product offers or processes allows them to differentiate from competitors and experience growth or increase profits. The problem for organizations is that their resources for innovation are limited, demanding efficient usage of innovation resources without missing the boat. Organizations face a constant dilemma of conflicting interests as there is a trade-off between exploration and exploitation.

The goal of this research is to provide a framework for the adoption of technological innovations by customers, within which the importance of factors influencing the adoption is differentiated over time as a technology matures. Such a framework allows organizations to efficiently analyse and capitalize on the innovation landscape, by rating technologies on these factors. Such a framework can also be used to increase the adoption of existing innovations that are underperforming, by exposing opportunities for improvement.

This research focusses on the adoption of innovations in the financial services industry, using a case study approach. Rigorous analysis of existing literature revealed 78 factors influencing innovation adoption, which were grouped into categories. Not all categories received strong support from scientific studies, such as network value, which was eventually removed as the case study also did not provide sufficient evidence for its influence. The case study also revealed exposure as a new factor to be included. The following seven categories were identified:

- Performance Expectancy: The degree to which the customer expects using a technology will provide benefits in performing certain activities
- Effort Expectancy: The expected degree of ease a customer associates with using a technology
- Social Influence: The extent to which a customer perceives that important others (e.g., family and friends) believe that they should use a technology
- Facilitating Conditions: The customers expectation of the available resources, available support and the individual and technological availability to use a technology
- Hedonic Motivation: The degree of fun or pleasure derived from using an innovation
- Perceived Risk: A customer's perceived potential for loss in the pursuit of a desired outcome of adopting a technology
- Exposure: The degree to which a customer has heard of and been informed about a technology

These seven factors are the important factors influencing the adoption of technological innovations in the financial services industry. With this information, organizations can efficiently analyse and capitalize on the innovation landscape, by serving as a checklist for the importance of each factor during the technology life cycle.

The case study revealed that not all factors received equal attention from innovation practitioners in this industry. In particular, practitioners in the financial services industry could improve efficiency by placing an increased focus on social influence and facilitating conditions.

# TABLE OF CONTENTS

# LIST OF FIGURES

# LIST OF TABLES

# 1 INTRODUCTION

## 1.1 Background

Innovation is a vital economical component. For organizations, the capability to innovate often creates a key competitive advantage (Porter, 1990). Being able to mobilize knowledge, technological skills and experience to create novel product offers or processes allows them to differentiate from competitors and experience growth or increased profits (Porter, 2008; Tidd & Bessant, 2011). The importance of innovation for business continuity has been expressed by several authors, even stating as much as "Innovate or die" or "Change or die" (Beer & Nohria, 1999; Getz & Robinson, 2003). Innovation is also important from a macro-economic perspective, according to Baumol (2002) innovation is ultimately responsible for virtually all economic growth since the eighteenth century.

Innovation can be seen as a complicated process as it involves many environments and factors, but a simplified process consists of four activities: searching, selecting, implementing and capturing value.


**FIGURE 1. SIMPLIFIED MODEL OF THE INNOVATION PROCESS, ADAPTED FROM TIDD & BESSANT (2011)**

In the searching activity the internal and external environment are scanned for opportunities and threats for change. Based on the organization's strategy and environment it is decided which opportunities and threats are selected to follow up on. Implementing consists of all the steps related to launching the new idea, such as attracting new knowledge and resources. The final activity is capturing value, to ensure that the predicted benefits are achieved and knowledge generated in the innovation process can be incorporated into the organization and used in the future. A simplified model, adapted from Tidd & Bessant (2011), is given in Figure 1.

## 1.2 Problem statement

Organizations face a constant dilemma of conflicting interests, there is a trade-off between exploration and exploitation (Hofman & van Dijk, 2013; March, 1991; O'Reilly III & Tushman, 2004) and organizations must be ambidextrous to become successful (Tushman & O'Reilly III, 2006; Volberda, 1996). The problem for organizations is that their resources for innovation are limited. They do not know when an emerging technology will become successful and cannot invest in all trends to capture the successful ones. Because of this organizations want to know how to successfully innovate emerging technologies into a product offering, preferably in a relatively short time. They struggle to find out when to step in and act on a developing technology and turn it into a product offering. Due to the sheer number of emerging technologies organizations also face problems examining them all. Getz & Robinson (2003) also touch upon the subject, remarking that blindly innovating as much as possible can be counter-productive, but focus more on the internal perspective of creating innovation.

There are several reasons why companies want to get the timing just right. Companies that are too early face high risks. Developing innovations early involves making heavy costs with no guaranteed returns and the environment might react negatively, leading to negative publicity and reputation

damage. On the other hand companies also fear being late in the innovation process, as they might lag behind competitors and lose customers to them.

Creating a new innovation based on an emerging technology involves a radical change in the market. This point where radical change is possible is defined by Gladwell (2006) as the tipping point. The tipping point is the moment of critical mass, the threshold, the boiling point after which a rapid change will take place (Gladwell, 2006). Without knowing the requirements for this point to take place it is difficult to achieve maximum value from innovating at the optimal cost. It is unclear what the ideal moment is to invest in the emerging technology and what developments are required to reach the tipping point and start achieving the benefits. Business-adoption will not take place until organizations are certain that user-adoption of an emerging technology will take place. This research considers the tipping point to be the moment when all external factors have achieved a sufficient level to ensure user-adoption, at which point an emerging technology becomes applicable to all organizations in the same environment. The next step of deciding to actually apply the technology remains to be made, depending on internal factors.

Based on Gartner studies, Hofman & Van Dijk (2013) calculated that far over 1000 technological trends exist. Facing this many technological trends creates a difficulty for organizations in the selection stage of the innovation process in Figure 1. As a consulting company, Deloitte is interested in helping organizations with this. Eventually the emerging technologies become mature enough and changes in the trend or invention itself and the environment lead to it being incorporated into an innovation, a new product offering. Whether or not an implemented innovation becomes successful in an organization depends on many factors, both internal and external. The ideal moment to launch this new offer is at the tipping point where the innovation will take of rapidly. This process is shown in Figure 2. In this research, the external factors influencing implemented innovations at the end of the innovation process are studied to provide a framework that can be used in the selection stage of the innovation process in Figure 1, this means this study traces back the process in Figure 2.

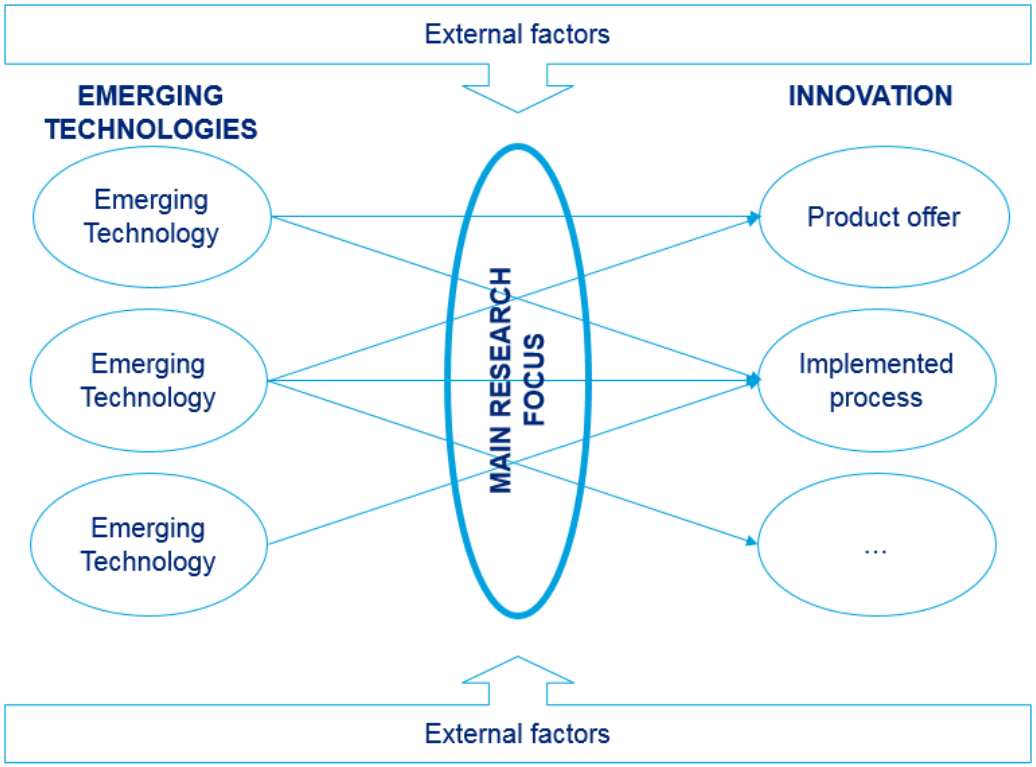



**FIGURE 2. INNOVATION PROCESS**

## 1.3 Terminology

In innovation literature and practice there are a lot of differences between terminologies. To increase understandability, the selected terminology will be explained, based on the framework in Figure 2.

The Organisation of Economic Co-operation and Development (OECD, 2005, p. 46) defines innovation as "the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations". Boddy (2009, p. 6) uses a similar description, stating "innovation is the process of taking a creative idea and turning it into a useful product, service or method of operation". In this paper an innovation is seen as the final result of this process, thus being a newly implemented product or process.

In this paper an emerging technology is defined as an idea for new possible applications of technology or a technical invention. To provide more clarity a few examples are given. Social analytics (an idea for new possible applications) spurred on by technological inventions and developments that allow the analysis opens the possibility of targeted insurance policies with flexible premiums (an innovation). HTML5 (an invention) allows for inter-active communication across multiple platforms (an innovation) that increases customer satisfaction. Usage-based insurance or telematics (an innovation) is spurred on by a combination of mobile devices, location services and advanced analytics (all inventions).

There are a multitude of factors that influence how successful an innovation will become, both before and after the implementation process. The focus of this paper are the factors before the implementation process, determining if and when organizations should act on an emerging technology. Examples of such external factors include the local technical and economic development (3G/4G coverage) and social, cultural and legal factors like the importance of privacy.

## 1.4 Research questions

This study discusses external factors influencing adoption of innovations determined before the actual implementation of the innovation. In order to resolve the problem stated in the previous chapter and achieve the goal of the research, the following question will be answered:

> **Which combination of external factors contributes to the adoption of innovations based on emerging technologies?**

Within this research the influence of external factors on the adoption of innovations developed from emerging technologies is investigated. The connection between this relation and business performance is then validated in practice.

Subquestions are formulated to make the research and main question more concrete. The following subquestions are formulated; they will be answered in the different chapters.

1. What external factors contribute to the adoption of innovative products and services by customers according to literature?
2. How do the external factors interrelate in adoption of emerging technologies?
3. What external factors influencing adoption are recognized in practice?
4. To what extent can a framework of required external factors for rapid innovation adoption be applied to emerging technologies?

# 2 RESEARCH METHODOLOGY

This chapter describes the research outline. It begins with describing the approach used to conduct the research, followed by the scope and goal of the research. Next the value added by the research is described and finally a short overview is given.

## 2.1 Research approach

This research uses a case study methodology approach and utilizes the methodology by Yin (2014). Yin (2014) recommends to start a case study with a literature study to develop a theoretical framework for the case study. The theoretical framework is used to take a deductive approach in this research. This provides several advantages, as it ties the research into the existing body of knowledge, helps research get started and directs the analysis of the collected data (Thornhill, Saunders, & Lewis, 2008; Yin, 2014). This research is classified as an interpretive research methodology, as it combines qualitative knowledge with a literature review, in order to discover the influence of external factors on the adoption and development of innovations in organizations.

Based on the methodology by Yin (2014) and the process required to begin this research, several phases and activities can be identified, each with their own deliverable. These deliverables are described shortly in Figure 3. As the main research question is too complicated to answer at once, subquestions have been formulated that are answered by the different phases and activities.

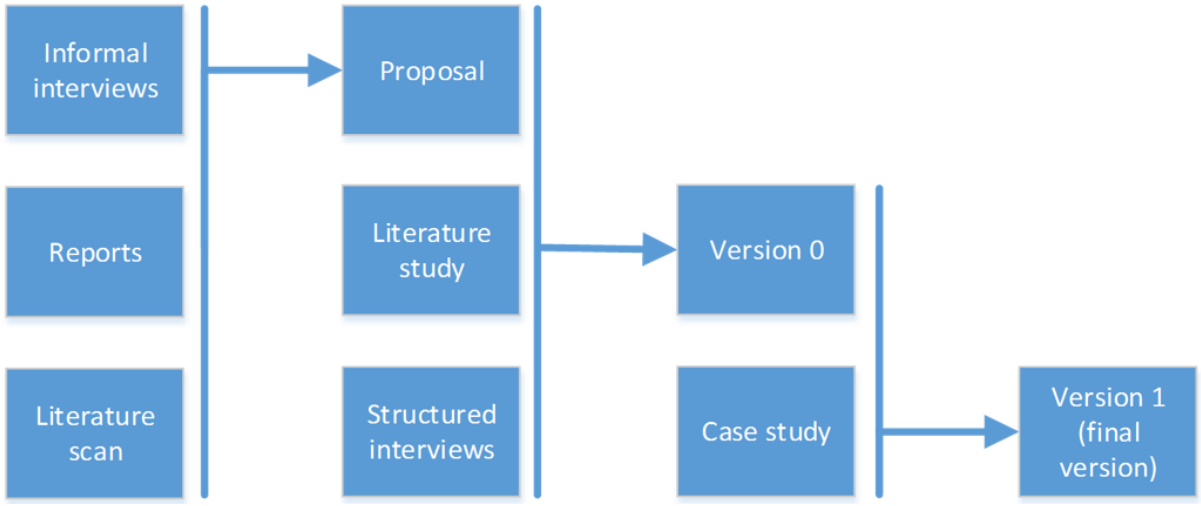



**FIGURE 3. RESEARCH APPROACH**

The first step after the proposal is a structured literature review, using the methodologies explained by Webster & Watson (2002) and Kitchenham (2004). The literature study is conducted in chapter 3 and answers research question 1. This will answer the first research question and generate a list of factors that influence adoption according to literature. These factors have to be grouped and combined and their interrelation has to be identified. To do so, a theoretical model is formulated in section 3.4, answering research question 2. The next step is to identify the factors recognized in practice, answering research question 3. This is done by conducting the case study, described in chapter 4. The final step is to combine literature and practice in an attempt to create a complete model fitting both literature and practice. This step is completed in chapter 5 and answers research question 4. An overview of the research questions, chapters and activities is given in Table 1.

| Research question | | Chapter | Outcome |
|---|---|---|---|
| **1.** | **What external factors contribute to the adoption of innovative products and services by customers according to literature?** | 3 Literature review | Description of external factors and their influence |
| **2.** | **How do the external factors interrelate in adoption of emerging technologies?** | 3.4 Theoretical model | Model of grouped factors influencing adoption |
| **3.** | **What external factors influencing adoption are recognized in practice?** | 4 Case study | Description of external factors and their influence, overlap and discrepancies |
| **4.** | **To what extent can a framework of required external factors for rapid innovation adoption be applied to emerging technologies?** | 5 Discussion | Validated framework of external influences on adoption of innovations |

TABLE 1. RESEARCH OVERVIEW

## 2.2 Scope

The scope of this research is to develop a framework for the adoption of technology based innovations. Based on the interest of Deloitte it was determined to scope this down to a subset of this, the financial services industry, for which Deloitte wanted to validate the framework and learn about innovations in this industry.

Given the limitation of time and experts to consult, it is not possible to look at all technologies in the financial services industry, a selection has to be made. Scoping down allows for a more focused and precise research that results in more added value from deeper insights in the final result. The financial services industry was further scoped down to the insurance industry due to the differences between insurance companies and banks, such as the main processes and relations with clients.

Even within the insurance industry, a selection of innovations has to be made, where each innovation is studied as a case. The innovations are preferably recently introduced so that expertise on the innovation has not yet been forgotten by experts. The innovations also have to be clearly based on a technology and preferably not all the same. In accordance with Yin (2014) it is preferred that different innovations are studied, but also that one innovation is studied twice to allow replication of results.

## 2.3 Goal

The goal of this research is to collect and combine the existing knowledge and expertise on innovation into factors influencing the adoption of technological innovations. This will then be formed into a framework to show the different influencing external factors and their underlying relations, to allow for better understanding and application to (emerging) technologies. Such a framework will help organizations with determining the optimal moment where investing in an emerging technology and the innovation-process will pay off, as well as help identifying possible areas for improvement and provide a methodology to quickly check their focus. The final goal of this study is to validate this framework by applying it to a specific industry.

# 3 LITERATURE REVIEW

The purpose of this chapter is to answer two research subquestions: “What external factors contribute to the adoption of innovative products and services by customers according to literature?” as well as “How do the external factors interrelate in adoption of emerging technologies?” The answers to these questions will give an overview of the state of research in the academic field of technology acceptance. This chapter begins by describing the used approach, after which a short introduction of the field of technology acceptance is given. After this, a detailed literature view is conducted, answering research subquestion 1. The conclusion of this chapter is to formulate a theoretical model, answering research subquestion 2.

## 3.1 Approach

This section describes the approach and methodology used in the literature review process. The conducted literature study is based on the method described by Kitchenham (2004), which aims to present a fair evaluation of a research topic by using a trustworthy, rigorous, and auditable methodology (Kitchenham, 2004).

The importance of such a methodology is stretched by Bhattacherjee (2012) who states that no research is scientific research unless it contributes to a body of science and follows a scientific method. Furthermore, a structured rigorous literature review with a clear goal and result has a higher chance of getting published (Webster & Watson, 2002). The findings of the literature study in section 3.4 are presented with a concept-centric approach as described by Webster & Watson (2002).

The literature study was conducted by keyword searches on Google Scholar[1] and Scopus[2], using the scientific license provided by the University of Twente. Papers that were not accessible under this license were not used. Table 2 gives an overview of the conducted searches.

| Keyword | Period |
|---|---|
| Technology acceptance | May 2014 |
| Innovation acceptance | May 2014 |
| Innovation adoption | May 2014 |
| Technology adoption | May 2014 |
| Technology diffusion | May 2014 |
| Innovation diffusion | May 2014 |
| Risk technology acceptance | July 2014 |
| Network externalities technology acceptance | July 2014 |
| Maturity technology acceptance | September 2014 |
| Time technology acceptance | September 2014 |

**TABLE 2. LITERATURE SEARCH PROCESS**

## 3.2 Introduction

Research in the area of user acceptance of new technologies is one of the most mature areas in information systems literature (Hu, Chau, Sheng, & Tam, 1999). Theoretical models explaining user acceptance routinely explain over 40 percent of the variance in individual intention to use technology

[1] http://scholar.google.nl/
[2] http://www.scopus.com/

(Venkatesh, Morris, Davis, & Davis, 2003). Technology acceptance has roots in the fields of psychology, sociology and information systems, while theories from the field of diffusion of innovations (Rogers, 2003) have been integrated by Moore and Benbasat (1991, 1996). This chapter will explain the various models and developments in the field of technology acceptance and describe which concepts can be used to predict adoption behaviour of technological innovations. In the top 10 theories of the Information Systems field, two theories can be found about technology acceptance: the Technology Acceptance Model (TAM) and the Unified Theory of Use and Acceptance of Technology (UTAUT) (Moody, Iacob, & Amrit, 2010). UTAUT (Venkatesh et al., 2003) combines nine preceding theories (including TAM (Davis, Bagozzi, & Warshaw, 1989; Davis, 1989)) into a unified theory. This chapter will start with explaining the preceding theories and UTAUT, after which newer theories and critics on the older theories will be discussed.

## 3.3 Existing Literature

### 3.3.1 Theory of Reasoned Action

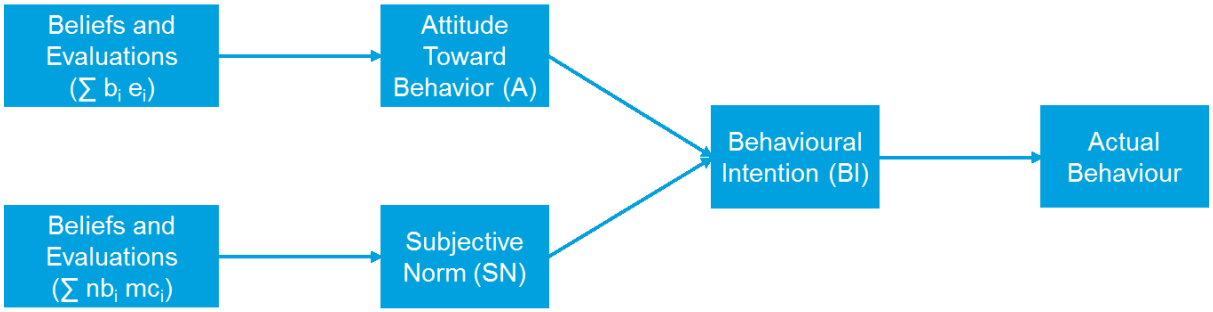



**FIGURE 4. THE THEORY OF REASONED ACTION (AJZEN & FISHBEIN, 1980; FISHBEIN & AJZEN, 1975).**

The theory of reasoned action (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975) is a theory in the field of behavioural psychology. According to this theory it is likely that if a person intends to perform a behaviour, the person will consequently perform that behaviour. The theory of reasoned action contains three main constructs; behavioural intention (BI), attitude towards behaviour (A) and subjective norm towards behaviour (SN). Behavioural intention is a measure of the strength of one's intention to perform a specified behaviour, attitude is defined as an individual's positive or negative feelings about performing the target behaviour and subjective norm refers to the person's perception that the people who are most important to him think he should or should not perform the behaviour in question (Fishbein & Ajzen, 1975).

While the construct of behavioural intention is determined by the other constructs of attitude towards behaviour and subjective norm towards behaviour, both of these constructs are determined by a sum of beliefs and their respective weights. The attitude towards behaviour (A) is determined by a person's beliefs ($b_i$) about each of the consequences ($i$) the behaviour will cause, multiplied by the evaluation ($e_i$) of each of those consequences (Fishbein & Ajzen, 1975). This concept also indicates that any external change will not directly influence attitude, but rather that it only effects attitude after being processed in the person's belief structure (Ajzen & Fishbein, 1980). The subjective norm (SN) is determined by a person's normative beliefs ($nb_i$), the expectation the person believes other persons (or groups) have about the behaviour, weighted by the motivation to comply ($mc_i$) with this expectation (Fishbein & Ajzen, 1975). An overview of the theory of reasoned action is given in Figure 4.

As noted by Davis et al. (1989), the theory of reasoned action indicates that external variables studied in information systems research achieve their influence on behaviour only through the internal psychological variables as mentioned in the theory of reasoned action. As such, it can be used as a common frame of reference within which to integrate various lines of research.

### 3.3.2 Technology Acceptance Model

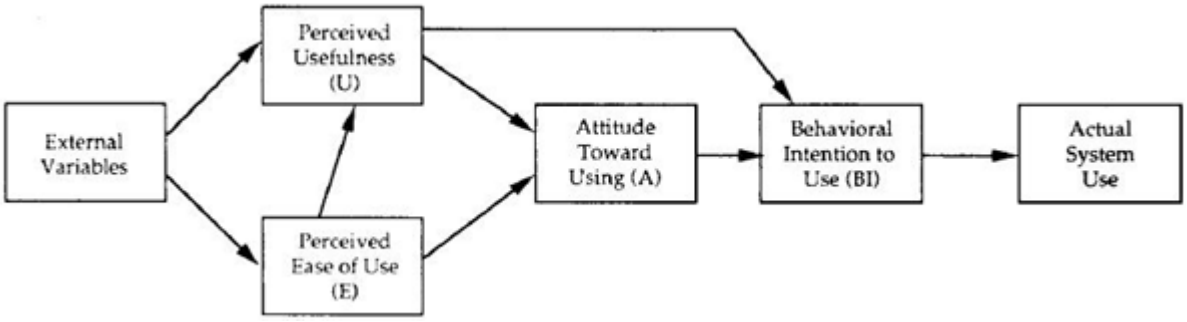



**FIGURE 5. THE TECHNOLOGY ACCEPTANCE MODEL (DAVIS ET AL., 1989; DAVIS, 1989).**

Adapted from the theory of reasoned action, the technology acceptance model (Davis et al., 1989; Davis, 1985, 1989) is a model to predict user acceptance of information systems. It is the major guideline for acceptance research (Vogelsang, Steinhüser, & Hoppe, 2013) and the most influential theory in the field of information systems (Moody et al., 2010). The goal of the development was to provide a general but theoretically justified model that can be used to both predict and explain user behaviour for a broad range of technologies and populations. Backed by the theory of reasoned action, this means that in order to achieve these goals the technology acceptance model has to trace the impact of external factors on internal beliefs, attitudes and intentions. This is done by identifying fundamental variables from previous research that deal with the cognitive and affective determinants of technology acceptance and modelling the relations among them (Davis et al., 1989).

