How to compete effectively with self-service technologies

The impact of technology readiness and the technology acceptance model on self-scanning

Master's Thesis 30 credits
Department of Business Studies
Uppsala University
Spring Semester of 2017

Date of Submission: 2017-05-30

Emil Lundberg

Supervisor: Anna Bengtson

”History tells us that all truly great innovations will be met with fear and suspicion as threatening the laws of nature. This happened with railway trains as well as with electricity, and had it not been met with similar reactions, the self-service format of grocery retailing would not have qualified to be regarded in the same category” (Nyberg, 1998, p. 125).

Abstract

Problem Due to the promises of retailer benefits, self-service technologies (SSTs) are becoming a common sight in the Swedish grocery retail setting. The mere installation of SSTs is yet not enough to make the consumer adopt them.

Purpose By asking, "*how is the consumer's attitude towards technology affecting his/her acceptance of the grocery retail self-scanning system",* the purpose of this thesis is to explore the effect of the technology readiness theory on the technology acceptance model. Thus, practically investigate how and why some consumers accept, whereas other consumers reject SSTs.

Theory The direct mediating effect of four consumer-specific technology adoption predictors: optimism, innovativeness, insecurity and discomfort, are investigated in relation to two system-specific technology adoption predictors: perceived usefulness and perceived ease of use. Throughout the theoretical framework, and in combination with SST literature, eight hypotheses are constructed.

Method A positivist research approach with a deductive reasoning is adopted. To answer the hypotheses, a quantitative method implemented through a survey strategy is chosen. Statistical testing of the 192 collected answers follows the quantitative data gathering.

Conclusion The results show that multiple consumer-specific characteristics have a direct mediating effect on perceived usefulness and perceived ease of use. Thus, the consumer's attitude towards technology plays a significant role in the consumer's propensity to accept SSTs, such as the grocery retail self-scanning system. This implies that retailers aiming at developing efficient and competitive self-service strategies should pro-actively consider the "techno-ready" consumer attributes. In particular: optimism and discomfort.

Keywords Retail, self-service technology, self-scanning, technology acceptance model, technology readiness, perceived usefulness, perceived ease of use.

Word count 16.613 words

The author wants to express his appreciation to:

Anna Bengtson

James Sallis

Nikko Harrisson

Daniel Lötmo

Henrik Wahlsten

Mona Ahlenius

Laurent Simula

Noel Dew

and

all the survey respondents

Table of contents

1. Introduction 1
1.1 Practical research problem 1
1.2 Theoretical research problem 3
1.3 Research contribution 3
1.4 Research purpose 4

2. Contextual background 5
2.1 Self-service in grocery retail 5
2.2 Self-service technologies 5
2.2.1 Self-scanning 6

3. Theory 7
3.1 The technology acceptance model 7
3.1.1 Criticism 8
3.2 Technology readiness 9
3.2.1 Criticism 10
3.3 The technology readiness and acceptance model 10
3.3.1 The agglomerated technology readiness index as a direct mediator 11
3.3.2 The technology readiness variables as direct mediators 12
3.4 Where to go from here? 13

4. Conceptual framework 14
4.1 The effect of optimism 14
4.2 The effect of innovativeness 14
4.3 The effect of discomfort 16
4.4 The effect of insecurity 16
4.5 Conceptual model 17

5. Method 18
5.1 Methodology 18
5.2 Research design 18
5.3 Pre-study 19
5.4 Quantitative method 20
5.4.1 Survey 20
5.4.2 Pilot survey 20
5.4.3 Data collection 21
5.4.4 Sampling frame 21
5.4.5 Ethical considerations 22
5.4.6 Operationalization 23
5.4.7 Statistical analysis 24
5.5 Reliability 24
5.6 Validity 25
5.6.1 Internal validity 25
5.6.2 External validity 25
5.7 Limitations 26

6. Result 28
6.1 Preliminary analysis 28
6.1.1 Data screening 28
6.1.2 Normality 29
6.1.3 Linearity 30
6.1.4 Homoscedasticity 30
6.2 Sample characteristics 30

6.3 Mann-Whitney U test 31
6.4 Factor analyses 31
6.4.1 Factor analysis on technology readiness *32*
6.4.2 Factor analysis on the technology acceptance model *35*
6.5 Construction of variables 36
6.5.1 Description of the variables *37*
6.6 Spearman's rank-order correlation 37
6.7 Multiple regressions 38
6.7.1 Testing the assumptions *38*
6.7.2 Proposed equations *39*
6.7.3 Regression one *39*
6.7.4 Regression two *40*
6.7.5 Modified equations *41*
6.8 Hypotheses testing 41
6.9 Summary of the results 43

7. Analysis 44
7.1 The effect of technology readiness on the technology acceptance model 44
7.1.1 The effect of optimism *44*
7.1.2 The effect of innovativeness *44*
7.1.3 The effect of discomfort *46*
7.1.4 The effect of insecurity *47*
7.1.5 Summary *47*
7.2 The importance of technology readiness 48

8. Conclusion 49
8.1 Theoretical contribution 49
8.2 Managerial implications 50
8.3 Future research 52

References 54
Interviews 60

Annexes

Annex 1 – Interview guide 61
Annex 2 – The technology readiness index 62
Annex 3 – Perceived usefulness 65
Annex 4 – Perceived ease of use 66
Annex 5 – Normality assessment 67
Annex 6 – Factor analysis on the technology acceptance model 68
Annex 7 – List of abbreviations 70

1. Introduction

The following section introduces the reader to the topics addressed in this thesis. A practical and theoretical research problem is described, a research purpose is stated, and a precise research question is formulated.

1.1 Practical research problem

High fixed costs, intense working capital, low barriers of entry, shrinking margins, fickle customers and ever-changing consumption trends are a few out of many negative externalities haunting the contemporary Swedish retail sector (Rämne, Gustafsson, Vestin, Lindblom & Kilander, 2010). It is therefore not surprising that market observers tend to stress traditional retail as the worst possible business (Udland, 2015) and emphasize a brick-and-mortar death spiral (Reeves, 2015). Traditional retail, as we know it, is indeed under a great threat. However, it is far from dead (Rämne *et al*., 2010). Retail is, and has always been prosperous for those willing to embrace the retail evolution (Nyberg, 1998; Ingene, 2014).

In order to stay competitive in today's retail industry, physical retailers, in particular grocery retailers (Oehlsen, 2005; Avery, 2008; Bickers, 2009; Rämne *et al*., 2010), turn to self-service technologies (SSTs): "technological interfaces that enable customers to produce a service independent of direct service employee involvement" (Meuter, Ostrom, Roundtree & Bitner, 2000, p. 50). These technologies are introduced for many reasons. To name a few: SSTs allow retailers to streamline transactions processes (Avery, 2008; Bickers, 2009), enhance productivity (Legris, Ingham & Collerette, 2003), counteract the negative effect related to queuing (Avery, 2008; Bickers, 2009; Riel, Semeijn, Ribbink & Bomert-Peters, 2012), and