The technology acceptance model proposes two new belief constructs, perceived usefulness (U) and perceived ease of use (E). Similar to the theory of reasoned action, the technology acceptance models states that actual use is determined by behavioural intention to use (BI), that behavioural intention is determined by the person's attitude towards using (A) and that attitude towards using is determined by beliefs and evaluations. The first new belief construct, perceived ease of use, influences attitude towards using and the other new belief construct, perceived usefulness. The second construct, perceived usefulness, influences both attitude towards using as well as behavioural intention directly. Both belief constructs (perceived usefulness and perceived ease of use) are influenced by external variables, similar to the theory of reasoned action (Davis et al., 1989). An overview of the technology acceptance model is given in Figure 5.

Even though the relation between subjective norm and behavioural intention was found to be significant in both the theory of reasoned action and the theory of planned behaviour (Ajzen, 1991), it is not included in the technology acceptance model. Davis et al. (1989) found it to be insignificant in predicting behaviour intention, but do remark the need for additional research into the impact of social influences on usage behaviour.

### 3.3.3 Theory of Planned Behaviour

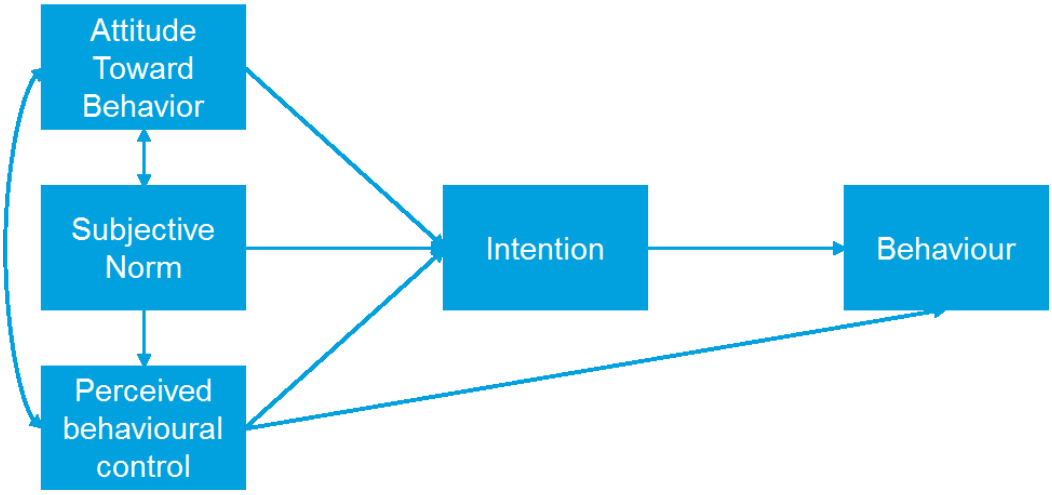



**FIGURE 6. THE THEORY OF PLANNED BEHAVIOUR (AJZEN, 1985, 1991)**

Recognizing the limitations of the theory of reasoned action (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975) in dealing with behaviours of people which have incomplete volitional control, Ajzen (1985, 1991) proposed the theory of planned behaviour. Similar to the theory of reasoned action it contains actual behaviour, behavioural intention (BI), attitude towards the behaviour (A) and subjective norm towards the behaviour (SN), where A and SN are each determined by beliefs and evaluations (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975). New in the theory of planned behaviour is the concept of perceived behavioural control (PBC). Similar to the way A and SN are determined, PBC is determined by the sum of each control belief ($c_i$) multiplied by their respective perceived power ($p_i$) of that control factor (Ajzen, 1991).

A behavioural intention can only be expressed in a behaviour if the behaviour is under volitional control, meaning the person can decide at will to perform or not perform the behaviour. This can be hindered by factors such as limited availability of time, money, skills and cooperation of others. While it logically follows that behavioural control influences behaviour, the theory investigates the perception of behavioural control, noting it is perception that influences the actual behaviour and not actual control. An example given by Ajzen (1991) is that of learning skiing: “if two individuals have equally strong intentions to learn to ski, and both try to do so, the person who is confident that he can master this activity is more likely to persevere than is the person who doubts his ability.” Perceived behavioural control can influence the attitude towards a behaviour, but also behaviour directly, as PBC can be used as a substitute for a measure of actual control. An overview of the theory of planned behaviour is given in Figure 6.

### 3.3.4 Model of Personal Computer Utilization

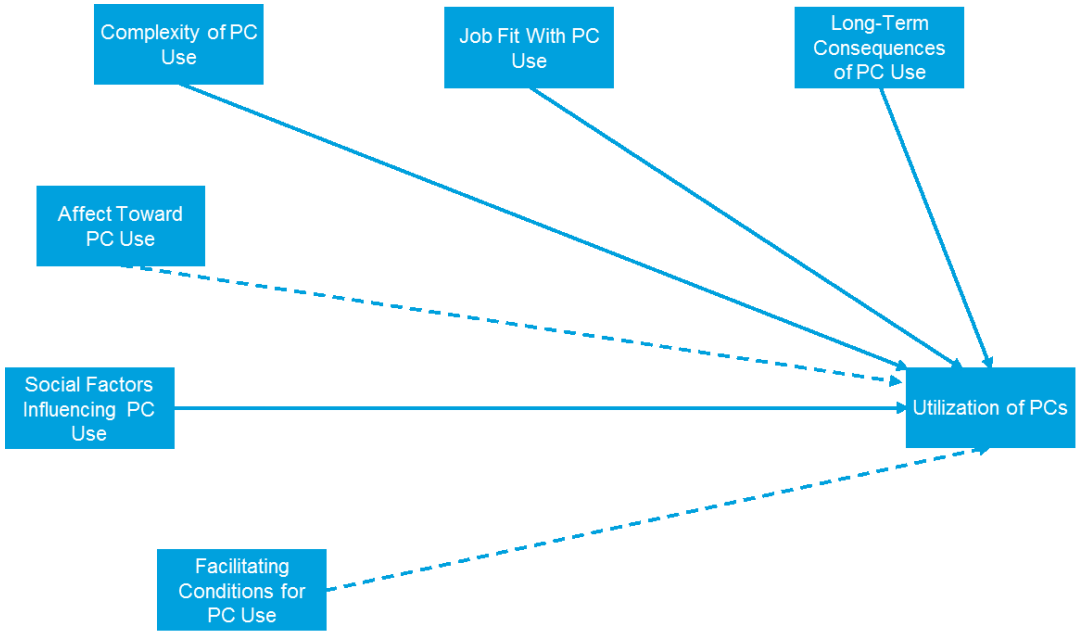



**FIGURE 7. THE MODEL OF PERSONAL COMPUTER UTILIZATION, DASHED LINES INDICATE INSIGNIFICANT RELATIONS (THOMPSON, HIGGINS, & HOWELL, 1991)**

The Model of Personal Computer Utilization was created by Thompson, Higgins, & Howell (1991), using a subset of the Theory of Human Behaviour by Triandis (1979). Thompson et al. (1991) argue that IS researchers have been wrong in basing models and theories of technology acceptance on the theory of reasoned action (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975), mentioning that it is lacking in certain respects. Because the competing theory by Triandis (1979) has been accepted within the psychological literature, it should also be used within the technology acceptance context. Recognizing this had not been done, the goal of Thompson et al. (1991) was to test a model using of personal computer utilization based on Triandis' (1979) theory of attitudes and behaviour.

Social factors influencing PC use are defined as the person's internalization of norms, roles and values of the reference groups towards the behaviour (Triandis, 1979). Thompson et al. (1991) remark that this concept is similar to the subjective norm construct of the theory of reasoned action (Fishbein & Ajzen, 1975). Affect toward PC use is defined as the affective component (like/dislike) of attitude. There is discussion about the validity of separating the cognitive and affective components of attitude and the relation of affect and utilization was found to be statistically insignificant (Thompson et al., 1991).

The construct of perceived consequences is likely to contain multiple dimensions (Fishbein & Ajzen, 1975; Triandis, 1971) and has been separated into complexity, job fit and long-term consequences. Complexity is defined as "the degree to which an innovation is perceived as relatively difficult to understand and use" (Rogers & Shoemaker, 1971). Support for complexity can be found in the work of Tornatzky & Klein (1982) and within the IS field in the technology acceptance model, where perceived ease of use is the opposite of complexity and has a positive instead of negative relation.

Job fit is defined as perceived job fit and seen as the extent to which an individual believes that use can enhance job performance (Thompson et al., 1991). The positive relationship between perceived job fit and technology adoption is empirically supported (Cooper & Zmud, 1990; Goodhue, 1988;

Tornatzky & Klein, 1982). The definition of perceived usefulness in the technology acceptance model (Davis et al., 1989) is similar to the definition of job fit.

Long-term consequences of use is defined as outcomes that have a pay-off in the future. An example (and empirical support) is the study by Beatty (1986), where a strong relationship was found between perceived long-term consequences of use and actual use of CAD/CAM systems, because adopters believed that use would enhance their career mobility, but not improve their current job performance.

Facilitating conditions are defined as objective factors in the environment that make an act easy to do (Triandis, 1979). The relation between facilitating conditions and utilization of pcs was found to be not statistically significant (Thompson et al., 1991). An overview of the model of personal computer utilization is given in Figure 7.

### 3.3.5 Perceived Characteristics of Innovating

The perceived characteristics of innovating were factors identified by Moore and Benbasat (1991) as to having influence on user adoption of information technology innovations. Their work was based heavily on characteristics from the innovation diffusion theory by Rogers (2003). Recognizing the importance of the work by Rogers in this newer theory and the applicability to the context of this study, the innovation diffusion theory is included in this chapter.

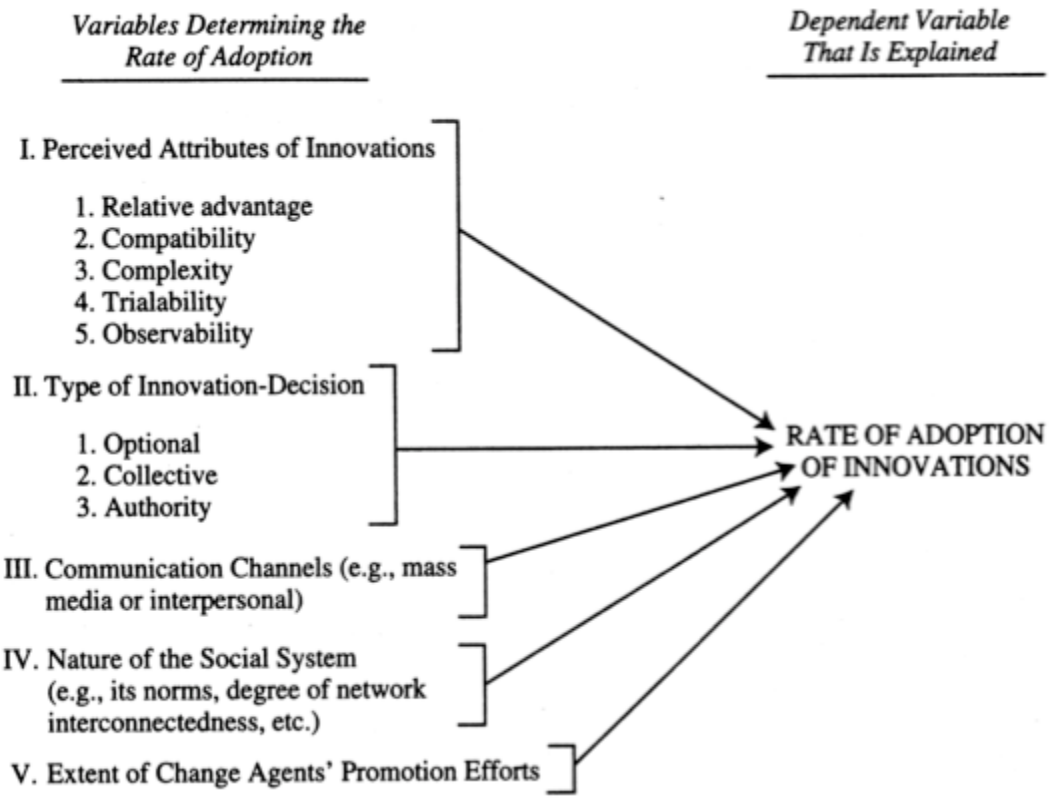



FIGURE 8. INNOVATION DIFFUSION THEORY (ROGERS, 2003)

Rogers (2003) original work defined a set of five perceived attributes of innovation that influence the rate of adoption of innovations. It is important to note that Rogers (2003) mentions that the five types of variables have not received equal attention, but in this chapter the focus is on the perceived attributes of innovations.

Relative advantage is defined as the degree to which an innovation is perceived as being better than its predecessor. It is expressed as the degree of economic profitability, social prestige and in other

ways (Rogers, 2003). Price is often an important aspect of relative advantage, showing that the perceived attributes of an innovation can change over time. Compatibility is the degree to which an innovation is perceived as consistent with the existing values, past experiences and needs of potential adopters (Rogers, 2003). Complexity is defined as the degree to which an innovation is perceived as relatively difficult to understand and use (Rogers, 2003).

Trialability is defined as the degree to which an innovation may be experimented with on a limited basis (Rogers, 2003). Trialability is particularly important for innovators and early adopters, indicating it might be an important factor when an innovation is influenced by network effects. Observability is defined as the degree to which the results of an innovation are visible to others (Rogers, 2003).

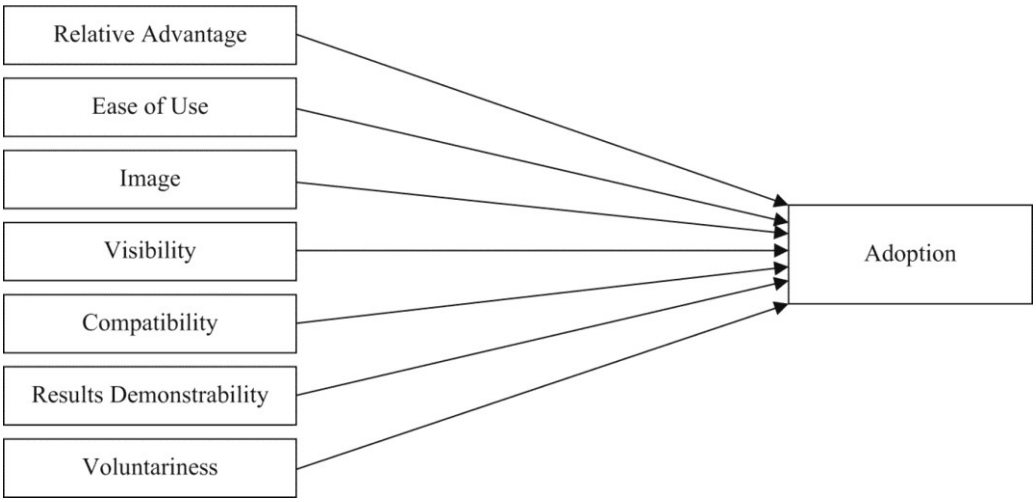



**FIGURE 9. PERCEIVED CHARACTERISTICS OF INNOVATING (MOORE & BENBASAT, 1991)**

Moore & Benbasat (1991) adapted and expanded these perceived attributes of innovations to seven constructs that influence adoption of technological innovations. An important change is that all constructs are not based on the perceived characteristics of the innovation, but on the perceived characteristics of using the innovation, an important difference as argued by Ajzen & Fishbein (1980). Relative advantage and compatibility are adapted definitions of Rogers (2003), while complexity has been renamed to Ease of Use.

Image is defined as the degree to which use of an innovation is perceived to enhance one's image or status in one's social system (Moore & Benbasat, 1991). Research has shown that the effect image (social status) is different enough from relative advantage to include it as a separate factor (Tornatzky & Klein, 1982). This means that the social advantage an innovation can provide is not included in the definition of relative advantage given by Moore & Benbasat (1991), the importance of separating .

Visibility is defined as the degree to which one can see others using the system in the organization (Moore & Benbasat, 1991). Results demonstrability is defined as the tangibility of the results of using the innovation, including the observability construct of Rogers (2003) and communicability (Moore & Benbasat, 1991). Voluntariness of use is defined as the degree to which use of the innovation is perceived as being voluntary, or of free will (Moore & Benbasat, 1991).

While relative advantage and compatibility are conceptually different, measures of both were found to be overlapping (Moore & Benbasat, 1991). This indicates a relation between relative advantage and compatibility, meaning one of those might not be related to adoption directly.

### 3.3.6 Motivational Model

Motivational theory has been used as an explanation for behaviour in psychology research. After recognizing that the effect of intrinsic motivation on technology acceptance required further research (Davis, 1989), Davis, Bagozzi & Warshaw (1992) applied motivational theory to understand new technology adoption and use. Two constructs were identified as having an effect on acceptance, extrinsic motivation and intrinsic motivation. The effect of both constructs on computer usage in the workplace was found to be significant. Extrinsic motivation is defined as the perception that users will want to perform an activity because it is perceived to be instrumental in achieving valued outcomes that are distinct from the activity itself, such as improved job performance, pay or promotions (Davis et al., 1992). Intrinsic motivation is defined as the perception that users will want to perform an activity for no apparent reinforcement other that the process of performing the activity per se (Davis et al., 1992). These constructs indicate that behaviour is influenced not just by a benefit construct (perceived usefulness, relative advantage, etc.), but also by an affective construct (like, dislike) similar to the construct of affect towards PC use (Thompson et al., 1991).

### 3.3.7 Decomposed Theory of Planned Behaviour

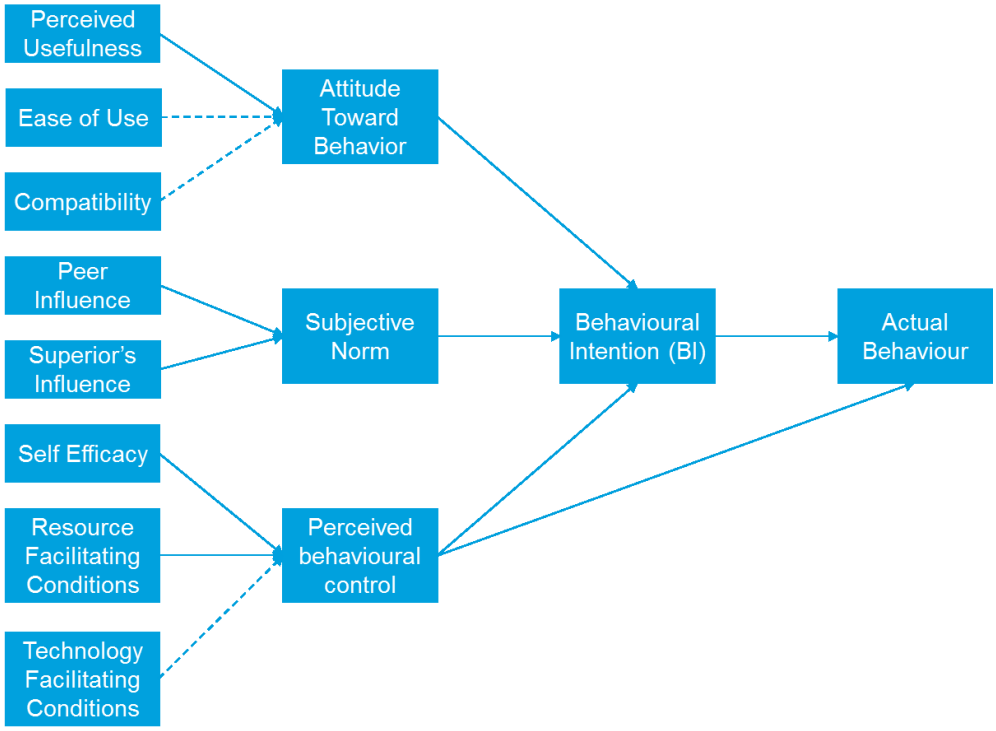



**FIGURE 10. DECOMPOSED THEORY OF PLANNED BEHAVIOUR, DASHED LINES INDICATE INSIGNIFICANT RELATIONS (TAYLOR & TODD, 1995)**

Taylor & Todd (1995) proposed an alternative version of the theory of planned behaviour where the belief structures are decomposed into multi-dimensional belief constructs. The decomposition can provide a stable set of beliefs which can be applied across a variety of settings and by focussing on specific beliefs it is clearer and more managerially relevant (Taylor & Todd, 1995). It can be seen as a combination of the theory of planned behaviour (Ajzen, 1985, 1991), the technology acceptance model (Davis et al., 1989; Davis, 1989) and the (perceived) characteristics of innovations (Moore & Benbasat, 1991; Rogers, 2003).

According to Taylor & Todd (1995) several constructs of the technology acceptance model (Davis, 1989) can be mapped onto perceived characteristics of innovations (Rogers, 2003). Perceived

usefulness is a combination of the definition given in the technology acceptance model (Davis, 1989) and the innovation characteristic of relative advantage (Rogers, 2003). Similarly, ease of use is taken from the technology acceptance model (Davis, 1989) and seen as analogous but opposite to complexity (Rogers, 2003). The definition of compatibility is taken solely from Rogers (2003). Support for the factors from Rogers (2003) has been found for adoption in general (Tornatzky & Klein, 1982) and IT usage specifically (Moore & Benbasat, 1991), while the technology acceptance model has been validated by Davis et al. (1989).

Several studies have suggested decomposing the normative belief structures into relevant referent groups (Taylor & Todd, 1995). In this model the normative believe structure has been decomposed into peer influence and superior's influence, while mentioning the possibility of subordinate's influence (Taylor & Todd, 1995). This decomposition shows that this model is tailored to an organizational setting, however the composition of peer groups and the importance of each group can be changed to the relevant setting.

When discussing the construct of control beliefs, Ajzen (1985, 1991) refers to the internal notion of individual self-efficacy and to external resource constraints. The construct of external resource constraints is similar to construct of facilitating conditions (Thompson et al., 1991; Triandis, 1971) and for technology usage this provides two dimensions for control beliefs: resource facilitating conditions and technology facilitating conditions such as technological compatibility (Taylor & Todd, 1995). Facilitating resources does not per se encourage technology use, but the absence does pose a barrier to usage (Taylor & Todd, 1995). An overview of the decomposed theory of planned behaviour can be found in Figure 10.

### 3.3.8 Social Cognitive Theory

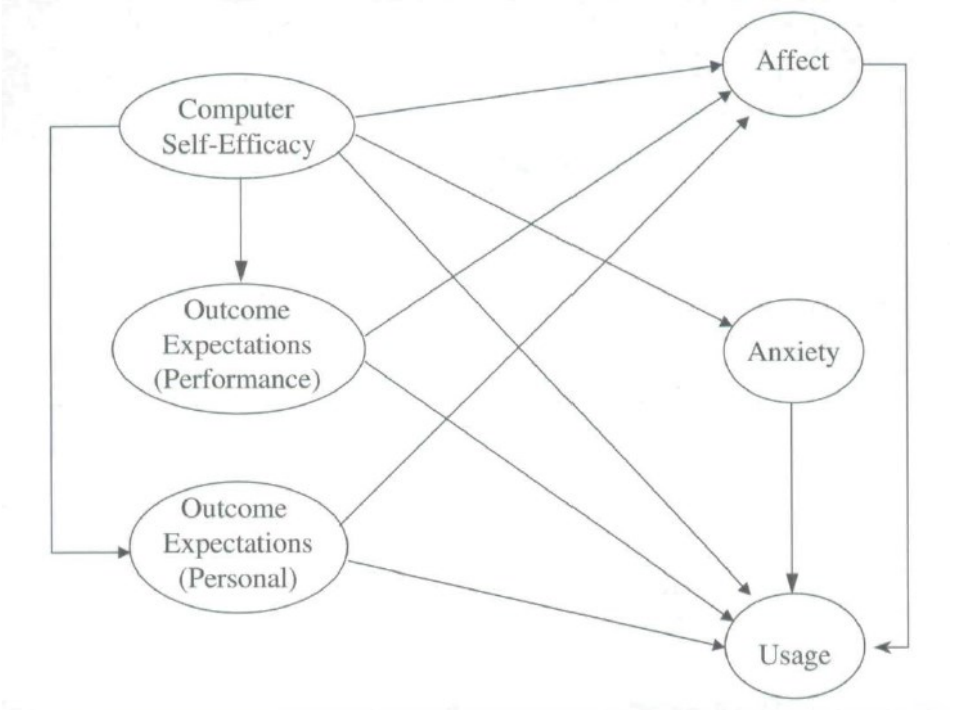



**FIGURE 11. USAGE MODEL BASED ON SOCIAL COGNITIVE THEORY (COMPEAU, HIGGINS, & HUFF, 1999)**

Based on earlier work (Compeau & Higgins, 1995), Compeau, Higgins & Huff (1999) applied and extended social cognitive theory (Bandura, 1986) to the context of computer utilization. Social cognitive theory recognizes continual reciprocal interaction between the environment, perceptions

and behaviour (Bandura, 1986), while most (TRA, TAM, TPB) view it as a causal structure (Compeau et al., 1999). This creates the importance of a positive first contact with technology, as the possibility of positive and negative spirals of self-efficacy and use exist (Compeau et al., 1999). In this theory self-efficacy is defined as an individual's beliefs about his or her capabilities to use computers (Compeau et al., 1999). This construct can also be found in the decomposed theory of planned behaviour (Taylor & Todd, 1995) and is supported by Ajzen (1985, 1991). Performance outcome expectations are defined as the expected improvements in job performance (efficiency and effectiveness) associated with computer usage (Compeau et al., 1999). Personal outcome expectations are defined as the expectations of change in image, status or rewards, such as promotions, raises or praise (Compeau et al., 1999). Affect is defined as the expected enjoyment a person derives from using computers, while anxiety is defined as the expected negative affective response to using computers (Compeau et al., 1999). Social cognitive theory provides a better understanding of the concept of affect towards computer use from the model of personal computer utilization (Thompson et al., 1991) by dividing it into the affect and anxiety construct and showing the underlying relations. An overview of the usage model based on social cognitive theory can be found in Figure 11.

### 3.3.9 Technology Acceptance Model 2

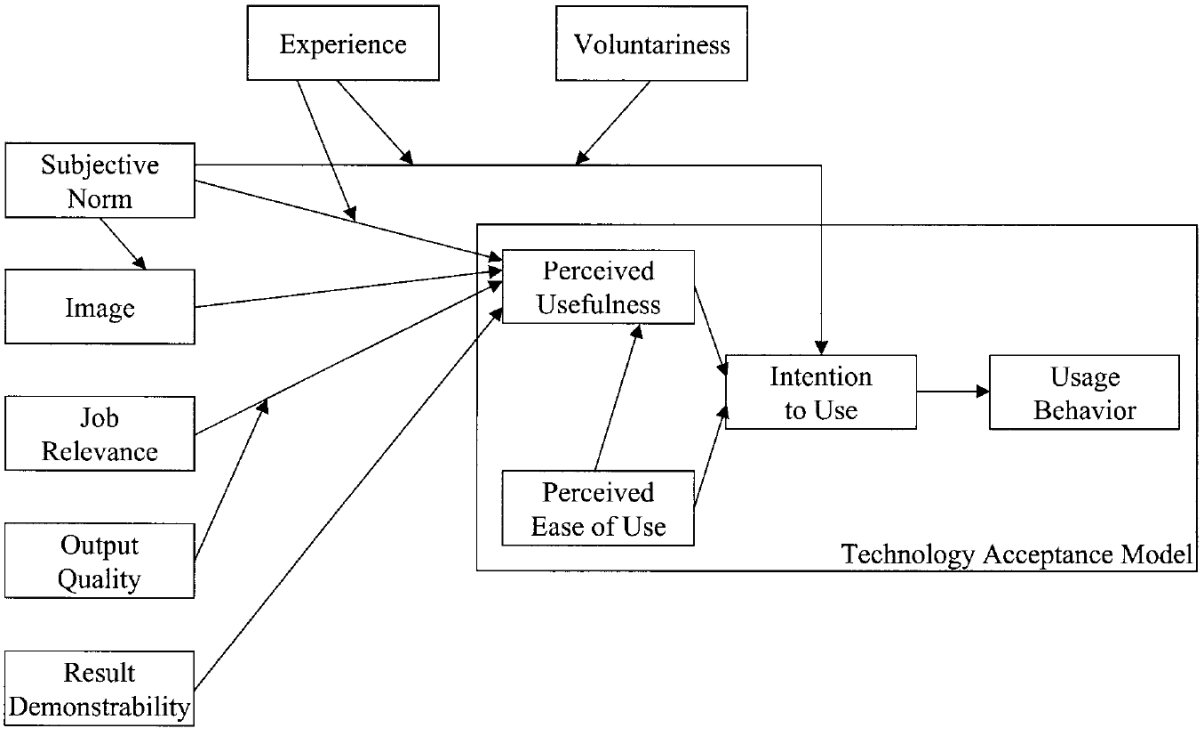



**FIGURE 12. TECHNOLOGY ACCEPTANCE MODEL 2 (VENKATESH & DAVIS, 2000)**

The second version of the technology acceptance model explains perceived usefulness and usage intentions in terms of social influence and cognitive processes. The first major change is the re-introduction of subjective norm. As defined in the theory of reasoned action, subjective norm refers to the person's perception that the people who are most important to him think he should or should not perform the behaviour in question (Fishbein & Ajzen, 1975).

Subjective norm was originally omitted from the technology acceptance model because it was found to have no significant effect on behavioural intention (Davis et al., 1989). Later studies indicated that subjective norm influenced behavioural intention only in mandatory settings (Hartwick & Barki, 1994). Based on this, Venkatesh and Davis (2000) added voluntariness as a moderating factor on the relation

between subjective norm and behavioural intention. They show that subjective norm influences perceived usefulness through the process of internalization. Internalization is the process of incorporating a referent's belief structure into one's own (Kelman, 1958; Warshaw, 1980), similar to informational social influence (Deutsch & Gerard, 1955), meaning to accept information from another as evidence about reality. This relation is moderated by experience, as an increase of one's own experience reduces the need for information from others (Venkatesh & Davis, 2000). Hartwick & Barki (1994) showed that after three months the effective of subjective norm on perceived usefulness becomes insignificant. Image, defined as by Moore & Benbasat (1991), is positively influenced by subjective norm. If important members of a person's social group believe that he or she should perform a behaviour, then performing the behaviour will tend to elevate his or her standing within the group (Venkatesh & Davis, 2000).

Next to social influences on perceived usefulness and usage intention, Venkatesh and Davis (2000) theorize four cognitive determinants of perceived usefulness based on empirical studies. They define job relevance as the individual's perception regarding the degree to which the target system is applicable to his or her job, output quality as how well the system performs its tasks, results demonstrability as defined by Moore and Benbasat (1991) and perceived ease of use as defined in the technology acceptance model (Davis et al., 1989). An overview of the second technology acceptance model can be found in Figure 12.

### 3.3.10 Unified Theory of Acceptance and Use of Technology

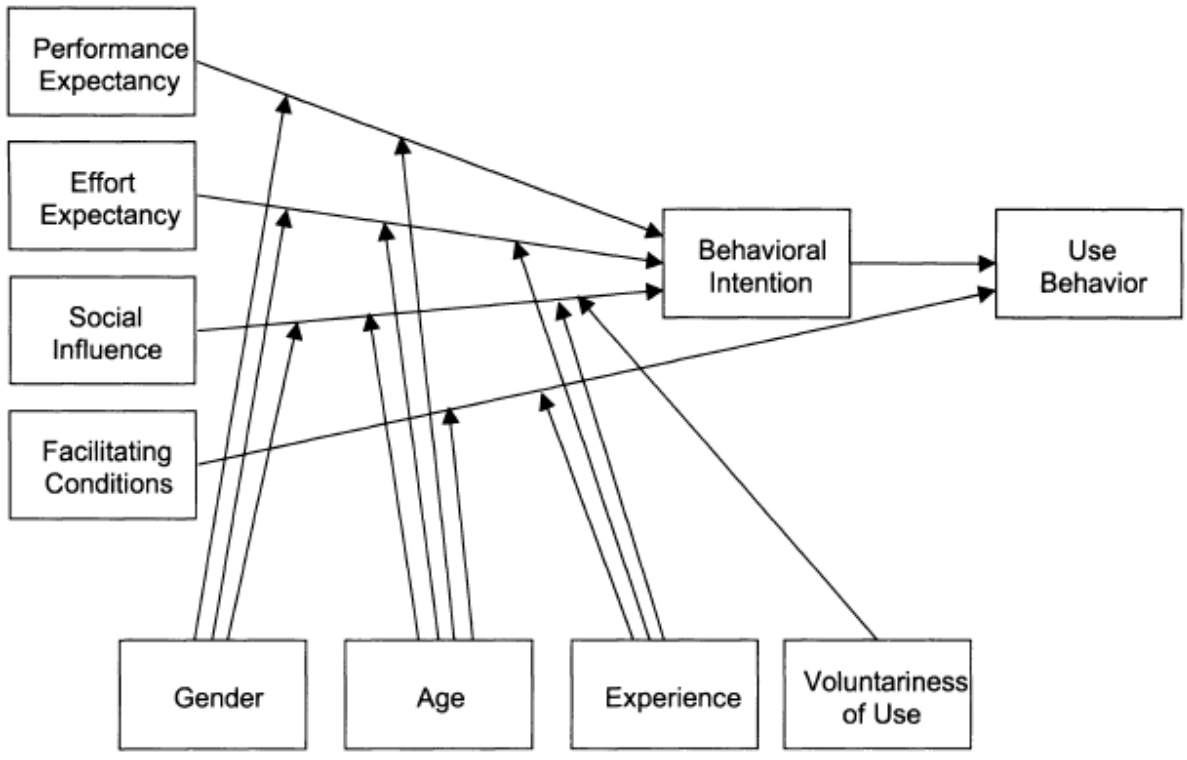



**FIGURE 13. UNIFIED THEORY OF ACCEPTANCE AND USE OF TECHNOLOGY (VENKATESH ET AL., 2003)**

Facing a multitude of competing technology acceptance models, Venkatesh et al. (2003) generated an overview of nine competing models and their underlying constructs and relations. Based on an empirical comparison of the nine models described previously in this chapter, the Unified Theory of Acceptance and Use of Technology (UTAUT) was created, using conceptual and empirical similarities

between the models. An overview of the unified theory of acceptance and use of technology can be found in Figure 13.

Venkatesh et al. (2003) base performance expectancy on the constructs perceived usefulness, extrinsic motivation, job-fit, relative advantage and outcome expectations from the studied models. They note that their similarities have been acknowledged by several authors and that it is the strongest predictor of intention in both voluntary and mandatory settings. The relation between performance expectancy is moderated by gender and age, as research on gender differences indicates that men (and young men in particular) tend to be highly task-oriented and thus place higher emphasis on performance expectancy (Venkatesh et al., 2003).

Effort expectancy is defined as the degree of ease associated with the use of the technology (Venkatesh et al., 2003). Venkatesh et al. (2003) base this on the constructs perceived ease of use, complexity and ease of use from the previous models, because of similarities noted in prior research. They found that effort expectancy has a significant effect on behavioural intention only in initial usage, becoming non-significant over periods of extended and sustained usage. As suggested by Venkatesh and Morris (2000), the study found effort expectancy to be more salient for women than for men. The study also found that effort expectancy was more important for older people, as they can find complex tasks more difficult, as suggested by Moris and Venkatesh (2000).

Social influence is defined as the degree to which an individual perceives that important others believe he or she should use the technology (Venkatesh et al., 2003). Venkatesh et al. (2003) base this on the constructs subjective norm, social factors and image from the previous models. Venkatesh and Davis (2000) show that social influence has an impact on individual behaviour through the mechanisms of compliance, internalization and identification. Venkatesh et al. (2003) found that the relation between social influence and behavioural intention is moderated by gender, age, experience and voluntariness, largely depending on the related mechanism. The study showed that social influence is a significant determinant for intention only in mandatory settings. The authors explain that in mandatory settings compliance causes social influences to have a direct effect on intention, while in voluntary settings internalization and identification influence the perceptions about the technology (performance expectancy and effort expectancy). Similarly to Venkatesh and Davis (2000), social influences were found to become insignificant after sustained use. Social influences were found to be more salient for women and older workers, similar to earlier research (Morris & Venkatesh, 2000; Venkatesh & Morris, 2000).

Facilitating conditions are defined as the degree to which an individual believes that an organization and technical infrastructure exists to support use of the system, capturing the concepts embodied by the constructs of perceived behavioural control, facilitating conditions and compatibility from the previous models (Venkatesh et al., 2003). Facilitating conditions were found to have an insignificant influence on behavioural intention, as for the largest part it is already incorporated in the effort expectancy construct. Facilitating conditions were found to become more significant with increased experience and for older workers.

### 3.3.11 Technology Readiness and Acceptance Model

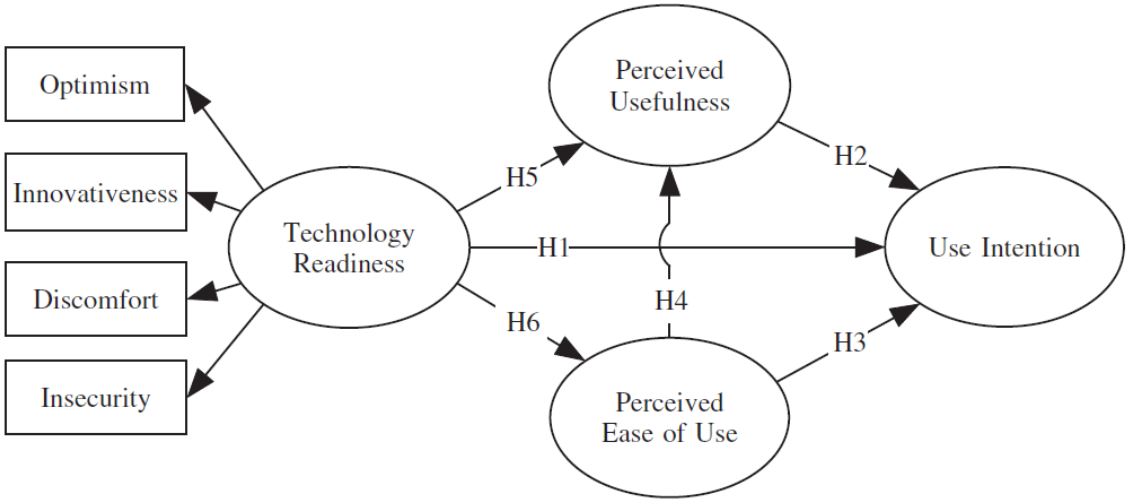



**FIGURE 14. TECHNOLOGY READINESS AND ACCEPTANCE MODEL (C.-H. LIN, SHIH, & SHER, 2007)**

The study of Lin et al. (2007) integrates technology readiness (Parasuraman, 2000) into the technology acceptance model (Davis, 1989) in the context of consumer adoption of e-service systems. Technology readiness conceptualizes consumers' general beliefs about technology and is associated with their use of technology-based products and services (Parasuraman, 2000). According to the study technology readiness consists of four sub-dimensions: optimism, innovativeness, discomfort and insecurity. Optimism is defined as the belief that technology offers people increased control, flexibility and efficiency (C.-H. Lin et al., 2007). Innovativeness is defined as the tendency to be a technology pioneer and thought leader (C.-H. Lin et al., 2007). Discomfort is defined as the perception of lack of control over technology and the feeling of being overwhelmed by it (C.-H. Lin et al., 2007). Insecurity is defined as the distrust towards technology and scepticism about its ability to work properly (C.-H. Lin et al., 2007).

Lin et al. (2007) indicate that the different sources of value have been insufficiently highlighted in the model. Lin et al. (2007) also propose that technology readiness is studied in a moderating capacity in the relations perceived usefulness → use intention and perceived ease of use → use intention. This seems unlikely, the definition of Parasuraman (2000) of technology readiness already indicates it as a belief structure, aligning it in the psychological processes indicated by Fishbein and Ajzen (1975) and Ajzen (1991). Furthermore, these previous works (Ajzen, 1991; Fishbein & Ajzen, 1975) do not indicate the presence of a moderator in the psychological processes. More likely, technology readiness is an attitude belief, and as such a predictor of perceived ease of use and perceived usefulness, or possibly a moderator in the relations actual → perceived ease of use and usefulness.

### 3.3.12 Consumer Acceptance of Technology Model

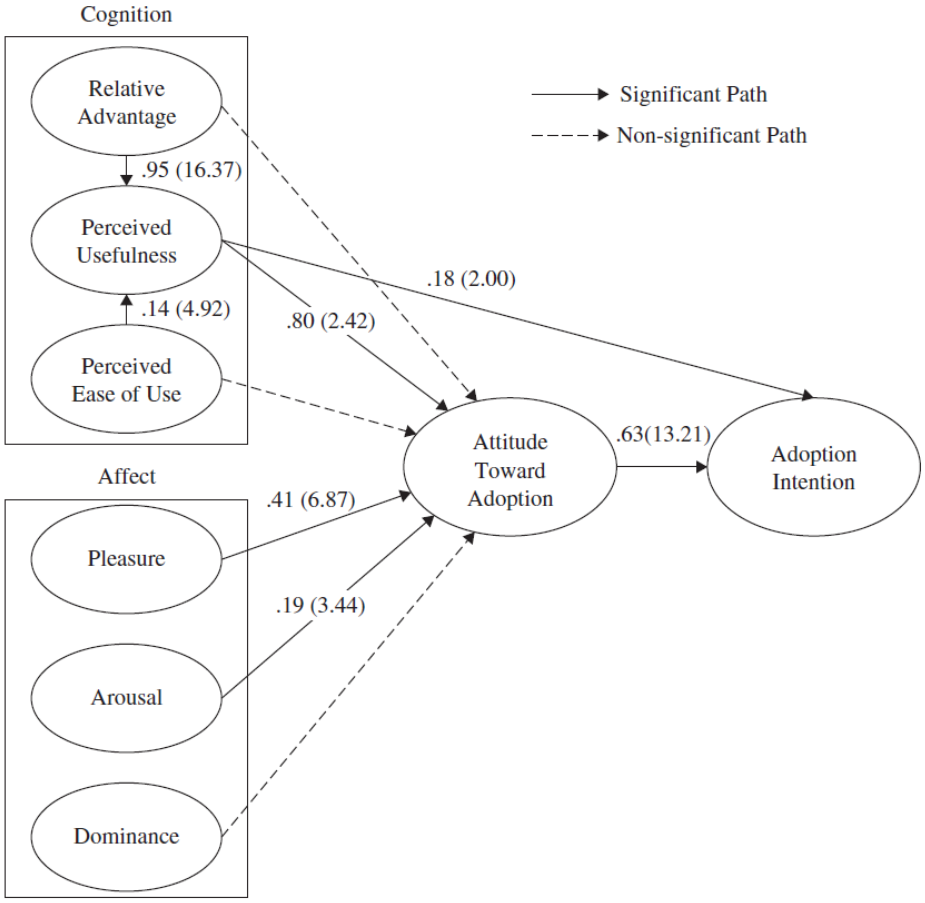



**FIGURE 15. CONSUMER ACCEPTANCE OF TECHNOLOGY MODEL (KULVIWAT, BRUNER II, KUMAR, NASCO, & CLARK, 2007)**

Kulviwat et al. (2007) found that technology acceptance studies rarely included affect and as such included it in a new technology acceptance model. The consumer acceptance of technology model is based on the technology acceptance model (Davis et al., 1989; Davis, 1989) and the PAD paradigm of affect (Mehrabian & Russell, 1974). The PAD paradigm consists of three dimensions: pleasure, arousal and dominance.

Pleasure is defined as the degree to which a person experiences an enjoyable reaction to some stimulus (Kulviwat et al., 2007) and includes emotions such as happiness, joy and satisfaction. Arousal is defined as a combination of mental alertness and physical activity which a person feels in response to some stimulus (Kulviwat et al., 2007) and includes emotions such as excitement. Dominance is defined as the extent to which the individual feels in control of, or controlled by, a stimulus (Kulviwat et al., 2007) and includes emotions such as boldness, courage, anger and fear.

The study by Kulviwat et al. (2007) showed that relative advantage was a strong predictor of perceived usefulness. Investigating the questionnaire items of perceived usefulness shows that the items were virtually identical to the questionnaire items for relative advantage, which were adopted from Moore and Benbasat (1991), so discriminant validity was not met for these constructs. Furthermore, Rogers (2003) indicates that relative advantage is the degree to which an innovation is perceived as better than the idea it supersedes, with degrees expressed as economic profitability, social prestige or other ways. The work of Moore and Benbasat (1991) identifies relative advantage of a personal workspace in an organizational setting, where economic benefits are the most important. Kulviwat et al. (2007)

study the consumer acceptance of a personal digital agenda in a voluntary setting, where social status and emotions such as joy also are important. Rogers (2003) indicates that both the nature of the innovation as well as characteristics of adopters may affect which specific subdimensions or relative advantage are important. The questionnaire of Moore and Benbasat (1991) for relative advantage only identifies the performance degree of relative advantage and should not be used in a consumer acceptance setting.

### 3.3.13 Technology Acceptance Model 3

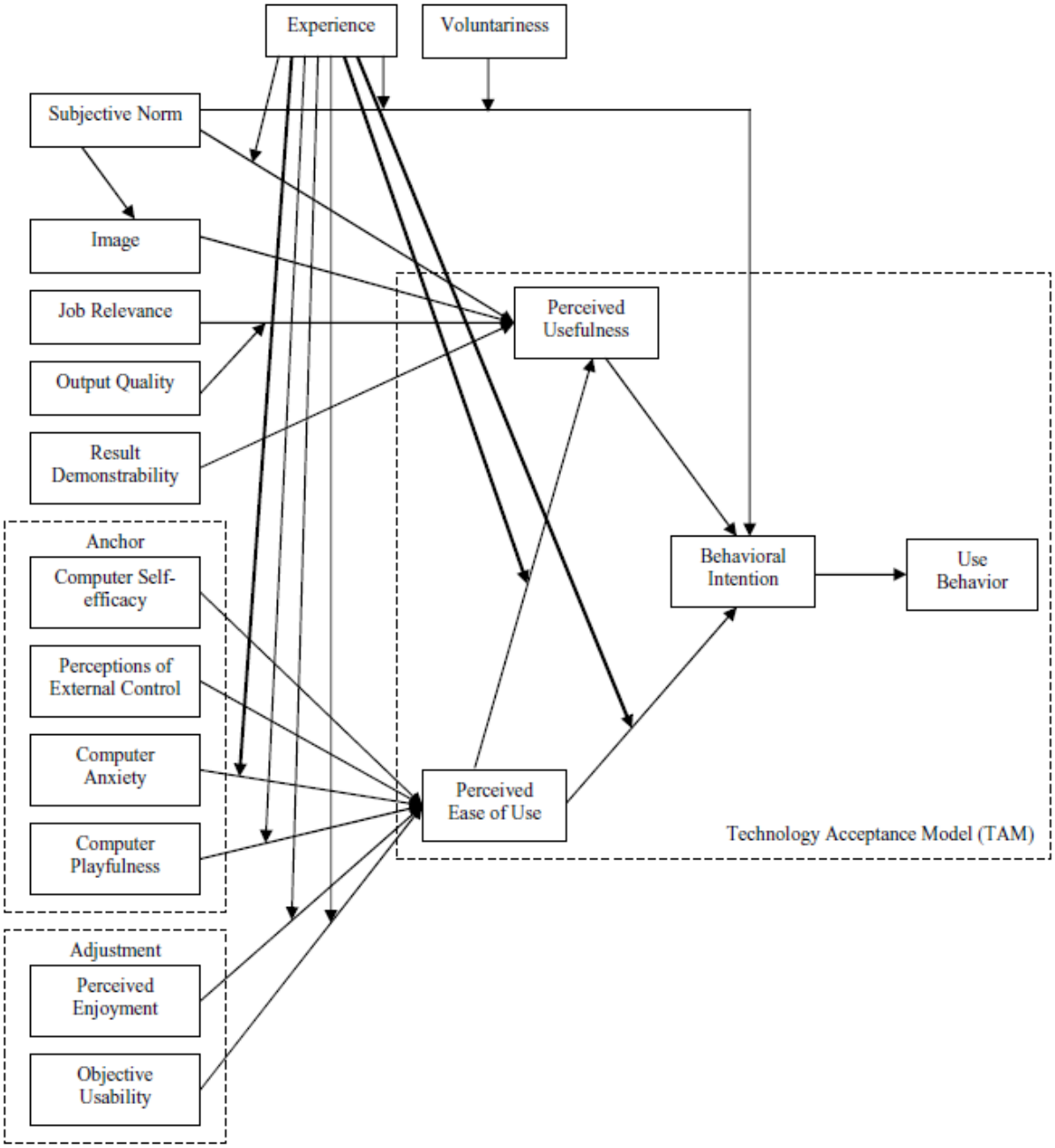



**FIGURE 16. TECHNOLOGY ACCEPTANCE MODEL 3 (VENKATESH & BALA, 2008)**

Technology acceptance model 3 combines the technology acceptance model 2 (Venkatesh & Davis, 2000) with the work of Venkatesh (2000) and expands the moderating role of experience (Venkatesh & Bala, 2008). All definitions are identical to those in the technology acceptance model 2 (Venkatesh

& Davis, 2000), except the determinants of perceived ease of use. The definitions of perceived ease of use can be found in Table 3, copied from Venkatesh and Bala (2008).

Venkatesh and Bala (2008) found that experience was an important moderating factor. Similarly to Venkatesh et al. (2003), perceived ease of use was found to become less significant for behavioural intention, but the study showed that it became more significant as a predictor for perceived usefulness. The study also found that with increasing experience the effect of computer anxiety and computer playfulness on perceived ease of use diminished, while the effect of computer self-efficacy and perceptions of external control remained significant. The two adjustment constructs, perceived enjoyment and objective usability, were introduced by Venkatesh (2000) as adjustments to one's judgement of a technology base on actual experience. The study supported the hypothesis of Venkatesh (2000) that both adjustment constructs become significant with increased experience. The complete overview of the technology acceptance model 3 can be found in Figure 16.

| Determinants | Definitions |
|---|---|
| Computer Self-Efficacy | The degree to which an individual believes that he or she has the ability to perform a specific task/job using the computer (Compeau & Higgins, 1995a, 1995b). |
| Perception of External Control | The degree to which an individual believes that organizational and technical resources exist to support the use of the system (Venkatesh et al., 2003). |
| Computer Anxiety | The degree of "an individual's apprehension, or even fear, when she/he is faced with the possibility of using computers" (Venkatesh, 2000, p. 349). |
| Computer Playfulness | ". . .the degree of cognitive spontaneity in microcomputer interactions" (Webster & Martocchio, 1992, p. 204). |
| Perceived Enjoyment | The extent to which "the activity of using a specific system is perceived to be enjoyable in its own right, aside from any performance consequences resulting from system use" (Venkatesh, 2000, p. 351). |
| Objective Usability | A "comparison of systems based on the actual level (rather than perceptions) of effort required to completing specific tasks" (Venkatesh, 2000, pp. 350–351). |

**TABLE 3. DETERMINANTS OF PERCEIVED EASE OF USE (VENKATESH & BALA, 2008)**

### 3.3.14 Unified Theory of Acceptance and Use of Technology 2

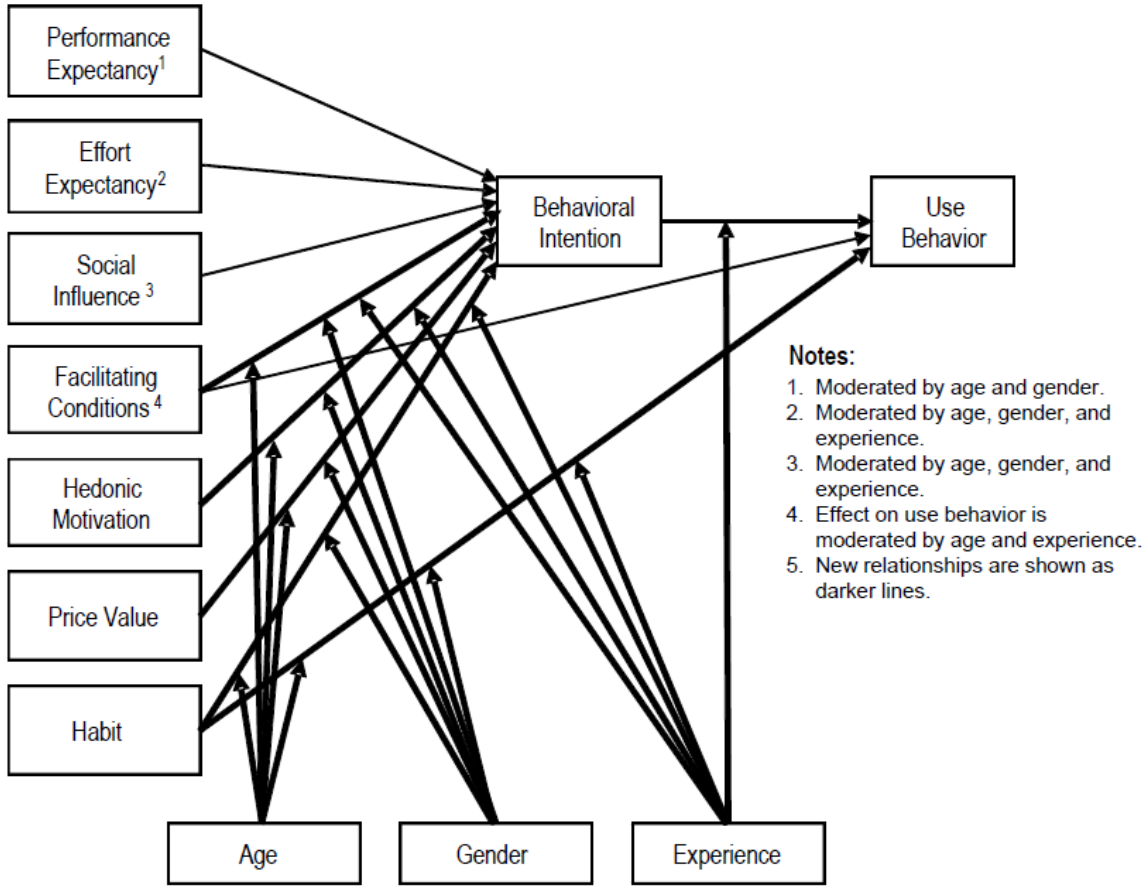



**FIGURE 17. UNIFIED THEORY OF ACCEPTANCE AND USE OF TECHNOLOGY 2 (VENKATESH, THONG, & XU, 2012). THE EFFECT OF MODERATORS ON CONSTRUCTS FROM VERSION 1 IS NOT INCLUDED**

While the original unified theory of acceptance and use of technology (Venkatesh et al., 2003) was developed to explain employee technology acceptance and use, Venkatesh et al. (2012) updated this version to the consumer use context. An overview of the updated version can be found in Figure 17. The definitions of the original constructs have changed slightly in order to adapt to the consumer use context. Venkatesh et al. (2012) define performance expectancy as the degree to which using a technology will provide benefits to consumers in performing certain activities; effort expectancy as the degree of ease associated with consumers' use of technology; social influence as the extent to which consumers perceive that important others believe they should use a particular technology; and facilitating conditions as the consumers' perceptions of the resources and support available to perform a behaviour.

Three important changes had to be made to adapt the model the consumer use context. Voluntariness was removed as a moderating factor, as consumer use takes place in a voluntary setting, price value was added as a construct influencing behavioural intention and facilitating conditions was indicated as a predictor of behavioural intention (Venkatesh et al., 2012). Venkatesh et al. (2012) define price value as consumers' cognitive tradeoff between the perceived benefits and the monetary cost for using. The effect of price value on behavioural intention is moderated by age and gender, such that the effect is stronger among women, particularly older women (Venkatesh et al., 2012). This is due to social role stereotyping of women as gatekeepers of family expenditures, which increases with age, and the fact that women pay more attention to detail and thus are more cost conscious (Venkatesh et al., 2012).

In organizational settings, facilitating conditions are more or less equal for all and can serve as a proxy for actual behavioural control and as such influence behaviour directly (Ajzen, 1991; Venkatesh et al., 2012). In consumer context the facilitation in the environment that is available to each consumer can vary significantly (Venkatesh et al., 2012). As a result, facilitating conditions will act more like perceived behavioural control in the theory of planned behaviour and influence both intention and behaviour (Ajzen, 1991; Venkatesh et al., 2012).

In order to improve the prediction of behavioural intention Venkatesh et al. (2012) added the constructs of hedonic motivation and habit as predictors of behavioural intention and use. In the study hedonic motivation is defined as fun or pleasure derived from using a technology. The importance of hedonic motivation as a predictor can be found in both consumer context studies and IS research (Venkatesh et al., 2012). Venkatesh et al. (2012) found the relation to be moderated by age, gender and experience such that the effect is stronger among younger men in early stages of experience with a technology. Young men tend to seek novelty and innovativeness more often and as such, hedonic motivation is more important for them, while with increasing experience, novelty and innovativeness decreases (Venkatesh et al., 2012). The construct of hedonic motivation has similarities with the constructs of pleasure and arousal from the work of Kulviwat et al. (2007). The constructs from Kulviwat et al. (2007) are strong predictors of attitude, but the questionnaire used to measure attitude included questions measuring pleasure, so discriminant validity was not achieved. This explains why the relation is less strong in the model of Venkatesh et al. (2012).

Venkatesh et al. (2012) define habit as the extent to which an individual perceives the behaviour as automatic. The study found the relations between habit and behavioural intention and behaviour to be moderated by age, gender and experience such that the effect is stronger for older men with high levels of experience with the technology. Older people tend to rely largely on automatic information processing and as such habit is more influential for them (Venkatesh et al., 2012). As explained for price value, women pay more attention to detail. As a result of this they are more sensitive to new cues or changes in the environment that weaken the effect of habit on intention and behaviour (Venkatesh et al., 2012). Venkatesh et al. (2012) explain that more experience means a longer time has passed and thus more repetitions of the behaviour have been done, strengthening the habit. The study also explains that as a result of the increased effect of habit with more experience, the effect of behavioural intention on use decreases.

### 3.3.15 Technology Acceptance with Network Externalities

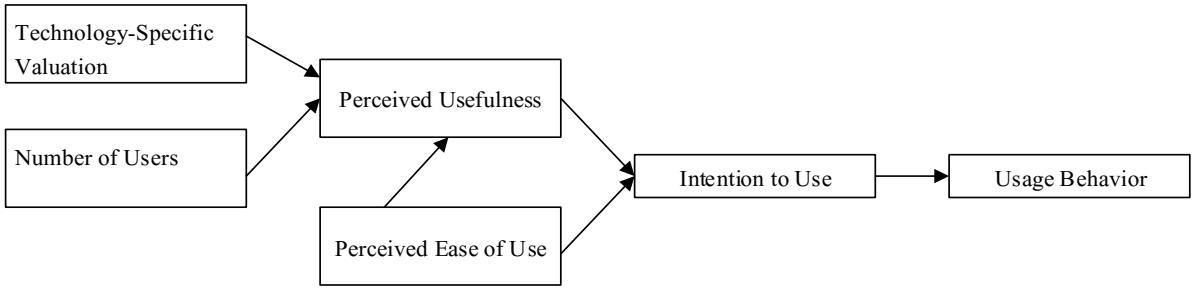



**FIGURE 18. INFLUENCE OF NETWORK EXTERNALITIES ACCORDING TO WANG, LO, & FANG (2008)**

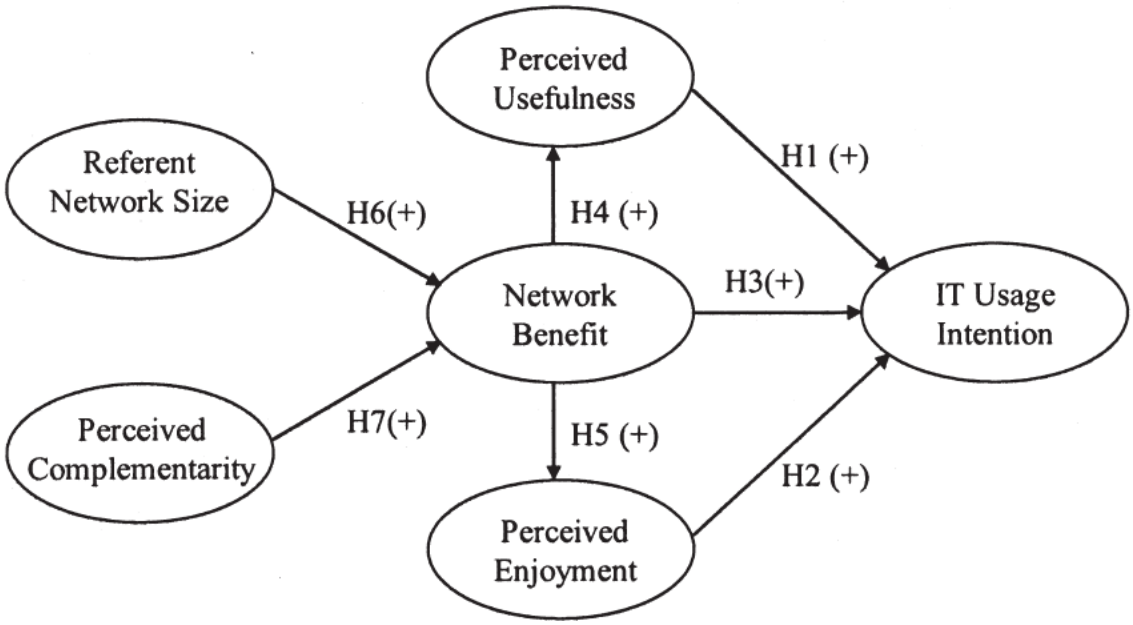



FIGURE 19. INFLUENCE OF NETWORK EXTERNALITIES ACCORDING TO C.-P. LIN AND BHATTACHERJEE (2008)

Some products provide more utility or value to users of a product or service when there is a network of other users using similar or compatible products (C.-P. Lin & Bhattacherjee, 2008). Products influenced by these network effects are known as network goods (Katz & Shapiro, 1985). Factors that drive network effects are called network externalities and can be both direct and indirect (Katz & Shapiro, 1985). Direct network externalities are based on the number of participants in a given network and indirect network externalities are benefits not directly from the number of network participants, such as complementary services, standards formation and price reduction (Katz & Shapiro, 1985).

Several authors have investigated the effect of network externalities on technology adoption and have uncovered different but related constructs influencing adoption. Wang, Lo, & Fang (2008) formulated the model presented in Figure 18. Their study uses the constructs of technology-specific valuation and number of users to explain the influence of network effects on perceived usefulness. Technology-specific valuation is defined as the value derived from the technology itself and refers to the value provided by the technology that is independent of any other users (Wang et al., 2008). Number of users is defined as the size of the installed base of the product (Wang et al., 2008).

C.-P. Lin and Bhattacherjee (2008) formulated the model presented in Figure 19, based on the network externalities by Katz and Shapiro (1985). Their study uses the constructs of referent network size, perceived complementarity and network benefit to explain the influence of network effects on perceived usefulness and perceived enjoyment. Referent network size is defined as the size of the group of people in the users' social circle that also use the technology, indicating it is not the total number of users world-wide that is interesting, but only those interesting for the user (C.-P. Lin & Bhattacherjee, 2008). Perceived complementarity is defined as the perceived availability of complementary goods and services (C.-P. Lin & Bhattacherjee, 2008). Combined, these two constructs form the construct of network benefits, which not only influences usage intention directly, but in absence also influences the perception of usefulness and enjoyment (C.-P. Lin & Bhattacherjee, 2008).

Both models have critical parts that are not present in the other, the model of C.-P. Lin and Bhattacherjee (2008) ignores technology specific valuation, but the model of Wang et al. (2008) fails to recognize that it is referent network size that is important and not network size itself, while also

ignoring complementarity completely. Furthermore, only the model of C.-P. Lin and Bhattacherjee (2008) takes into account the influence of network effects on perception. Both models do not include the effect of negative network externalities (too many users sharing a single internet connection for example), but since the goal of this study is adoption, at which point little users will be present, the negative effect is left out in this study as well.

### 3.3.16 Technology Acceptance and Risk

Several authors studied the influence of perceived risk on the acceptance and use of technology (Featherman & Pavlou, 2003; Im, Kim, & Han, 2008; Martins, Oliveira, & Popovič, 2014; Pavlou, 2003). Featherman and Pavlou (2003) based their model, shown in Figure 20, on the technology acceptance model by Davis (1989) and found perceived risk to be significant in predicting adoption intention and influencing perceived usefulness and perceived ease of use. In this model perceived risk is defined as "the potential for loss in the pursuit of a desired outcome of using an e-service". Perceived risk is determined by six facets of different types of risks. The study also tested if performance risk could be situated as a separate construct, but found the model to perform better without.

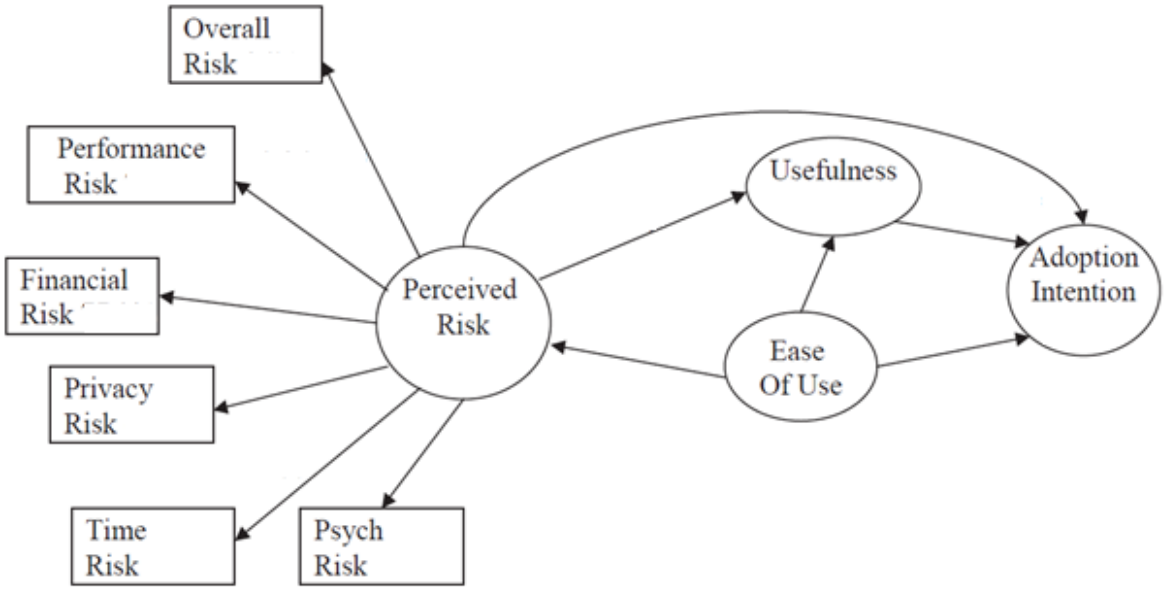



**FIGURE 20. INFLUENCE OF PERCEIVED RISK ON ADOPTION ACCORDING TO FEATHERMAN AND PAVLOU (2003)**

Martins et al. (2014) adapted the model of Featherman and Pavlou (2003) to be incorporated into the unified theory of acceptance and use of technology by Venkatesh et al. (2003). The resulting model can be seen in Figure 21 and was very successful, explaining as much as 81% of variance in the adoption of internet banking. This is more than any other acceptance model to date and is a clear indicator of the importance of incorporating perceived risk into technology acceptance models.

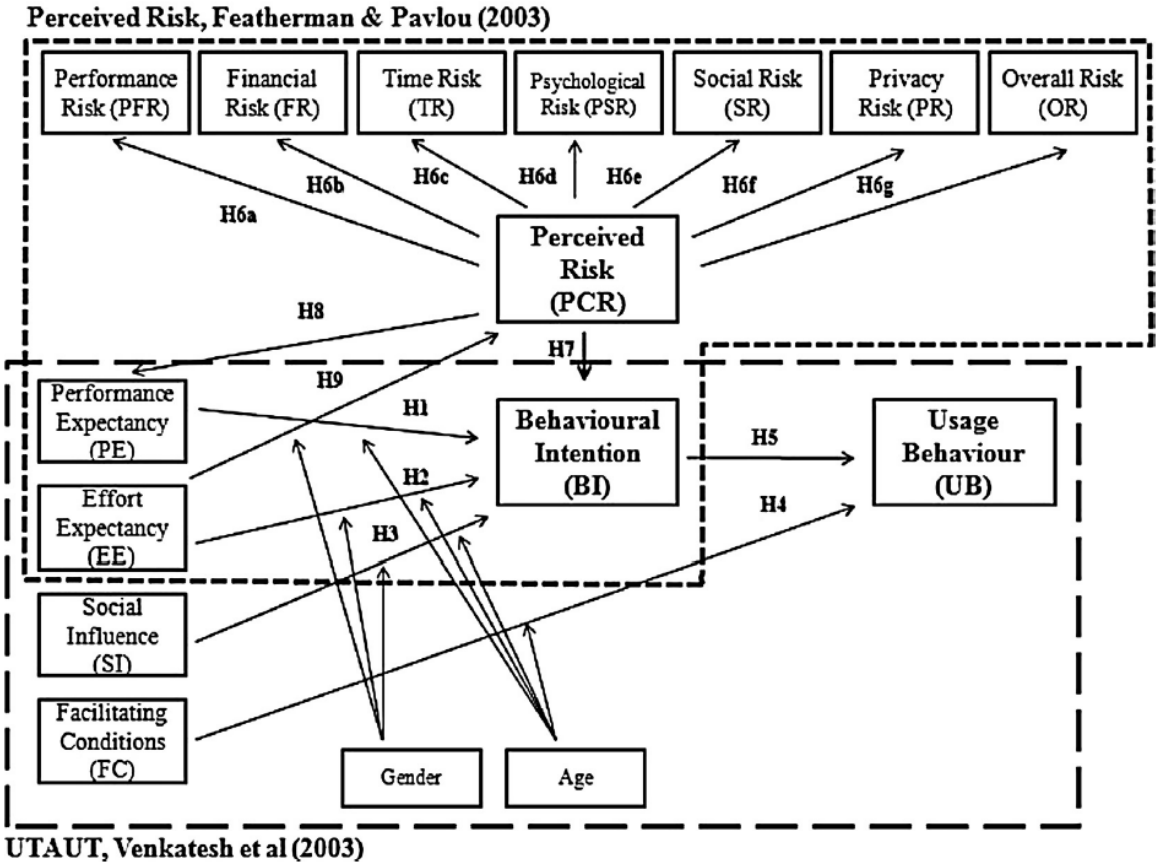



FIGURE 21. INFLUENCE OF RISK ON ADOPTION ACCORDING TO MARTINS ET AL. (2014)

An alternative way to model the effect of perceived risk on technology acceptance is provided by Im et al. (2008), who tested if perceived risk was best placed as an antecedent of perceived usefulness, an antecedent of behavioural intention or as a moderator for the effects of perceived ease of use and perceived usefulness on behavioural intention. Their study showed that perceived risk was best situated as a moderator, the model is presented in Figure 22.

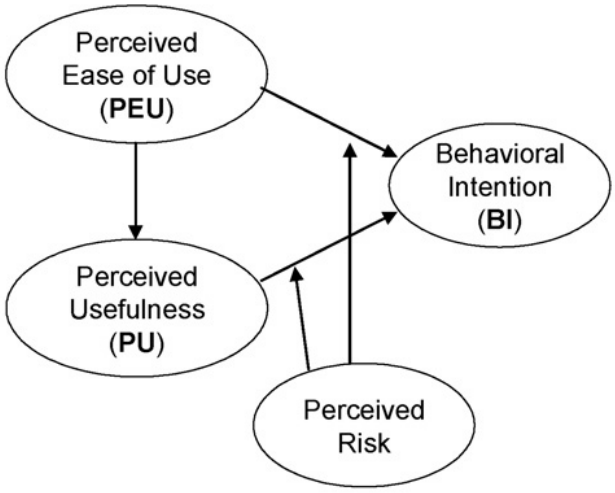



FIGURE 22. INFLUENCE OF PERCEIVED RISK ON TECHNOLOGY ACCEPTANCE ACCORDING TO IM ET AL. (2008)

### 3.3.17 Maturity as a moderator

Experts indicate that technology maturity has a moderating effect on the different factors that influence adoption. Identifying this effect can improve applicability in practice of acceptance models. The moderating effect of maturity is measured as time that passed between different measurements and is also seen as experience with the technology. Using time as a measurement for maturity is also in line with technology maturity research carried out by Gartner (Gartner, n.d.).

The effect of experience on constructs related to performance expectancy has been examined in several studies (Davis et al., 1989; Karahanna, Straub, & Chervany, 1999; Taylor & Todd, 1995; Thompson, Higgins, & Howell, 1994). As levels of experience increased, Thompson et al. (1994) found increased importance of long-term consequences and Taylor & Todd (1995) found increased importance of perceived usefulness. Davis et al. (1989) found no change with increasing experience and Karahanna et al. (1999) found relative advantage to be the only factor that was always significant. Venkatesh et al. (2012) also remarked that with increasing experience the importance of performance expectancy increases.

The effect of experience on constructs related to effort expectancy has been examined in several studies (Davis et al., 1989; Karahanna et al., 1999; Thompson et al., 1994; Venkatesh et al., 2003). As levels of experience increased, Davis et al. (1989) and Karahanna et al. (1999) found ease of use to become nonsignificant, Thompson et al. (1994) found decreased importance of complexity and Venkatesh et al. (2003) found decreased importance of effort expectancy.

The effect of experience on constructs related to social influence has been examined in several studies (Karahanna et al., 1999; Taylor & Todd, 1995; Thompson et al., 1994; Venkatesh & Davis, 2000; Venkatesh et al., 2003). As levels of experience increased, Thompson et al. (1994) found decreased importance of social factors, Taylor & Todd (1995), Karahanna et al. (1999) and Venkatesh & Davis (2000) found decreased importance of subjective norm and Venkatesh et al. (2003) found decreased importance of social influence.

The effect of experience on constructs related to facilitating conditions has been examined in several studies (Taylor & Todd, 1995; Thompson et al., 1994; Venkatesh & Bala, 2008; Venkatesh et al., 2003, 2012; Venkatesh, 2000). As levels of experience increased, Thompson et al. (1994) and Venkatesh et al. (2012) found decreased importance of facilitating conditions, Taylor & Todd (1995) found increased importance of perceived behavioural control, Venkatesh et al. (2003) found increased importance of facilitating conditions and Venkatesh (2000) and Venkatesh & Bala (2008) found computer self-efficacy and perceptions of external control to remain significant. The varying influences can be explained by the composite nature of facilitating conditions, consisting of multiple factors.

The effect of experience on constructs related to hedonic motivation has been examined in several studies (Venkatesh & Bala, 2008; Venkatesh et al., 2012; Venkatesh, 2000). As levels of experience increased, Venkatesh (2000) and Venkatesh & Bala (2008) found decreased importance of computer anxiety and computer playfulness, but increased importance of perceived enjoyment. Venkatesh et al. (2003) found that the importance of hedonic motivation decreased as experience increased and explained that the joy caused by innovativeness and novelty seeking reduces with increased experience. The effect of experience on perceived risk has been examined in the studies by Liébana-Cabanillas, Sánchez-Fernández, & Muñoz-Leiva (2014) and Miyazaki & Fernandez (2001). Their studies showed that not only does the perceived risk decrease as an individual gains experience with the technology, the acceptance of this risk also increases as an individual becomes experienced and gains increased knowledge of the actual risk.

## 3.4 Theoretical model

Based on the literature study in the previous chapter, which assessed the current state of knowledge with respect to understanding individual acceptance of technological innovations, a conceptual model can be created. The literature study resulted in the identification of 17 key competing theoretical models and discusses the similarities and differences amongst these models. These models pose 78 constructs as theorized determinants of acceptance.

In order to unify the different models, the results of the literature review are processed in line with the concept-centric approach proposed by Webster and Watson (2002) for processing the results of a literature review study. Based on conceptual similarities across models, while weighing in empirical validity of the models, 7 groups of concepts were identified in the literature review. This approach is similar to the research approach used by Venkatesh et al. (2003).

The naming convention used is in line with the unified theory of acceptance and use of technology (Venkatesh et al., 2003), to increase unison with existing literature. Furthermore, the construct names used by this theory promote the importance of the perception of expected results, which is in line with the literature findings. The resulting concept matrix can be found in Table 4. In the concept matrix, similar papers are treated as one, for example Davis (Davis, 1985, 1989) and Davis et al. (1989) that all address the first version of the technology acceptance model.

| Article(s) | Concepts | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|
| | Performance Expectancy | Effort Expectancy | Social Influence | Facilitating Conditions | Hedonic Motivation | Network Value | Perceived Risk | |
| Fishbein & Ajzen (1975); Ajzen & Fishbein (1980) | x | | x | | | | | 2 |
| Davis (1985, 1989); Davis et al. (1989) | x | x | | | | | | 2 |
| Ajzen (1985, 1991) | x | | x | x | | | | 3 |
| Thompson et al. (1991) | x | x | x | x | x | | | 5 |
| Moore & Benbasat (1991, 1996) | x | x | x | x | | | | 4 |
| Davis, Bagozzi & Warsaw (1992) | x | | | | x | | | 2 |
| Taylor & Todd (1995) | x | x | x | x | | | | 4 |
| Compeau & Higgins (1995); Compeau et al. (1999) | x | | | x | x | | | 3 |
| Venkatesh & Davis (2000) | x | x | x | | | | | 3 |
| Venkatesh et al. (2003) | x | x | x | x | | | | 4 |
| Lin et al. (2007) | x | | | | x | | | 2 |
| Kulviwat et al. (2007) | x | x | | | x | | | 3 |
| Venkatesh & Bala (2008) | x | x | x | x | x | | | 5 |
| Venkatesh et al. (2012) | x | x | x | x | x | | | 5 |
| Wang et al. (2008) | x | x | | | | x | | 3 |
| C.-P. Lin & Bhattacherjee (2008) | x | | | | x | x | | 3 |
| Featherman & Pavlou (2003) | x | x | | | | | x | 3 |
| Martins et al. (2014) | x | x | x | x | | | x | 5 |
| **Total** | 18 | 12 | 10 | 9 | 8 | 2 | 2 | |

**TABLE 4. CONCEPT MATRIX**

Based on conceptual similarities across models, with the constructs grouped into concepts, a unified model is formulated. In order to unify the different models, the results of the literature review are processed in line with the concept-centric approach proposed by Webster and Watson (2002) for processing the results of a literature review study. This methodology results in grouped constructs which are then positioned in the model, after which the relations between constructs are based on existing literature. In the event that different studies propose different relations, the decision will be made on close inspection of the (original) study and empiric validity of the study.

Following the methodology described above, the model presented in Figure 23 was formulated. In the following sections, each of the elements of the model will be explained according to the methodology.

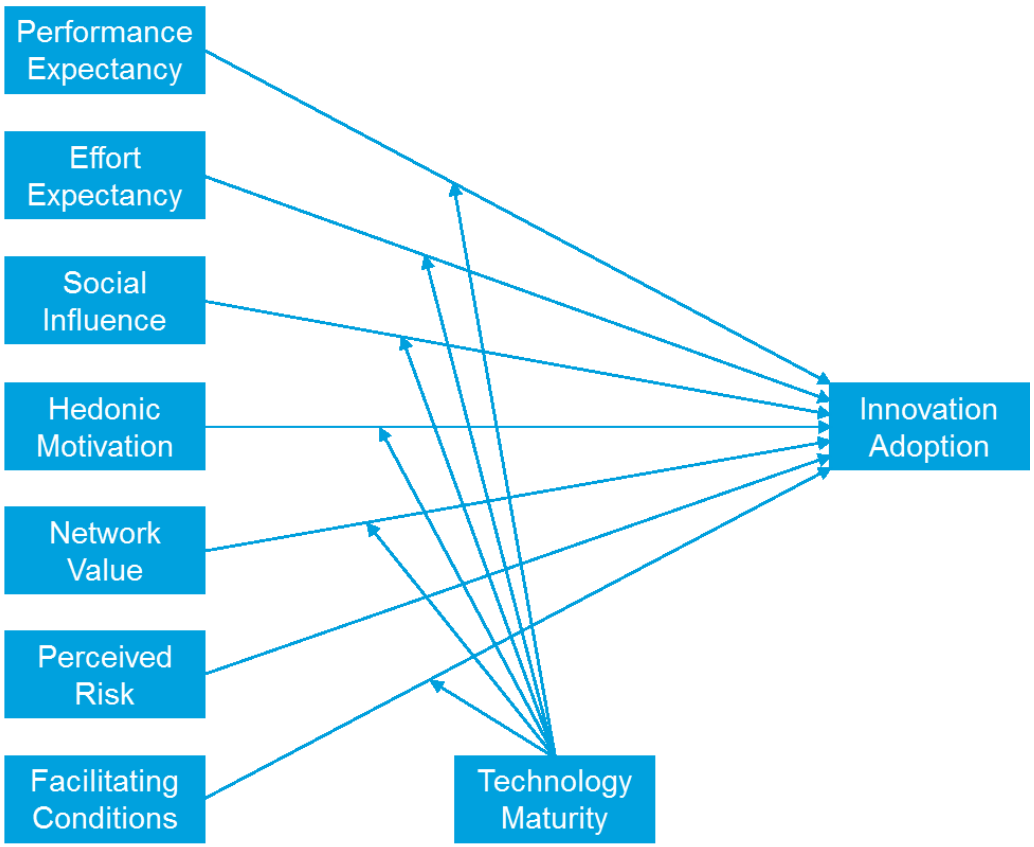



FIGURE 23. CONCEPTUAL MODEL

### 3.4.1 Performance Expectancy

The literature study identified several constructs relating to performance expectancy, which are presented in Table 5. The table contains all the different definitions for the constructs related to performance expectancy, but constructs from different models that copy definitions from previous models are not included. Based on these findings, this study assumes the definition for performance expectancy given below.

***Performancy Expectancy: The degree to which the customer expects using a technology will provide benefits in performing certain activities***

The relationship between the performance expectancy construct and behavioural intention is supported by many studies, of which the studies by Venkatesh et al. (2003, 2012) are the most notable. Of the studies that contain a construct related to performance, most found the performance related construct to be the strongest indicator of behavioural intention.

It is relevant to note that the results demonstrability construct (Moore & Benbasat, 1991) is included, even though it does not directly relate to performance. While not directly related to performance, the demonstrability does affect the perception of the expected results and as such does influence performance expectancy.

Relative advantage (Moore & Benbasat, 1991; Rogers, 2003) is also included as a performance expectancy construct. Relative advantage relates to the added value of an innovation over its predecessor, but because research historically focussed on innovations in organizations, where value is created by increasing performance, it is included as a performance expectancy construct. The step of translating relative advantage to a consumer setting where performance is not the only value has not been made. In order to translate relative advantage to a consumer setting, a value construct would have to be created, influenced by both performance, hedonic motivation and social influence. Relative advantage can then be seen as the degree to which the value of the innovation is perceived as being higher than the value of its predecessor. Alternatively, in line with the price-value construct defined by Venkatesh et al. (2012), relative advantage could also be seen as the degree to which the price-value of the innovation is perceived as being higher than the value of its predecessor. Price should then not only include financial costs, but also effort expectancy, negative social influences and negative hedonic motivation. The statistical analysis required to identify and validate such new constructs and relations is not included in the scope of this research and as such this is a recommendation for future research.

| Construct | Definition | Source |
|---|---|---|
| **Perceived Usefulness** | "the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989, p. 320). | Technology Acceptance Model |
| **Job-fit** | "the extent to which an individual believes that using a PC can enhance the performance of his or her job" (Thompson et al., 1991, p. 129). | Model of PC Utilization |
| **Long-term Consequences** | "Outcomes that have a pay-off in the future" (Thompson et al., 1991, p. 129). | Model of PC Utilization |
| **Relative Advantage** | "the degree to which using the innovation is perceived as being better than using its precursor" (Moore & Benbasat, 1991, p. 196) | Perceived Characteristics of Innovating |
| **Results Demonstrability** | "the tangibility of the results of using the innovation, including their observability and communicability" (Moore & Benbasat, 1991, p. 203). | Perceived Characteristics of Innovating |
| **Extrinsic Motivation** | The degree to which users will want to perform an activity "because it is perceived to be instrumental in achieving valued outcomes that are distinct from the activity itself, such as improved job performance, pay, or promotions" (Davis et al., 1992, p. 1112). | Motivational Model |
| **Outcome Expectations – Performance** | "Performance-related outcomes are those associated with improvements in job performance (efficiency and effectiveness) associated with using computers. (Compeau et al., 1999, p. 147) | Social Cognitive Theory |
| **Outcome Expectations – Personal** | "Personal outcome expectations relate to expectations of change in image or status or to expectations of rewards, such as promotions, raises, or praise." (Compeau et al., 1999, p. 148) | Social Cognitive Theory |
| **Job Relevance** | "an individual's perception regarding the degree to which the target system is applicable to his or her job" (Venkatesh & Davis, 2000, p. 191). | Technology Acceptance Model 2 |
| **Performance Expectancy** | "the degree to which an individual believes that using the system will help him or her to attain gains in job performance" (Venkatesh et al., 2003, p. 447). | Unified Theory of Acceptance and Use of Technology |
| **Optimism** | The "view of technology and a belief that technology offers people increased control, flexibility, and efficiency" (C.-H. Lin et al., 2007, p. 643). | Technology Readiness and Acceptance Model |
| **Performance Expectancy** | "the degree to which using a technology will provide benefits to consumers in in performing certain activities" (Venkatesh et al., 2012, p. 159). | Unified Theory of Acceptance and Use of Technology 2 |
| **Perceived Usefulness** | "the expected instrumentality of IT usage for improving user task performance, productivity and effectiveness" (C.-P. Lin & Bhattacherjee, 2008, p. 89). | Network benefit and IT usage |

TABLE 5. PERFORMANCE EXPECTANCY CONSTRUCTS AND DEFINITIONS

### 3.4.2 Effort expectancy

The literature study identified several constructs relating to effort expectancy, which are presented in Table 6. The table contains all the different definitions for the constructs related to effort expectancy, but constructs from different models that copy definitions from previous models are not included. Based on these findings, this study assumes the definition for effort expectancy given below.

***Effort Expectancy: The expected degree of ease a customer associates with using a technology***

The relationship between the effort expectancy construct and behavioural intention is supported by many studies, where the exact relation differs. Models based on the unified theory of acceptance and use of technology (Venkatesh et al., 2003) propose a direct relation with behavioural intention, while models based on the technology acceptance model (Davis et al., 1989; Davis, 1989) propose an additional influence of effort expectancy on behavioural intention through performance expectancy. The direct relation between effort expectancy is selected, as empirical evidence presented by Venkatesh et al. (2003) showed that the variance explained by the model using a direct relation was significantly larger ($R^2$ of 69 and 70 percent versus $R^2$ between 36% and 41%).

Most of the theories about acceptance of technology include a construct related to some form of required effort. Prior research has pointed out that many similarities exist between constructs related to effort expectancy (Davis et al., 1989; Moore & Benbasat, 1991; Thompson et al., 1991). The significance of effort expectancy makes sense from a consumer perspective, in an innovation setting where two identical innovations exist, where one requires less effort to acquire and use than the other, the former will be adopted more often than the latter.

| Construct | Definition | Source |
|---|---|---|
| **Perceived Ease of Use** | "the degree to which a person believes that using a particular system would be free of effort" (Davis, 1989, p. 320). | Technology Acceptance Model |
| **Complexity** | "the degree to which an innovation is perceived as relatively difficult to understand and use" (Rogers, 2003, p. 257). | Model of PC Utilization |
| **Ease of Use** | "the degree to which an innovation is perceived as being difficult to use" (Moore & Benbasat, 1991, p. 195). | Perceived Characteristics of Innovating |
| **Effort Expectancy** | "the degree of ease associated with the use of the system" (Venkatesh et al., 2003, p. 450). | Unified Theory of Acceptance and Use of Technology |
| **Objective Usability** | A "comparison of systems based on the actual level (rather than perceptions) of effort required to completing specific tasks" (Venkatesh, 2000, pp. 350–351) | Technology Acceptance Model 3 |
| **Effort Expectancy** | "the degree of ease associated with consumers' use of technology" (Venkatesh et al., 2012, p. 159). | Unified Theory of Acceptance and Use of Technology 2 |

TABLE 6. EFFORT EXPECTANCY CONSTRUCTS AND DEFINITIONS

### 3.4.3 Social Influence

The literature study identified several constructs relating to effort expectancy, which are presented in Table 7. The table contains all the different definitions for the constructs related to social influence, but constructs from different models that copy definitions from previous models are not included. Based on these findings, this study assumes the definition for social influence given below.

***Social Influence: The extent to which a customer perceives that important others (e.g., family and friends) believe that they should use a technology***

The effect of social influence on technology acceptance, while not controversial, is not recognized by all models on technology acceptance and use. This can largely be attributed to it not being included in the original technology acceptance model by Davis et al. (1989), which has served as a source for many other models exploring additional variables (such as risk, network effects and emotional influences). However, the importance of social factors (in the form of subjective norm) has been recognized in the theory of reasoned action (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975) and the technology acceptance model 2 (Venkatesh & Davis, 2000). These are both the theory on which the technology acceptance is based and its direct descendant by the original author, as such it can be concluded that social influence is a significant indicator of technology acceptance.

| Construct | Definition | Source |
|---|---|---|
| **Subjective Norm** | "the person's perception that most people who are important to him think he should or should not perform the behaviour in question" (Fishbein & Ajzen, 1975, p. 302). | Theory of Reasoned Action |
| **Social Factors** | Based on Triandis, social factors are "the individual's internalization of the reference groups' subjective culture, and specific interpersonal agreements that the individual has made with other, in specific social situations" (Thompson et al., 1991, p. 126) | Model of PC Utilization |
| **Image** | "the degree to which use of an innovation is perceived to enhance one's image or status in one's social system" (Moore & Benbasat, 1991, p. 195). | Perceived Characteristics of Innovating |
| **Visibility** | The degree to which one can see the innovation (by others using it) (Moore & Benbasat, 1991). | Perceived Characteristics of Innovating |
| **Social Influence** | "the degree to which an individual perceives that important others believe he or she should use the new system" (Venkatesh et al., 2003, p. 451). | Unified Theory of Acceptance and Use of Technology |
| **Social Influence** | "the extent to which consumers perceive that important others (e.g., family and friends) believe they should use a particular technology" (Venkatesh et al., 2012, p. 159). | Unified Theory of Acceptance and Use of Technology 2 |

TABLE 7. SOCIAL INFLUENCE CONSTRUCTS AND DEFINITIONS

### 3.4.4 Facilitating Conditions

The literature study identified several constructs relating facilitating conditions, which are presented in Table 8. The table contains all the different definitions for the constructs related to facilitating conditions, but constructs from different models that copy definitions from previous models are not included. Based on these findings, this study assumes the definition for facilitating conditions given below.

***Facilitating Conditions: The customers expectation of the available resources, available support and the individual and technological availability to use a technology***

The most abstract representation of facilitating conditions is given by Thompson et al. (1991), who state that facilitating conditions are factors that make an act (in this case, the adoption of an innovation) easy to accomplish. Depending on the studied subject the concrete definition of facilitating conditions has varied, but overall four conditions have been identified:

- Self-efficacy: An individual's belief about his or her capabilities to adopt, for example persons with bad eyesight may not be able to adopt a mobile telephone because they are not capable to read the screen.
- Resource availability: The degree to which resources such as time and money are available to use for the adoption. For example, an innovative mobile phone, computer or car might be highly wanted, but an individual might not be able to afford it.
- Compatibility: The degree to which an innovation is compatible with other technologies in use. For example, a specific navigation system for use in a car might not be compatible with the car an individual currently has.
- Support: The degree to which an individual believes support is available if problems with the innovation arise.

| Construct | Definition | Source |
|---|---|---|
| **Perceived Behavioural Control** | "the perceived ease or difficulty of performing the behaviour" (Ajzen, 1991, p. 188). | Theory of Planned Behaviour |
| **Facilitating Conditions** | Objective factors in the environment that observers agree make an act easy to accomplish. In an IS context, "provision of support for users of PCs may be one type of facilitating condition that can influence system utilization" (Thompson et al., 1991, p. 129) | Model of PC Utilization |
| **Compatibility** | The degree to which using "an innovation is perceived as being consistent with the existing values, needs, and past experiences of potential adopters" (Moore & Benbasat, 1991, p. 195). | Perceived Characteristics of Innovating |
| **Resource Facilitating Conditions** | The degree to which resources such as time and money are available (Taylor & Todd, 1995). | Decomposed Theory of Planned Behaviour |
| **Technology Facilitating Conditions** | The degree to which technology compatibility issues that may constrain usage exist (Taylor & Todd, 1995). | Decomposed Theory of Planned Behaviour |
| **Self-efficacy** | "Self-efficacy reflects an individual's beliefs about his or her capabilities to use computers." (Compeau et al., 1999, p. 147) | Social Cognitive Theory |
| **Facilitating Conditions** | "the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system" (Venkatesh et al., 2003, p. 453). | Unified Theory of Acceptance and Use of Technology |
| **Dominance** | "the extent to which the individual feels in control of, or controlled by, a stimulus" (Kulviwat et al., 2007, p. 1062). | Consumer Acceptance of Technology Model |
| **Computer Self-efficacy** | "The degree to which an individual believes that he or she has the ability to perform a specific task/job using the computer" (Venkatesh & Bala, 2008, p. 279). | Technology Acceptance Model 3 |
| **Perceptions of External Control** | "The degree to which an individual believes that organizational and technical resources exist to support the use of the system" (Venkatesh & Bala, 2008, p. 279). | Technology Acceptance Model 3 |
| **Facilitating Conditions** | "consumers' perception of the resources and support available to perform a behaviour" (Venkatesh et al., 2012, p. 159). | Unified Theory of Acceptance and Use of Technology 2 |

TABLE 8. FACILITATING CONDITIONS CONSTRUCTS AND DEFINITIONS

### 3.4.5 Hedonic Motivation

The literature study identified several constructs relating hedonic motivation, which are presented in Table 5. The table contains all the different definitions for the constructs related to hedonic motivation, but constructs from different models that copy definitions from previous models are not included.

The most abstract definition for hedonic motivation is given by Davis et al. (1992), who state intrinsic motivation as the degree to which users will want to perform an activity (in this case, adopting the innovation) for no apparent reinforcement other than the process of performing the activity per se. This comes down to all motivators that are not extrinsic in nature, thus all emotional feelings that are expected to be received from adopting the innovation. Based on these findings, this study assumes the definition for facilitating conditions given below. This definition makes the concept of hedonic motivation more concrete. Furthermore it is line with the definition for hedonic motivation used by Venkatesh et al. (2012) and covers the definitions of other constructs related to hedonic motivation.

***Hedonic Motivation: The degree of fun or pleasure derived from using an innovation***

| Construct | Definition | Source |
|---|---|---|
| **Affect Towards Use** | Based on Triandis, affect of use is "feelings of joy, elation, or pleasure, or depression, disgust, displeasure or hate associated by an individual with a particular act" (Thompson et al., 1991, p. 127). | Model of PC Utilization |
| **Intrinsic Motivation** | The degree to which users will want to perform an activity "for no apparent reinforcement other than the process of performing the activity per se" (Davis et al., 1992, p. 1112). This includes fun and enjoyment. | Motivational Model |
| **Affect** | Affect represents "the enjoyment a person derives from using computers" (Compeau et al., 1999, p. 148). | Social Cognitive Theory |
| **Anxiety** | Anxiety represents "the feelings of apprehension or anxiety that one experiences when using computers" (Compeau et al., 1999, p. 148). | Social Cognitive Theory |
| **Innovativeness** | The "tendency to be a technology pioneer and thought leader" (C.-H. Lin et al., 2007, p. 643). | Technology Readiness and Acceptance Model |
| **Discomfort** | The "perception of lack of control over technology and a feeling of being overwhelmed by it" (C.-H. Lin et al., 2007, p. 644). | Technology Readiness and Acceptance Model |
| **Insecurity** | The "distrust of technology and scepticism about its ability to work properly" (C.-H. Lin et al., 2007, p. 644). | Technology Readiness and Acceptance Model |
| **Pleasure** | "the degree to which a person experiences an enjoyable reaction to some stimulus" (Kulviwat et al., 2007, p. 1062). | Consumer Acceptance of Technology Model |
| **Arousal** | "a combination of mental alertness and physical activity which a person feels in response to some stimulus" (Kulviwat et al., 2007, p. 1062). | Consumer Acceptance of Technology Model |
| **Computer Anxiety** | The degree of "an individual's apprehension, or even fear, when she/he is faced with the possibility of using computers" (Venkatesh, 2000, p. 349). | Technology Acceptance Model 3 |
| **Computer Playfulness** | "the degree of cognitive spontaneity in microcomputer interactions" (Webster & Martocchio, 1992, p. 204). | Technology Acceptance Model 3 |
| **Perceived Enjoyment** | The degree to which "the activity of using a specific system is perceived to be enjoyable in its own right, aside from any performance consequences resulting from system use" (Venkatesh, 2000, p. 351). | Technology Acceptance Model 3 |
| **Hedonic Motivation** | "the fun or pleasure derived from using a technology" (Venkatesh et al., 2012, p. 161). | Unified Theory of Acceptance and Use of Technology 2 |
| **Perceived Enjoyment** | The "hedonic utility expected from IT usage, such as joy, social image, or personal fulfilment" (C.-P. Lin & Bhattacherjee, 2008, p. 89). | Network benefit and IT usage |

TABLE 9. HEDONIC MOTIVATION CONSTRUCTS AND DEFINITIONS

### 3.4.6 Network Value

The literature study identified several constructs that relate to expected network effects, which are presented in Table 10. Direct network effects are the increase in a technology's value as more users in an individual's social circle adopt the technology, while indirect network effects are the increase in complementary goods, services and support as more users in total adopt the technology. Based on these findings, this study assumes the definition for facilitating conditions given below. The network value is defined as the additional value of an innovation due to the size and composition of the innovation's user base.

***Network Value: The expected additional value of an innovation for a customer due to the size and composition of the innovation's user base***

| Construct | Definition | Source |
|---|---|---|
| **Technology-Specific Valuation** | "the independent benefit derived from the technology itself" (Wang et al., 2008, p. 103) | Extended TAM with network externalities |
| **Number of Users** | The size of the user base of the technology (Wang et al., 2008). | Extended TAM with network externalities |
| **Referent Network Size** | The size of the group of people in the user's social circle who also use the technology (C.-P. Lin & Bhattacherjee, 2008). | Network benefit and IT usage |
| **Perceived Complementarity** | The perceived availability of complementary goods and services (C.-P. Lin & Bhattacherjee, 2008). | Network benefit and IT usage |
| **Network Benefit** | "the utility or value that users of a product or service derive from the network of other users using similar or compatible products" (C.-P. Lin & Bhattacherjee, 2008, p. 87). | Network benefit and IT usage |

**TABLE 10. NETWORK VALUE CONSTRUCTS AND DEFINITIONS**

### 3.4.7 Perceived Risk

The literature study identified a single construct that relates to risk, the construct of perceived risk, which is presented in Table 11. This is not to say that there is only one study into the effect of risk on technology acceptance, the definition of the perceived risk construct is used in all the identified studies.

In this study the construct name and definition are adapted to previous literature findings. As such, the construct is named as perceived risk and this research adopts the definition stated below.

***Perceived Risk: A customer's perceived potential for loss in the pursuit of a desired outcome of adopting a technology***

Similar to past studies, it is the perception of risk that influences intention. At the same time, it is actual risk that reduces performance, for which perceived risk is a good proxy.

| Construct | Definition | Source |
|---|---|---|
| **Perceived Risk** | "the potential for loss in the pursuit of a desired outcome of using an e-service" (Featherman & Pavlou, 2003, p. 454). | TAM with perceived risk |

**TABLE 11. PERCEIVED RISK CONSTRUCT AND DEFINITION**

# 4 CASE STUDY

The purpose of this chapter is to answer the third research subquestion: “What external factors influencing adoption are recognized in practice?” Answering this question will give an overview of how innovation adoption by customers is approached in practice. This chapter begins by outlining the design of this case study in section 4.1, after which a short summary of the interviews is given in sections 4.2-4.4. This chapter ends with section 4.5 where the interviews are analysed.

## 4.1 Case Study Design

According to Yin (2014) there are five important components of a case study research design:

1. A study’s questions
2. Its propositions
3. Its unit(s) of analysis
4. The logic linking the data to the propositions
5. The criteria for interpreting the findings

Yin (2014) recommends to start a case study with a literature study to develop a theoretical framework, which can be found in the previous chapters. The theoretical framework is used to take a deductive approach in this research. This provides several advantages, as it ties the research into the existing body of knowledge, helps your research get started and directs the analysis of the collected data (Thornhill et al., 2008; Yin, 2014).

The case study will answer the research question "What external factors influencing adoption are recognized in practice?”. The propositions of the case study can be derived from the theoretical model in the previous chapter, which is based on the literature study. Each relation in the resulting model is a proposition for the case study that needs to be examined. Another proposition is that the resulting model is usable and that using the model creates value for the insurance industry. The propositions from the model and the units of analysis can be found in Figure 24.

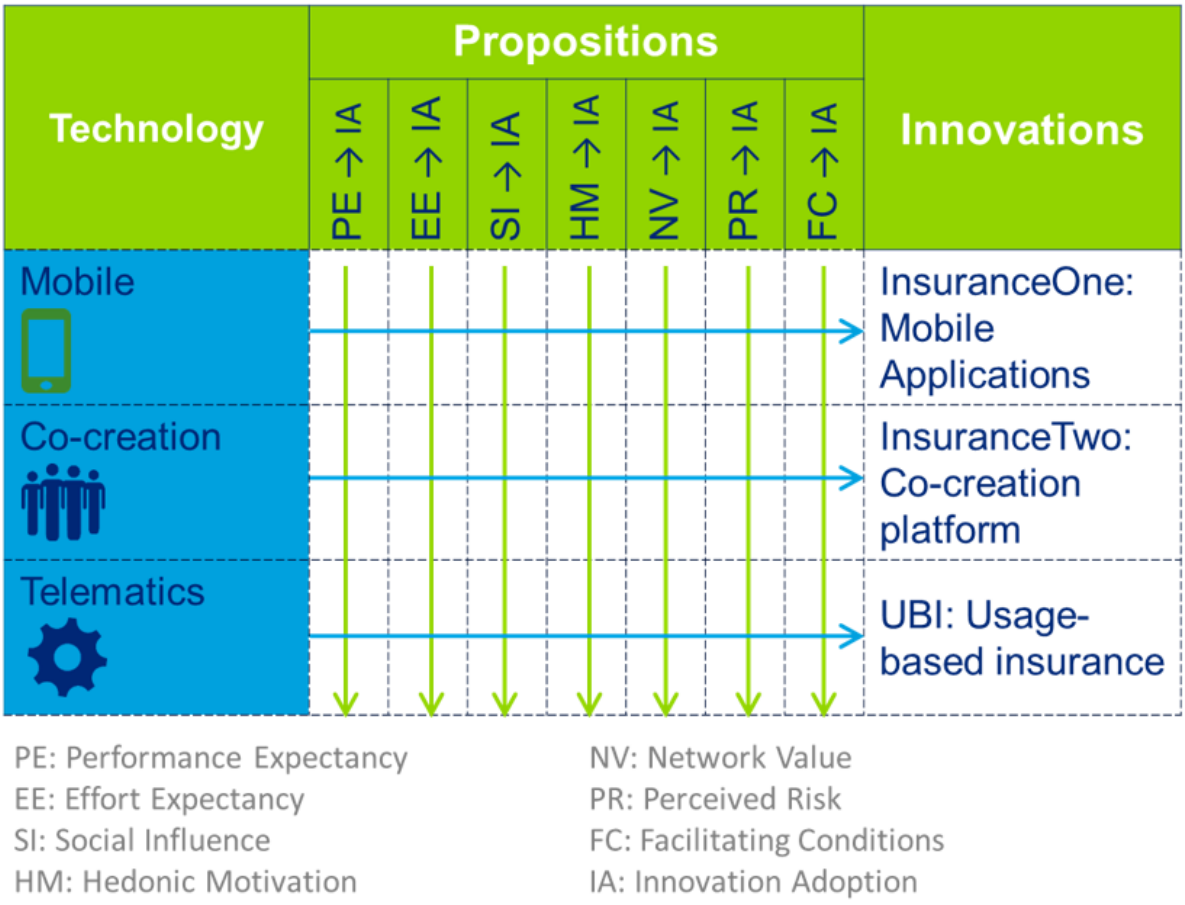



FIGURE 24. CASE STUDY DESIGN

### 4.1.1 Data collection

Data for the case studies is collected by semi-structured interviews. Using semi-structured interviews has several advantages. Semi-structured interviews can be used in an explanatory study to understand causal relationships between variables (Thornhill et al., 2008). In this case to test the correctness of the propositions about the model from the literature study.

Semi-structured interviews gather data which are analysed qualitatively, which is needed when it is necessary to understand the reasons for decisions taken by the research participants (Thornhill et al., 2008). In this case, to test if the propositions about the model from the literature study were already used by the research participants.

Semi-structured interviews also provide the opportunity to 'probe' for answers, when it is desired that the research participant to explain or expand his answers (Thornhill et al., 2008). The opportunity to explain and expand the meaning of the answers adds significance and depth to the obtained data (Thornhill et al., 2008). Furthermore, it may lead the interview to not previously considered areas that are significant for your understanding and relevant for the research (Thornhill et al., 2008).

The questions prepared for the interview can be found in Appendix A. Interview 1 was conducted on July 30th 2014, interview 2 on August 26th 2014 and interview 3 on September 2nd 2014.

### 4.1.2 Data analysis

With knowledge and permission of the participants, all interviews are recorded and then transcribed. After transcribing, each transcript is imported in Atlas.TI, a qualitative data analysis

program. Using this program, relevant quotes from interviewees are noted down and mapped to an appropriate code.

The analysis is based on the theoretical model, as Yin (2014) suggests its use for data analysis when existing theory has been used to formulate research questions and propositions. As such, one code was created for each item in the theoretical model and maturity was added to investigate its influence.

After all transcripts have been coded, the program can show how grounded a code is by counting how many times a quotation concerns a particular code. Furthermore, it can be used to determine how many sources refer to the code, as well as display a list containing all quotations about the particular code for analysing purposes.

### 4.1.3 Data quality

Bryman (1988) argues against using a theoretical framework for analysis, stating the possibility that the theoretical constructs do not match the views of the participants and that matters not in the framework might be excluded. To prevent this from happening the theoretical framework and interview questions were not supplied to the interview participants prior to the interview. Only a select set of questions was released, to allow the participants to prepare and make clear that the subject of the interview would be the adoption of innovations.

Yin (2014) created an overview of different tactics that should be applied in different stages of the case study, to ensure the four common measures of data quality in empirical research are achieved. These four are construct validity, internal validity, external validity and reliability. While these measures of data quality cannot be determined in this qualitative research, the tactics to ensure the quality were used.

Construct validity examines to what degree a measure is actually representing the intended construct and not another construct (Bhattacherjee, 2012). To ensure construct validity, multiple sources of evidence should be used, a chain of evidence should be established and key informants should review the draft case study report (Yin, 2014). In this study data was collected from multiple sources of evidence, who all got to review a draft report. The chain of evidence was established by documenting the information provided to the interviewees, recording the interviews and saving the coded transcripts. As a result of the chain of evidence, any conclusions can be traced back to the data supporting it.

Internal validity examines to what degree the observed change in a dependent variable is caused by a change in the independent variable and not by changes in the environment or other factors (Bhattacherjee, 2012). Internal validity is difficult to ensure in case studies, as variables are not directly observed but rather inferred during interviews. However, the interviews do structurally provide the opportunity for explaining rival theories, one of the methods encouraged by Yin (2014).

External validity examines to what degree the observed associations can be generalized from the sample to the population and to other people, organizations, contexts and time (Bhattacherjee, 2012, p. 86). The theoretical framework used in this study has a strong scientific foundation where external validity has been tested for different populations, organizations, context and time. The case study uses theory and uses replication logic over multiple cases, both tactics recommended by Yin (2014) for achieving external validity.

The goal of reliability is to minimize errors and bias by allowing later investigators to follow the same procedures as the prior investigator on the same case, to arrive at similar conclusions. Reliability is

achieved by documenting the procedures followed in the earlier case. In this instance, reliability is achieved by documenting and archiving the procedures followed in the research, as well as the obtained results.

## 4.2 Interview 1, Mobile Apps

Interviewee 1 is trend watcher and innovation strategist for the company InsuranceOne. In his function he is responsible for creating an innovation strategy and determining the focus and selection of innovation efforts, both internally oriented as well as consumer oriented. To do so he conducts research and analysis on technological trends and developments, to determine which can be used to create an innovation. InsuranceOne is a large insurance company in the Dutch insurance market, who partners with BankOne for the sale of its products.

Interviewee 1 was selected specifically for his experience with releasing two consumer-oriented applications. The first application was launched at the end of 2009 and reached 30.000 downloads by 2011. This application was designed for damage reports involving a single vehicle, which is approximately 70% of all claims. The application allows users to file a damage report from their mobile phone directly after the damage occurs, including photographs. The GPS function of the mobile phone fills in the location and determines phone numbers of nearby emergency services. This combination of functionality means users no longer require paper forms, do not need to figure out their exact location and do not need to search for the nearest garage and tow company. Additional to the functionality surrounding damage reports, the application also features weather and traffic information, as well as accident prevention tips.

The second application was launched in 2012 and reached 15.000 downloads mid-2014. The application allows users to place doctor's appointments in their calendar, save questions and notes, record the conversation with the doctor and functions as a medication reminder. The application also explains medical terms and allows the user to read patient information leaflets (known as a "bijsluiter" in Dutch). InsuranceOne has significantly fewer customers with a healthcare insurance than with a car insurance, so the applications were both deemed successful.

During the interview it was discussed how customers received the new applications and what convinced them to adopt the innovation. While discussing the application for damage reports and when asked what was important for consumers to adopt the application, interviewee 1 focused on the influence of novelty and communication. When summarising the discussion of this application, interviewee 1 stated: *"The most important is really the novelty, but also that BankOne continuously communicated the application to its customers".*

While discussing the application for doctor's appointments and when asked what was important for consumers to adopt the application, interviewee 1 elaborated on the absence of novelty, as well as the function and ease of use. When asked about the influence of risk on adoption, interviewee 1 also elaborated extensively on how consumers perceived risk and placed demands about risk, stating:

*"People say that they want to store all data locally on their mobile phone, they don't want a connection to InsuranceOne. […] At the same time people said they did not feel comfortable with storing their data in an InsuranceOne application. […] They want to know what happens with their data and if we could access it."*

## 4.3 Interview 2, Social co-creation platform

Interviewee 2 is the community manager of TwoGether, a social co-creation platform used by InsuranceTwo. InsuranceTwo is a large insurance company in the Dutch insurance market. Interviewee 2 is selected for his close involvement in the development and launch of TwoGether, but also his close contact with consumers that have adopted the innovation, in his role as community manager.

In 2010 InsuranceTwo was looking for ways to increase consumer trust in the company, as consumer trust in insurance companies in general took a hit after the affairs around profiteering policies (woekerpolissen). The TwoGether initiative was launched in April 2011 and offered policy holders the opportunity to appeal their rejected insurance claim to the public. InsuranceTwo guaranteed to grant the claim if over 60% of the voters, with a minimum of 100 voters, voted for granting the claim. If a claim is granted, InsuranceTwo will then look for opportunities to include the situation in their policies, so that future claims would be accepted by the company. TwoGether is also used for voting "I agree" or "I disagree" on an opinion, for example "the government should ban the GoogleGlass while driving, as it is not safe". Furthermore, TwoGether features a forum, to facilitate discussions between users and present the opportunity for more advanced (or off-topic) discussions.

InsuranceTwo expected a very quick adoption of TwoGether, aiming at 2000 users within one year after launch. While these numbers were not reached with 1000 users after one year, InsuranceTwo was pleased with their launch, as the users were found to be much more active and participating than expected. The growth of TwoGether steadily continued, particularly after media attention and customer mailings, and TwoGether now has 3200 users.

During the interview it was discussed how the platform was received by its users and how they responded to the different functionalities. Interviewee 2 talked a lot about effort expectancy and stated the following:

*"What we have really been searching for is an easy way to ensure that people can participate in a simple and accessible way, without turning it into a complex marketing study that takes up hours of everyone's time, but instead presenting it in a nice and interactive manner."*

Interviewee 2 also indicated that the complexity, the high effort expectancy associated with a forum, caused the usage of the forum to be far lower than that of the voting section of the platform.

After explaining the concept of perceived risk and discussing how TwoGether provided anonymity to its voting users (but not when sending in a case), interviewee 2 indicated the following: *"The anonymity, I think that people really appreciate that. […] So the conscious accessibility combined with the anonymity has clearly been influential".*

## 4.4 Interview 3, Usage Based Insurance

Interview 3 discussed UBI, a usage based insurance solution, based on a telematics application for mobile phones. The solution has been developed by large professional services firm OrgThree in the United States and for now only targets the US audience. The interview was held with two participants from OrgThree, interviewee 3 is a director of OrgThree and interviewee 4 is a senior advisor of OrgThree and former president US business of one of the largest insurance companies, both globally and in the United States.

UBI consists of five components:

- An app that can be downloaded to the smartphone of the driver, which then transmits motion data to OrgThree
- A driver risk score based on individual trip scores. The insure received the trip score after each trip, while the insurance company receives the driver risk score
- A driver portal where drivers can get detailed information about each trip, with information about each trip such as routes, speeds and scores but also locations where events happened that influenced the trip score
- An underwriting portal where the insurance company can compare driver scores between individual drivers or groups of drivers
- A data bureau where insurance companies can analyse data such as speed, location and acceleration collected from all insurance companies, to have access to a meaningful amount of data for testing risk algorithms

In October 2010 Interviewee 3 and 4 were discussing how insurance companies were going to evolve in the face of developments in technology, accessibility of data and statistical analysis. They discussed how these technologies could impact the risk side of automobile insurance and wondered how companies could achieve the required amount of data for accurate risk calculations. They presented their views to the national association of mutual insurance companies in January of 2013 and explained that the current risk analysis methodologies would become irrelevant with the upcoming availability and accessibility of actual driving data. Based on the discussions held there, the concept of UBI was created and the leadership of the national association of mutual insurance companies eventually endorsed their solution, leading to the actual development of UBI which was completed in July 2014. By now contracts have been signed with five insurance companies, of which two have deployed UBI for their employees for testing, expecting a full rollout within three months.

When asked the reasons why consumers would or would not adopt UBI, the interviewees primarily mentioned financial gains. Interviewee 4 stated the following about this: *"In terms of why they sign up, they are usually offered some kind of discount, a relatively modest discount to sign up, with the opportunity to get a bigger discount if their driving behaviour warrants it"*.

Interviewee 4 also discussed how people not participating because they do not want to be tracked, would eventually affect the policy price for those that are participating:

*"I think what may happen ultimately is that when you get enough adoption of consumers sharing their driving behavior data, similar to what happened with credit score. If you choose not to make your driving score available, or in the case of credit score if you don't have a credit score, you are likely to pay more for your insurance then if you did. So over time, as the predictive power of this information becomes more readily accepted and more and more people begin to share it with their insurance company, those that don't might actually suffer some sort of a penalty."*

## 4.5 Interview Analysis

This subchapter contains the analysis of the qualitative data collected in the interviews. This section begins by giving an overview of the coded concepts and their occurrence. After this, each individual code is discussed, based on the quotes from the interviews. During the interviews and coding process it became apparent that the interviewees recognized some additional factors that they believed to be important in influencing adoption, these factors were novelty and publicity.

### 4.5.1 Overview of coded concepts

Table 12 gives an overview of all the coded concepts and their presence in each of the interviews, created with the Codes-Primary Documents function of Atlas.TI. When an item gets more references, from multiple sources, the conclusion can be drawn that this item is of more importance to the interviewee than other topics, assuming no explicit mention of importance is made. The maturity concept is excluded, as it is not investigated as a direct influence, but rather as a moderating factor. For example, this table shows that performance expectancy has 17 references by all interviewees, showing that in the opinion of the interviewees performance expectancy is more important than for example social influence, with two references from two interviewees.

| **Construct** | **Source** | | | **Total** |
|---|---|---|---|---|
| | Interview 1 | Interview 2 | Interview 3 | |
| Performance Expectancy | 5 | 5 | 7 | 17 |
| Effort Expectancy | 2 | 7 | 2 | 11 |
| Social Influence | 1 | 1 | 0 | 2 |
| Hedonic Motivation | 0 | 3 | 3 | 6 |
| Network Value | 0 | 0 | 0 | 0 |
| Perceived Risk | 1 | 6 | 3 | 10 |
| Facilitating Conditions | 0 | 1 | 0 | 1 |
| Maturity | 6 | 2 | 3 | 11 |
| Novelty | 13 | 0 | 0 | 13 |
| Publicity | 7 | 3 | 0 | 10 |
| **Total** | 35 | 28 | 18 | 81 |

**TABLE 12. OVERVIEW OF CODED CONCEPTS**

### 4.5.2 Conceptual Model

#### 4.5.2.1 Performance Expectancy

With 17 references and all interviewees referring to performance expectancy, it is clear that performance expectancy is an important factor. Notable here is that interviewee 1 indicated that not only performance was important, but that the impression was important. When asked if saving time was the most important advantage for customers, he replied: *"You would think that, but obviously that is not true. Picking up the phone is much faster. […] I think we deluded ourselves that internet is easy and fast. "*

When asked about what the most important reason for people to download the healthcare app, interviewee 1 responded: *"The function, what I hear from them is that people appreciate the function. They say they normally have to take a note to the doctor. […] This is clearly the function and not so much the novelty."*

Interviewee 2 indicated that the social co-creation platform was primarily used by customers of InsuranceTwo and that people would join primarily when a case appeared online that was relevant to

their particular insurance. Later on he stated: *"I think that performance expectancy is a very important factor."*

Interviewee 4 indicated that people would sign up for UBI to save money:

*"In terms of why they sign up, they are usually offered some kind of discount, a relatively modest discount to sign up, with the opportunity to get a bigger discount if their driving behaviour warrants it. […] That can be attractive to people who are good drivers. So that is the reason why people would sign up."*

#### 4.5.2.2 Effort Expectancy

During all interviews a reference was made to effort expectancy. Primarily interviewee 2 focussed heavily on effort, with 7 references it was the most referred factor during that particular interview. Interviewee 2 also placed effort in his top three of most important factors:

*"I find effort to be a very important factor. What we have really been searching for is an easy way to ensure that people can participate in a simple and accessible way, without turning it into a complex marketing study that takes up hours of everyone's time, but instead presenting it in a nice and interactive manner."*

Interviewee 2 also indicated that the complexity, the high effort expectancy associated with a forum, caused the usage of the forum to be far lower than that of the voting section of the platform.

"*You really noticed that the accessibility was a lot lower there. You see that the complexity is a lot higher than with two simple buttons with an expending field to scroll through. So the commitment to really participate on a forum is noticeably more complex. […] You notice that once someone has participated once, in any forum, that it is a technological method that you recognize everywhere. […] Particularly people that have not yet participated in any forum are afraid and will not participate."*

Interviewee 1 also indicated twice that people gave feedback on how easy to use the application was, indicating that it was a factor for them. In interview 3 no direct references about the importance of effort expectancy were made, but they did indicate that measures were taken to reduce effort expectancy, by removing steps required for users and including functions to prevent data charges.

#### 4.5.2.3 Social Influence

Social influence was only referenced twice, in two interviews. Interviewee 1 touched shortly on the subject, asking where a gain in social status was included. He referred to Google Glass and stated: *"Exclusivity is a huge factor for why people want that thing. […] Innovations that I find interesting often include a component of vanity."*

After being asked if it ever occurred that people joined after others recommended TwoGether to them, interviewee 2 said that this does, but he did not illustrate or expand his answer.

#### 4.5.2.4 Hedonic Motivation

Hedonic motivation was referenced six times in two of the three interviews. After viewing the conceptual model, interviewee 2 explained how InsuranceTwo viewed hedonic motivation:

*"What we do in the field of hedonic motivation, very much from the software-perspective, is gamification. So things like "only so many days left to vote", but also awarding badges for number of times voting. So TwoGether contains some gamification elements."*

Interviewee 2 confirmed that InsuranceTwo actively looks at hedonic motivation and that in his opinion, it also had an effect on the users: *"The badges are visible on the forum and the "so many days*

*left to vote" is for the case-section. I believe that the last one in particular has an effect and the badges are more a sort of show-element."*

Gamification was also employed in UBI, interviewee 3 stated the following:

*"The UBI has been designed is that we will permit contests, or to use the term gamification, where family members or individuals in a certain group can compete with each other to score safe driving points. There is going to be that element to it as well."*

Interviewee 3 also indicated that UBI presents a trip score after every trip, alongside with options to improve your score. Furthermore, interviewee 3 believed that UBI had a direct impact on hedonic motivation as well, stating that it made people feel better:

*"In terms of hedonic motivation I think that there's a few things, one aspect of hedonic motivation is people feel better if they know, in the same way if someone knows they are eating a healthy diet, or they are exercising in a way that will promote their health and wellbeing, that increases their feeling of happiness. We believe that if people understand that they are driving in a safe way, or they learn how they can drive in a more safe way, that will also increase their happiness."*

#### 4.5.2.5 Network Value

No references to network value were made, and no situations concerning network value were identified in the interviews. Both TwoGether and UBI required a certain amount of users to achieve any benefit (respectively 100 voting users and an unspecified number to draw significant statistical conclusions), but any increase over these numbers do not further increase value. As such, it is not a network effect and not a component of network value.

#### 4.5.2.6 Perceived Risk

Perceived Risk was referenced ten times in total, in all three interviews. Interviewee 1 presented a detailed view on the matter, explaining that people do not trust the company with their private data, but on the other hand do not desire additional security steps like encrypted local storage:

*"At the same time people said they were uncomfortable with storing their data in an InsuranceOne-app. That was some time ago and will increase even more in the future."*

Interviewee 2 also explained a detailed view on the matter, as the primary purpose of TwoGether was to increase trust:

*"What even more important at that time was the lack of trust in insurers. Consumers have a negative image of insurers, especially in that time with the attention on profiteering policies. […] What we have been looking for is a way to become the most trusted insurance brand."*

Interviewee 2 also mentioned that risk did not play a role in the adoption, as anonymity was included in TwoGether. After asking his opinion if this was because risk was low, or because risk was simply unimportant, interviewee 2 indicated that people did appreciate the anonymity:

*"The anonymity, I think that people appreciate that. […] The intended accessability combined with the anonymity, had a positive influence."*

Interviewee 4 indicated that risk was a clear factor for some people deciding not to adopt:

*"The reasons why people don't sign up, in some cases they don't want their driving behaviour monitored. One of the things that is captured when you drive, particularly with mobile apps, is your*

*location. For privacy purposes, some people might be uncomfortable with their insurance company, or some third party, know where they are. So they may chose not to participate."*

Interviewee 4 also indicated that Americans are becoming more used to sharing data for value, particular younger Americans, and that this made them more inclined to do so again.

#### 4.5.2.7 Facilitating Conditions

Facilitating Conditions was only referenced once, by interviewee 2. Interviewee 2 indicated that support for TwoGether was necessary and that it was provided both by himself and the IT provider.

#### 4.5.2.8 Maturity

Maturity was referenced eleven times in all three interviews. Interviewee 1 mentioned that he experienced a social innovation project that was discontinued, as it was too early because social innovations were not hyped until two years ago. He mentioned this could have happened to the apps launched by InsuranceOne as well.

Interviewee 1 mentioned that the factors encouraging adoption of the Google Glass changed over time as the technology matured:

*"Now that people know a bit more about it and have tried it out, most people realise that it might not be so useful and is just a novity. For example, performance expectancy is more important now, while in the beginning it was the enjoyment of it being a new innovation. At later stages it becomes more important if a technology achieves the expected performance."*

Interview 3 supported this statement, as 4nterviewee 4 also indicated that users find benefit more important as a technology matures. He also stated that more opportunities arise to increase the benefit as a technology matures and that customers expect this to increase. Interviewee 3 elaborated on this, stating that as a technology matures and more competitors begin providing a similar solution, the company needs to push the innovation and increase the performance in order to differentiate themselves from the competition.

Interviewee 2 indicated that the immaturity of the technology caused signing up to TwoGether to be too big a step for consumers.

In interview 3 several detailed reference were made concerning maturity combined with other factors. About risk interviewee 4 stated the following:

*"Certain the younger generation, but true for older Americans as well. They really latched on to sharing data in exchange for some kind of value. They do it with retailers all the time, they do it with Yelp and Google and other types of companies. That's why I think having a phone based solution will be more attractive to people, because it's something they are quite familiar with and something that they do today. […] I don't think that the concept of sharing data in exchange for value is one that's foreign to them anymore. Because they do it in so many circumstances."*

### 4.5.3 Additional identified factors

During the interviews and subsequent transcribing, coding and analysis, two additional factors were identified of which the place in the conceptual model was unclear. The first factor was novelty, the second factor was publicity.

#### 4.5.3.1 Novelty

Novelty was referenced 13 times by interviewee 1, but not in the other interviews. Interviewee 1 indicated several times that novelty was the primary reason for customers to adopt the damage report

application, as their reason he indicated: *"If people don't know what it's going to do yet, but it is new and they are curious and interested, then it is alright."*

Interviewee 1 also indicated that novelty was **not** the reason for people to adopt the healthcare application, which was launched three years later. Instead, the function of the application was now the primary reason.

#### 4.5.3.2 Publicity

Publicity was referenced ten times in two of the three interviews. Interviewee 1 stated the following about publicity: *"It helped greatly that several blogs published about it because it was new."*

Interviewee 1 said the following about the reasons that the damage report application was downloaded often: *"The primary reason is novelty, but also that the bank continuously communicated that to its customers and also included it in their application."*

Interviewee 2 voiced similar opinions: *"What you always see is that once it is the subject of communications, or if it is used in the advertisement campaigns, that usage increases."*

He also stated about the start of the platform: *"It had been picked up by the media and you saw that caused a growth in members."*

### 4.5.4 Summary

Overall consensus was achieved on the factors performance, effort and risk. Little support was found for social influence, network value and facilitating conditions. Hedonic motivation received moderate support. Novelty and publicity emerged as factors that were not included in the conceptual model, but received strong support by at least some of the interviews. Strong support was found for the moderating effect of maturity on performance, increasing its importance as a technology matures. Support was also found for the moderating effect of maturity on risk, decreasing the importance and value of risk as a technology matures.

# 5 DISCUSSION

This chapter discusses the results of this research. It begins by discussing how the results of the case study lead to an updated version of the theoretical model created from the literature study. After this the external validity is discussed and this section ends with recommendations for practice.

## 5.1 Updating the conceptual model

This section compares the results of the case study to the conceptual model from the literature study to determine if there are any discrepancies. Any discovered discrepancies are discussed to determine if the conceptual model needs to be updated accordingly. This section first looks at the additional factors that were discovered and then turns to the elements in the original conceptual model.

### 5.1.1 Novelty

The two new factors that were uncovered during the case study were novelty and publicity. Novelty and publicity are also related, part of the importance of novelty was that it sometimes generated publicity, but publicity was also generated by other factors. The other part of the importance of novelty was that it satisfied a consumers need to be innovative and generated positive feelings.

Generating positive feelings and satisfying a need to be innovative is a direct match with the concept of hedonic motivation, defined as “the fun or pleasure derived from using a technology” (Venkatesh et al., 2012, p. 161). Several studies also note this, stating that these feelings can be caused by the novelty of a product or service (C.-H. Lin et al., 2007; Venkatesh et al., 2012).

As a result of the similarity of novelty to hedonic motivation and publicity, which has already been remarked upon in literature, it is rejected as a new factor and not included in the revised model.

### 5.1.2 Publicity

Publicity was not included in the original conceptual model, but data from the case study did show that it was a factor influencing the adoption of innovations. It makes sense that publicity was not included in the original conceptual model, the literature on which the conceptual model was based has the precondition that the studied individuals know the studied innovation. In order to make the conscious decision to adopt or not adopt an innovation, the innovation has to be known, either from previous publicity or from communications by the researchers and as such publicity was not a factor, as it was always present.

The literature has a micro-perspective, focussing on individual persons that may adopt an innovation. This research moves to a macro-perspective, where the overall adoption of an innovation is studied. Here, the precondition that the innovation is known is not present and an increase in publicity leads to more people making the conscious decision of adopting an innovation, thus influencing the overall adoption of the innovation. As a result of this, publicity is to be accepted as a new factor influencing adoption and changes have to be made in order to allow publicity to fit in the model. To create a fit for publicity in the model it is renamed to exposure, as the factors influencing adoption take the perspective from the adopter. As a result of this, exposure is accepted as a new factor influencing adoption and included in the revised model. Based on these findings, this study assumes the definition for exposure given below.

***Exposure: The degree to which a customer has heard of and been informed about a technology***

### 5.1.3 Performance Expectancy

Data from the case study clearly showed the influence of performance expectancy on innovation adoption. Performance expectancy was consistently one of the most supported factors influencing innovation adoption, being in the top three most supported factors in all three interviews and having the most references in total.

Performance expectancy is also recognized as one of the most influential factors in the studied literature, with it or related constructs existing in all studied literature. As such, there is no discrepancy with the conceptual model that needs to be discussed and performance expectancy remains in the model for innovation adoption.

### 5.1.4 Effort Expectancy

Data from the case study clearly showed the influence of effort expectancy on innovation adoption. References to effort expectancy were made in all interviews, although the intensity of references varied. Particularly interviewee 1 showed strong support for effort expectancy and related concepts.

Effort expectancy is also recognized as one of the most influential factors in the studied literature, with it or related constructs existing in almost all the studied literature. As such, there is no discrepancy with the conceptual model that needs to be discussed and effort expectancy remains in the model for innovation adoption.

### 5.1.5 Social Influence

Data from the case study did not clearly show the influence of social influence on innovation adoption, even though the importance of social influence is clearly proven in practice, as it or related constructs exist in almost all the studied literature.

This study did not reveal the reason that social influence received so little attention in the financial services industry. Possible reasons could be that it is a difficult factor to increase, or that increasing social influence is not an acceptable practice in the financial services industry. Regardless of the reason, possibilities to increase social influence do exist. In combination with the emergence of gamification technologies in particular, it is possible to include referral programs to increase social influence. As a result, social influence is not removed from the conceptual model.

### 5.1.6 Hedonic Motivation

The data from the case study showed moderate support for hedonic motivation. Taking into account that novelty was not included because it overlapped with hedonic motivation, part of the support of novelty would transfer to hedonic motivation, significantly increasing the support for hedonic motivation.

Hedonic motivation is recognized as a factor in the studied literature, but it or related constructs exist only in a small part of the studied literature. Hedonic motivation does not fit well in the classic literature for technology acceptance in organizations. As a result, it is only featured in the more modern literature and only really kicked off after the paper by van der Heijden (2004), but in the recent literature is found to be very significant.

Based on the strong support from modern literature, as well as the (updated) support from the case study data, there is no discrepancy with the conceptual model that needs to be discussed and hedonic motivation remains in the model for innovation adoption.

### 5.1.7 Network Value

Network value received no support in the case study. On top of that, the factor was also not strongly supported by the literature. The lack of support might be caused by a lack of network effects in the financial services industry, but either way it shows that network value is not a factor influencing innovation adoption in the financial services industry. As a result, network value is removed from the conceptual model and not included in the revised version.

### 5.1.8 Perceived Risk

Data from the case study clearly showed the influence of perceived risk on innovation adoption. References to perceived risk were made in all interviews, although the intensity of references varied. In each interview, perceived risk focused primarily on privacy risk. Interviewee 1 gave a detailed explanation about how consumers do not trust organizations with their data and find it an infraction of privacy, which interviewee 2 supported. Interviewee 3 and 4 indicated that some consumers do not want any technology to follow and store their location information. Other facets of risk exist as well, but were not discussed, such as the potential for financial loss. A potential for financial loss could not be identified in the studied innovations, as none of the solutions included payment data.

Literature only showed little support for perceived risk influencing innovation adoption as it was only recently introduced in the field of technology acceptance. Papers such as Martins et al. (2014) show that it is important to include perceived risk in a technology acceptance model. Based on promising findings in recent literature and the clear support from practice perceived risk remains in the conceptual model.

### 5.1.9 Facilitating Conditions

The impact of a micro-macro perspective found for publicity can also be recognized in the lack of support for facilitating conditions. In part, facilitating conditions concern the availability of resources such as time and money. From a micro-perspective, these are important factors influencing the adoption decision and execution, but from a macro-perspective it is difficult to increase the available time and money for the entire target market. However, some parts of facilitating conditions, such as support and compatibility were mentioned in the case study. These factors are important for innovation adoption and require attention during the development process. Because of that, facilitating conditions is not removed from the conceptual model.

### 5.1.10 Updated version

Summarising the previous sections; the decision was made to include publicity, but not novelty. Network value was removed, but all other factors remained. These revisions to the conceptual model are visualized in Figure 25. A graphical representation for use by Deloitte and organizations in the financial services industry can be found in Appendix B, where the importance of the factors is placed on a Gartner Hype Cycle, indicating the maturity of technologies. Questionnaires that can be used to rate performance expectancy, effort expectancy, social influence, hedonic motivation, perceived risk and facilitating conditions can be found in Appendix C. Publicity emerged as a new factor and as such a questionnaire for this factor has not yet been developed.

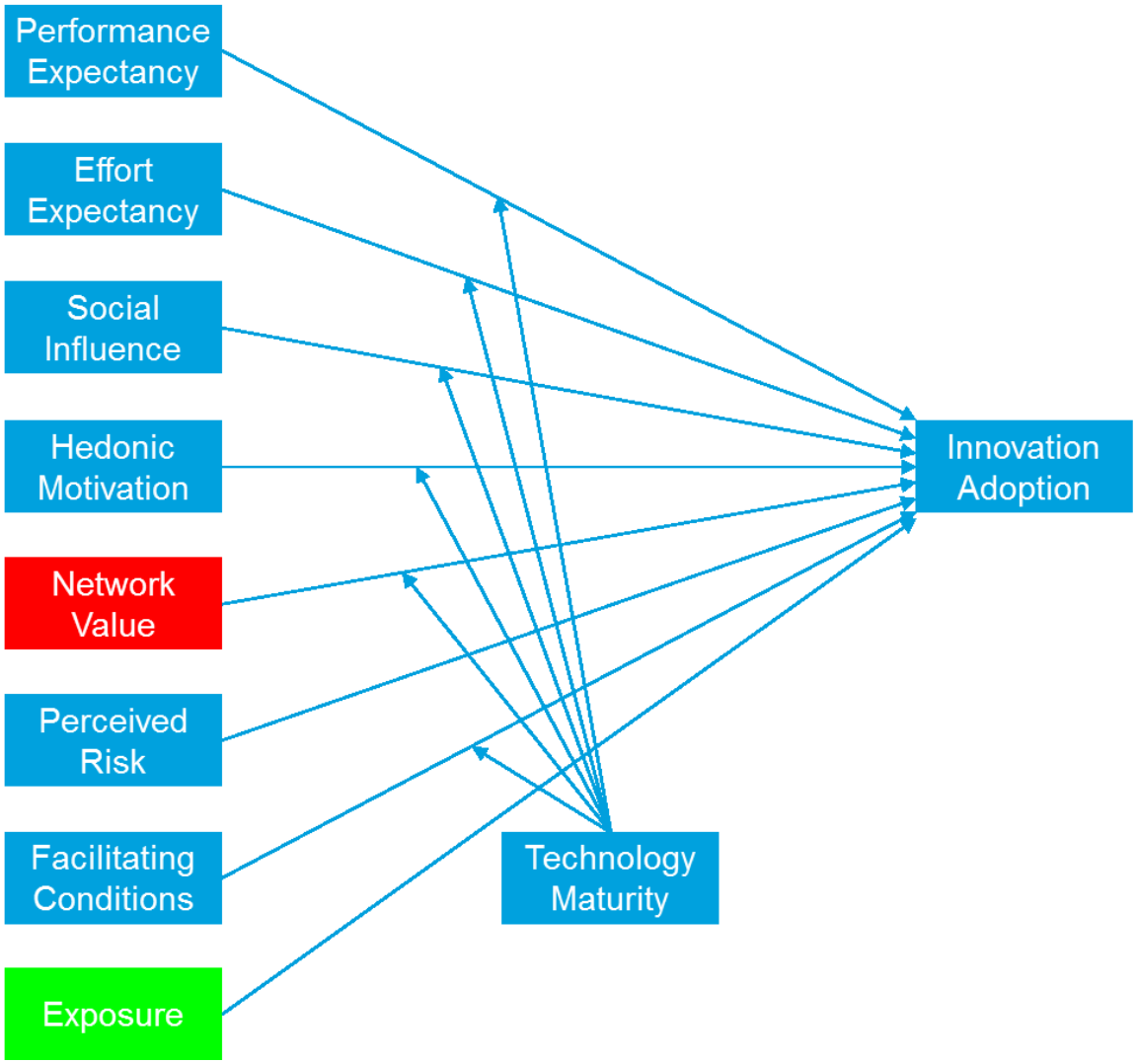



FIGURE 25. UPDATES TO THE MODEL OF FACTORS INFLUENCING INNOVATION ADOPTION

## 5.2 External validity

External validity examines to what degree the observed associations can be generalized from the sample to the population and to other people, organizations, contexts and time (Bhattacherjee, 2012, p. 86). This study used replication logic, as recommended by Yin (2014) to ensure external validity to the insurance sector. The scope of this study is the financial services industry, of which the insurance sector is a large subset. To ensure external validity to the financial services industry, this study is based on scientific theory which has been tested in different populations, organizations, industries, regions and time. Using theory to ensure external validity is the second recommendation by Yin (2014) to ensure external validity.

The case studies that all take place in the insurance industry, thus using replication logic, are deemed a valid representation of the insurance industry and thus these results can be generalized to the insurance industry. As the insurance industry is a large subset of the financial services industry it is also deemed externally valid to the financial services industry. This is strengthened by the use of general scientific theories that have been tested in different industries, organizations and populations, to the extent that the result can even be generalized to a general adoption model.

## 5.3 Contribution to practice

This section elaborates the practical contributions that the results of this research provide for organizations. This thesis is scoped on the financial services industry, so this section begins with elaborating the contributions for organizations in this industry that engage in consumer innovation. After this, the contributions for Deloitte as a professional services provider are elaborated.

### 5.3.1 Financial Services Industry

This study revealed that organizations in the financial services industry do not give adequate attention to the effect of social influence on consumer adoption. Social influence has been scientifically proven as a predictor for innovation adoption and as such organizations should try to maximize the social influence their potential customer base receives. The organizations studied in this research did not attempt to maximize the social influence on their potential customer base, so there is a lot of room for improvement. In some cases, a quick win can be realised here by implementing referral programs in the gamification elements that are applied to many innovations in the financial services industry.

This thesis and the created model for consumer innovation adoption provides insight into the adoption and success of innovations and the influence of external factors during the innovation process. These insights allow organizations in the financial services industry to be efficient with their time when analysing potential technologies and innovations. By formalizing a process that mostly relies on gut-feeling the innovation process becomes transparent and presentable, allowing for increased top-management support. The link to technology maturity along with the individual factors also allows to quickly and efficiently scan emerging technologies to define a long-term innovation strategy.

### 5.3.2 Deloitte

This thesis and the created model for consumer innovation adoption provides insights into the adoption and success of innovations and the influence of external factors during the innovation process. With these insights Deloitte can provide several services to organizations inside the financial services industry. Deloitte can advise organizations that have difficulties with a specific innovation that is not being adopted on how to improve adoption of the innovation, but Deloitte can also advise before and during the development process to prevent these problems.

A current value proposition of Deloitte is to analyse technology trends and to select and transform these trends into a long-term innovation strategy. Scoped at the financial services industry, the model for consumer innovation adoption provides a clear guideline for creating both long- and short-term innovation strategies. It can help Deloitte with the creation of an innovation strategy, but also the presentation and formalization of this strategy for organizations in the financial services industry.

The previous section explained how the model for consumer innovation adoption can help with creating innovation strategies for the financial services industry. The methodology used and described in this research can also be applied to other industries, although results might be similar due to the reliable use of scientific literature during the creation process. After applying the methodology to different industries, the result can then be used to advise organizations outside the financial services industry on improving problematic innovations and to create innovation strategies for organizations in the chosen industry.

# 6 CONCLUSION

This chapter presents the conclusions of this research. The research questions presented at the start of this research are answered in the first section. The second section contains the contribution of this research to literature. This chapter concludes with the limitations of this research and recommendations for future work in section 6.3.

## 6.1 Conclusions

This section contains the conclusions to the research questions answered by this research. It begins by addressing the individual research subquestions and finishes with the answer to the main research question. The main question answered by this research is stated below and has been answered by dividing the question into separate sections of the problem.

> **Which combination of external factors contributes to the adoption of innovations based on emerging technologies?**

The first step to determine the answer to the main question was to study the available literature and answer the first research question:

1. *What external factors contribute to the adoption of innovative products and services by customers according to literature?*

The structured approach to answering this question is presented in section 3.1. The findings are represented in Tables 4 till 10, containing constructs related to the following seven categories:

1. Performance Expectancy
2. Effort Expectancy
3. Social Influence
4. Hedonic Motivation
5. Perceived Risk
6. Facilitating Conditions
7. Network Value

This categorization was made to better represent the findings of the literature review, as the complete list of constructs does not provide much clarity on its own. This also allows the formulation of a conceptual model to answer the second research subquestion:

2. *How do the external factors interrelate in adoption of emerging technologies?*

This research subquestion was answered by the conceptual model presented in Figure 23, which is explained in section 3.4. The next step to answer the main question was to conduct a case study to gather the qualitative data to answer the third research question:

3. *What external factors influencing adoption are recognized in practice?*

The structured approach to answering this question is presented in section 4.1. Coding and analysis of the data generated by the case study revealed six factors that influenced consumer adoption of innovations in practice:

1. Performance Expectancy
2. Effort Expectancy

3. Hedonic Motivation
4. Perceived Risk
5. Novelty
6. Exposure

By comparing these results to the original conceptual model gap-analysis was conducted, so that the final research subquestion could be answered:

4. *To what extent can a framework of required external factors for rapid innovation adoption be applied to emerging technologies?*

The gap-analysis revealed that two new concepts appeared while three were not included. Publicity and novelty appeared, but novelty bore close resemblance to both publicity and hedonic motivation, so it was rejected. Publicity was accepted as a new concept, but renamed to exposure, indicating the degree of exposure to the target customer base of the innovation.

Social influence and facilitating conditions remained in the conceptual model despite a lack of support from practice, as the scientific support for these factors is large, indicating these two factors as gaps in the current focus of the financial services industry which can be improved. Network value was removed as no support was found in practice and the scientific support for this factor was small. There were no network effects present in the studied cases, so closer examinations might be required. However, based on this study there is no significant direct effect of network value on adoption, thought direct effects of network value on the individual factors might still exist.

These changes presented in Figure 25 resulted in the model for consumer innovation adoption, which is the ultimate conclusion of this research. It answers the main research question "Which combination of external factors contributes to the adoption of innovations based on emerging technologies?" and can be found in Figure 26. Instructions for applying this result can be found in Appendix B, while survey items to measure the values can be found in Appendix C.

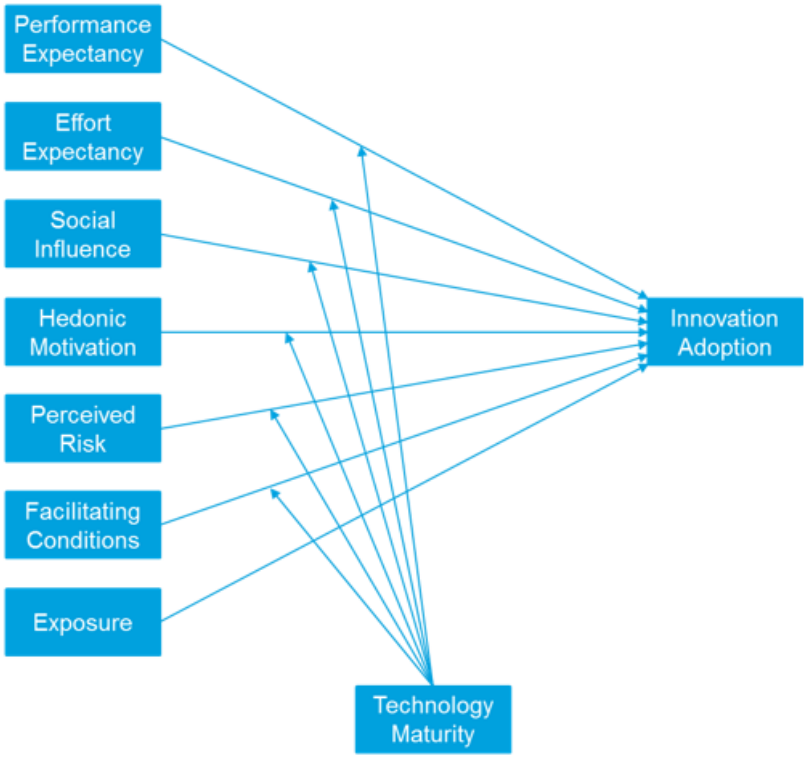



**FIGURE 26. FINAL MODEL OF FACTORS INFLUENCING INNOVATION ADOPTION IN THE FINANCIAL SERVICES INDUSTRY**

## 6.2 Contribution

This research provides two major contributions to current theory in the field of technology acceptance and innovation management.

The conceptual model created based on the studied literature is an extension and refinement of the paradigm in the field of technology acceptance. Venkatesh et al. (2012, p. 173) suggest future work to identify other relevant factors that may help increase applicability of UTAUT (Venkatesh et al., 2003) to a wide range of consumer technology use contexts. The entire original UTAUT model is included in the conceptual model created in this study, as well as three new factors: network value, hedonic motivation and perceived risk.

Adams, Bessant, & Phelps (2006, p. 38) state that there is a huge gap in in innovation management, because of the lack of development in the area of commercialization of innovation. Furthermore, much of the literature that considers launch and commercialization of innovations does so from the viewpoint of the adopter, which is supported by the literature studied in this research and the created conceptual model. By changing the perspective from the adopter to the organization, the factor of exposure to target client base becomes included in the model for consumer innovation adoption and network value got removed. This is a first step to a paradigm shift and unification for both the innovation management and technology acceptance fields, which can be completed once the methodology used in this research has been applied in general, without the focus on financial services industry.

## 6.3 Limitations and Suggestions for Future Research

This section begins by describing the limitations of this research, after which possibilities for future research are given.

### 6.3.1 Limitations

There are a number of limitations present in this research, which are primarily caused by the limited amount of time available for this research.

The scope of this research is the financial services industry and the most important limitation concerns generalizability, as only a limited amount of organizations was investigated. These organizations all fall under the insurance industry, which is a subset of the financial services industry. Since there is no complete sample of the financial services industry generalization to the financial services industry is not assured. Furthermore, by no means are the results of this research generalizable to all existing organizations, regardless of industry, location and size.

This research used semi-structured interviews as a method of data collection, so that the interview is flexible and can discover relevant topics that otherwise might not have been brought up. This method results in a set of qualitative data which is based on the views of experts in the insurance industry. It is possible that their views are biased and differ from how the average potential adopter values innovations and how innovation adoption actually occurs.

### 6.3.2 Future Research

This research provides several interesting opportunities for future research. New studies can overcome the limitations mentioned in the previous section, but also build on this research to further the field and increase practical use.

Adding additional case studies in different industries will increase the scope and generalizability of this research to different industries. With sufficient data, a general model for innovation adoption in all industries can be created.

The conceptual model based on the studied literature provided a new direction in the technology acceptance field. To firmly ground this model in the existing literature the conceptual model should be quantitatively tested on an innovation to create statistical evidence of its significance. In order to do so, the research methodology described in this thesis should be adapted to include statistical data generation and analysis, aimed at individual innovation adoption.

The model for consumer innovation adoption shifted the perspective from the adopter to the organization to align with innovation management theory. Further study into the different elements in the model is required, to develop measurement models but also to identify activities that can be undertaken to improve these factors so that innovation managers are provided with usable measurement methodologies and actionable information to improve underperforming elements.

# 7 BIBLIOGRAPHY


Adams, R., Bessant, J., & Phelps, R. (2006). Innovation management measurement: A review. *International Journal of Management Reviews*, *8*(1), 21–47.

Ajzen, I. (1985). *From intentions to actions: A theory of planned behavior*. Springer.

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, *50*(2), 179–211.

Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior*. Englewood Cliffs, NY: Prentice-Hall.

Bandura, A. (1986). *Social foundations of thought and action*. Englewood Cliffs, NY: Prentice-Hall.

Baumol, W. J. (2002). *The free-market innovation machine: Analyzing the growth miracle of capitalism*. Princeton, NY: Princeton University Press.

Beatty, C. A. (1986). *The Implementation of Technological Change: A Field Study of Computer Aided Design* (unpublished doctoral dissertation). University of Western Ontario, London, Ontario.

Beer, M., & Nohria, N. (1999). Cracking the code of change. *Harvard Business Review*, *78*(3), 133–41.

Bhattacherjee, A. (2012). Social Science Research: principles, methods, and practices.

Boddy, D. (2009). *Management*. Pearson Education.

Bryman, A. (1988). *Quantity and Quality in Social Research*. London: Unwin Hyman.

Compeau, D., & Higgins, C. A. (1995). Computer self-efficacy: Development of a measure and initial test. *MIS Quarterly*, *19*(2).

Compeau, D., Higgins, C. A., & Huff, S. (1999). Social cognitive theory and individual reactions to computing technology: A longitudinal study. *MIS Quarterly*, *23*(2).

Cooper, R. B., & Zmud, R. W. (1990). Information technology implementation research: a technological diffusion approach. *Management Science*, *36*(2), 123–139.

Davis, F. D. (1985). *A technology acceptance model for empirically testing new end-user information systems: Theory and results*. Massachusetts Institute of Technology.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 319–340.

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: a comparison of two theoretical models. *Management Science*, *35*(8), 982–1003.

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1992). Extrinsic and intrinsic motivation to use computers in the workplace1. *Journal of Applied Social Psychology*, *22*(14), 1111–1132.

Deutsch, M., & Gerard, H. B. (1955). A study of normative and informational social influences upon individual judgment. *The Journal of Abnormal and Social Psychology*, *51*(3), 629.

Featherman, M. S., & Pavlou, P. A. (2003). Predicting e-services adoption: a perceived risk facets perspective. *International Journal of Human-Computer Studies*, *59*(4), 451–474.

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention and behavior: An introduction to theory and research*. Reading, MA: Addison-Wesley.

Gartner. (n.d.). Gartner Hype Cycle. Retrieved from http://www.gartner.com/technology/research/methodologies/hype-cycle.jsp

Getz, I., & Robinson, A. G. (2003). Innovate or die: is that a fact? *Creativity and Innovation Management*, *12*(3), 130–136.

Gladwell, M. (2006). *The tipping point: How little things can make a big difference*. Hachette Digital, Inc.

Goodhue, D. (1988). IS attitudes: toward theoretical and definitional clarity. *ACM SIGMIS Database*, *19*(3-4), 6–15.

Hartwick, J., & Barki, H. (1994). Explaining the role of user participation in information system use. *Management Science*, *40*(4), 440–465.

Hu, P. J., Chau, P. Y., Sheng, O. R. L., & Tam, K. Y. (1999). Examining the technology acceptance model using physician acceptance of telemedicine technology. *Journal of Management Information Systems*, *16*(2), 91–112.

Im, I., Kim, Y., & Han, H.-J. (2008). The effects of perceived risk and technology type on users' acceptance of technologies. *Information & Management*, *45*(1), 1–9.

Karahanna, E., Straub, D. W., & Chervany, N. L. (1999). Information technology adoption across time: A cross-sectional comparison of pre-adoption and post-adoption beliefs. *MIS Quarterly*, *23*(2).

Katz, M. L., & Shapiro, C. (1985). Network externalities, competition, and compatibility. *The American Economic Review*, 424–440.

Kelman, H. C. (1958). Compliance, identification, and internalization: Three processes of attitude change. *Journal of Conflict Resolution*, 51–60.

Kitchenham, B. (2004). Procedures for performing systematic reviews. *Keele, UK, Keele University*, *33*, 2004.

Kulviwat, S., Bruner II, G. C., Kumar, A., Nasco, S. A., & Clark, T. (2007). Toward a unified theory of consumer acceptance technology (pages 1059-1084). *Psychology & Marketing*, *24*(12).

Liébana-Cabanillas, F., Sánchez-Fernández, J., & Muñoz-Leiva, F. (2014). The moderating effect of experience in the adoption of mobile payment tools in Virtual Social Networks: The m-

Payment Acceptance Model in Virtual Social Networks (MPAM-VSN). *International Journal of Information Management*, *34*(2), 151–166.

Lin, C.-H., Shih, H.-Y., & Sher, P. J. (2007). Integrating technology readiness into technology acceptance: The TRAM model. *Psychology & Marketing*, *24*(7), 641–657.

Lin, C.-P., & Bhattacherjee, A. (2008). Elucidating individual intention to use interactive information technologies: The role of network externalities. *International Journal of Electronic Commerce*, *13*(1), 85–108.

March, J. G. (1991). Exploration and exploitation in organizational learning. *Organization Science*, *2*(1), 71–87.

Martins, C., Oliveira, T., & Popovič, A. (2014). Understanding the Internet banking adoption: A unified theory of acceptance and use of technology and perceived risk application. *International Journal of Information Management*, *34*(1), 1–13. doi:10.1016/j.ijinfomgt.2013.06.002

Mehrabian, A., & Russell, J. A. (1974). *An approach to environmental psychology.* the MIT Press.

Miyazaki, A. D., & Fernandez, A. (2001). Consumer perceptions of privacy and security risks for online shopping. *Journal of Consumer Affairs*, *35*(1), 27–44.

Moody, D., Iacob, M.-E., & Amrit, C. (2010). In Search of Paradigms: Identifying the Theoretical Foundations of the IS Field. In *Proceedings of the European Conference on Information Systems* (pp. 1–13). Pretoria, South Africa.

Moore, G. C., & Benbasat, I. (1991). Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information Systems Research*, *2*(3), 192–222.

Moore, G. C., & Benbasat, I. (1996). Integrating diffusion of innovations and theory of reasoned action models to predict utilization of information technology by end-users. In *Diffusion and adoption of information technology* (pp. 132–146). Springer.

Morris, M. G., & Venkatesh, V. (2000). Age differences in technology adoption decisions: Implications for a changing work force. *Personnel Psychology*, *53*(2), 375–403.

O'Reilly III, C. A., & Tushman, M. L. (2004). The ambidextrous organization. *Harvard Business Review*, *82*(4), 74–83.

Organisation for Economic Co-operation and Development. (2005). *Oslo manual: Guidelines for collecting and interpreting innovation data*. OECD publishing.

Parasuraman, A. (2000). Technology Readiness Index (TRI) a multiple-item scale to measure readiness to embrace new technologies. *Journal of Service Research*, *2*(4), 307–320.

Pavlou, P. A. (2003). Consumer acceptance of electronic commerce: integrating trust and risk with the technology acceptance model. *International Journal of Electronic Commerce*, *7*(3), 101–134.

Porter, M. E. (1990). The Competitive Advantage of Notions. *Harvard Business Review*.

Porter, M. E. (2008). *Competitive advantage: Creating and sustaining superior performance*. Simon and Schuster.

Rogers, E. M. (2003). *Diffusion of innovations*. Simon and Schuster.

Rogers, E. M., & Shoemaker, F. F. (1971). Communication of innovations: A cross-cultural approach.

Taylor, S., & Todd, P. A. (1995). Understanding information technology usage: A test of competing models. *Information Systems Research*, *6*(2), 144–176.

Thompson, R. L., Higgins, C. A., & Howell, J. M. (1991). Personal Computing: Toward a Conceptual Model of Utilization. *MIS Quarterly*, *15*(1).

Thompson, R. L., Higgins, C. A., & Howell, J. M. (1994). Influence of experience on personal computer utilization: testing a conceptual model. *Journal of Management Information Systems*, 167–187.

Thornhill, A., Saunders, M., & Lewis, P. (2008). *Research methods for business students*. Pearson Education Limited.

Tidd, J., & Bessant, J. (2011). *Managing innovation: integrating technological, market and organizational change*. John Wiley & Sons.

Tornatzky, L. G., & Klein, K. J. (1982). Innovation characteristics and innovation adoption-implementation: A meta-analysis of findings. *Engineering Management, IEEE Transactions on*, (1), 28–45.

Triandis, H. C. (1971). *Attitude and attitude change*. New York, NY: John Wiley & Sons.

Triandis, H. C. (1979). Values, attitudes, and interpersonal behavior. In *Nebraska symposium on motivation*. University of Nebraska Press.

Van der Heijden, H. (2004). User acceptance of hedonic information systems. *MIS Quarterly*, *28*(4), 695–704.

Venkatesh, V. (2000). Determinants of perceived ease of use: Integrating control, intrinsic motivation, and emotion into the technology acceptance model. *Information Systems Research*, *11*(4), 342–365.

Venkatesh, V., & Bala, H. (2008). Technology acceptance model 3 and a research agenda on interventions. *Decision Sciences*, *39*(2), 273–315.

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: four longitudinal field studies. *Management Science*, *46*(2), 186–204.

Venkatesh, V., & Morris, M. G. (2000). Why don't men ever stop to ask for directions? Gender, social influence, and their role in technology acceptance and usage behavior. *MIS Quarterly*, 115–139.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, *27*(3).

Venkatesh, V., Thong, J., & Xu, X. (2012). Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology. *MIS Quarterly*, *36*(1), 157–178.

Vogelsang, K., Steinhüser, M., & Hoppe, U. (2013). A qualitative approach to examine technology acceptance. In *International Conference on Information Systems (ICIS 2013): Reshaping Society Through Information Systems Design* (Vol. 1, pp. 234–245).

Wang, C.-C., Lo, S.-K., & Fang, W. (2008). Extending the technology acceptance model to mobile telecommunication innovation: The existence of network externalities. *Journal of Consumer Behaviour*, *7*(2), 101–110.

Warshaw, P. R. (1980). A New Model for Predicting Behavioral Intentions: An Alternative to Fishbein. *Journal of Marketing Research (JMR)*, *17*(2).

Webster, J., & Martocchio, J. J. (1992). Microcomputer playfulness: development of a measure with workplace implications. *MIS Quarterly*, 201–226.

Webster, J., & Watson, R. T. (2002). Analyzing the Past to Prepare for the Future: Writing a Literature Review. *Management Information Systems Quarterly*, *26*(2), 3.

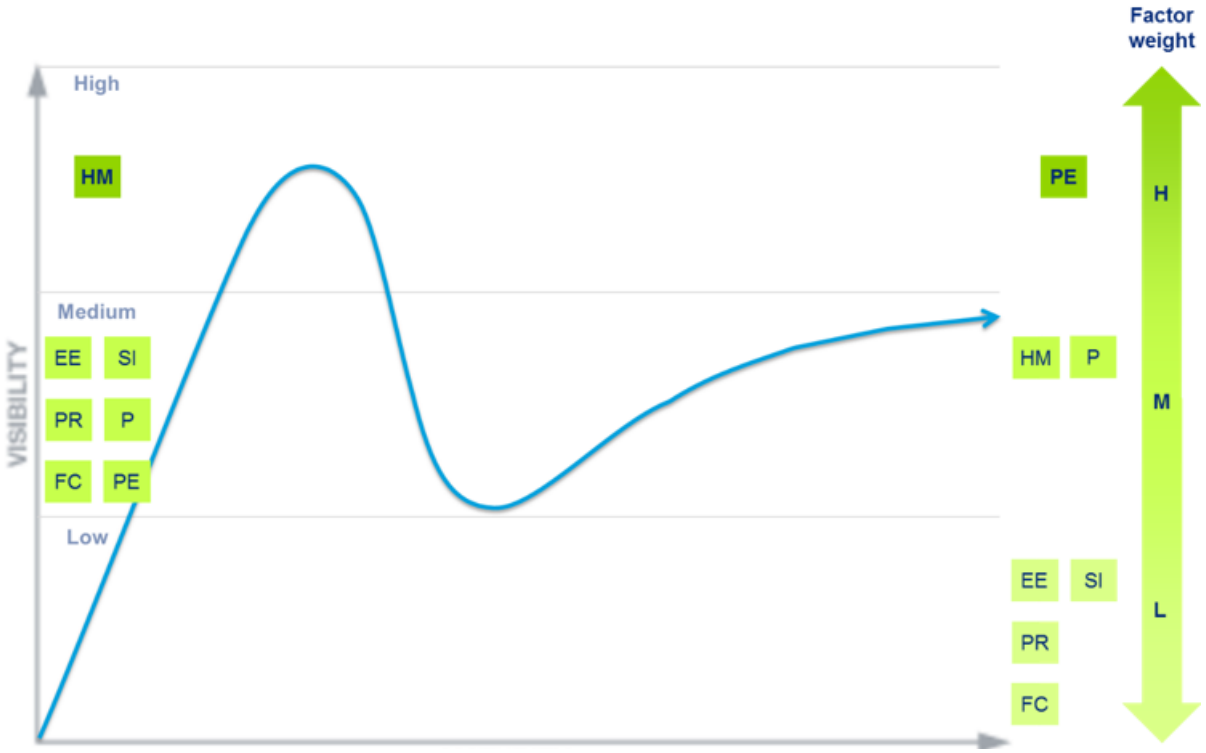
Yin, R. K. (2014). *Case study research: Design and methods*. Sage publications.

# APPENDICES

## Appendix A. Prepared questions for interviews

1. Welke factoren zijn volgens u belangrijk geweest voor de consument om [de innovatie] te adopteren?
2. Wat is volgens u de belangrijkste reden dat de [innovatie] een succes is geworden?
3. Wat vindt u het belangrijkst aan [de innovatie]?
4. Wanneer is volgens u [de innovatie] succesvol geworden, waarom was dit op dat moment? Wat leidde hier toe? Had het ook kunnen mislukken?
5. Waar let u op als u de geschiktheid van innovaties voor een consument beoordeelt? Waar lette u specifiek op bij [de innovatie]?
6. Hoe belangrijk was volgens u de verwachte performance (scheelt tijd of geld, helpt met een bepaalde taak, etc.) van [de innovatie] voor consumenten? Hebt u hier op gelet?
7. Hoe belangrijk was volgens u het verwachte gebruikersgemak van [de innovatie] voor consumenten? Hebt u hier op gelet?
8. Hoe belangrijk waren volgens u sociale invloeden van anderen op consumenten bij het besluit tot adoptie van [de innovatie]? Hebt u hier op gelet?
9. Hoe belangrijk was volgens u het verwachte plezier en genoegen (zoals bijvoorbeeld bij een spelletje) dat het gebruik van [de innovatie] verschaft voor een consument? Hebt u hier op gelet?
10. Hoe belangrijk was volgens u de extra waarde van het netwerk van andere gebruikers van [de innovatie]? (zoals bijvoorbeeld bij whatsapp) Hebt u hier op gelet?
11. Hoe belangrijk was volgens u het verwachte risico van het gebruik van [de innovatie] voor een consument? Hebt u hier op gelet?
12. Hoe belangrijk waren volgens u de faciliterende omstandigheden voor een consument om van plan te zijn [de innovatie] te adopteren? Denk hierbij aan: gelooft hij dat hij zelf instaat is de innovatie tot zijn voordeel te gebruiken? Is de benodigde technologie aanwezig? Slechtzienden hebben minder behoefte aan een app, iemand zonder smartphone heeft geen behoefte aan een app. Let u hier op?
13. Hoe belangrijk waren volgens u de faciliterende omstandigheden om te zorgen dat een consument ook daadwerkelijk tot adoptie van [de innovatie] overgaat? Een consument die van plan is om te adopteren kan dit toch alsnog niet doen, als bijvoorbeeld blijkt dat hij toch geen geld heeft voor de aanschaf, of blijkt dat het niet compatible is met technologieën die hij of zij gebruikt. Let u hier op?
14. Is [de innovatie] mogelijk gemaakt / gerealiseerd door gebruik van [de technologie]? Zo nee, tot welke technologie behoort het dan wel volgens u?
15. Verwacht u dat de factoren verschillen voor andere technologieën? Kunt u een voorbeeld aangeven van welke verschillen u verwacht?
16. Vindt u dat de waarde van bepaalde factoren bepaald wordt door de gebruikte technologie?

# Appendix B. Graphical representation of results




| | |
|---|---|
| — | Gartner Emerging Technology Maturity line |
| HM | Hedonic Motivation: Expected hedonic motivation for customer base |
| EE | Effort Expectancy: Expected effort for customer base |
| SI | Social Influence: Social influence on customer base |
| PR | Perceived Risk: Perceived risk for customer base |
| FC | Facilitating Conditions: Facilitating conditions for customer base |
| PE | Performance Expectancy: Expected performance for customer base |
| E | Exposure: Degree of exposure to customer base |

This image shows the importance of factors influencing innovation adoption in the financial services industry. The factors are mapped on the Gartner Hype Cycle, with immature technologies on the left and mature technologies on the right. For both maturity stages, the factors are represented based on importance, with the most important factor on top and the least important factor(s) at the bottom.

This image can be used to rate and compare technologies and innovations, by determining their maturity and rating them for each of the factors. It can also be used for single technologies or innovations, by determining the most important factor as well as identifying factors with a non-satisfactory score. Questionnaires that can be used to score the factors can be found in Appendix C.

# Appendix C. Factor Survey Items

The survey items use a 7-point Likert scale and all are adopted from Venkatesh et al. (2012), with the exception of perceived risk which is adopted from Im et al. (2008).

**Performance Expectancy**
PE1. I find the technology useful in my daily life.
PE3. Using the technology helps me accomplish things more quickly.
PE4. Using the technology increases my productivity.

**Effort Expectancy**
EE1. Learning how to use the technology is easy for me.
EE2. My interaction with the technology is clear and understandable.
EE3. I find the technology easy to use.
EE4. It is easy for me to become skilful at using the technology.

**Social Influence**
SI1. People who are important to me think that I should use the technology.
SI2. People who influence my behaviour think that I should use the technology.
SI3. People whose opinions that I value prefer that I use the technology.

**Facilitating Conditions**
FC1. I have the resources necessary to use the technology.
FC2. I have the knowledge necessary to use the technology.
FC3. The technology is compatible with other technologies I use.
FC4. I can get help from others when I have difficulties using the technology.

**Hedonic Motivation**
HM1. Using the technology is fun.
HM2. Using the technology is enjoyable.
HM3. Using the technology is very entertaining.

**Perceived Risk**
PR1. It is probable that the technology would not be worth its cost.
PR2. It is probable that the technology would frustrate me because of its poor performance.
PR3. Comparing with other technologies, using the technology has more uncertainties.
PR4. It is uncertain whether the technology would be as effective as I think.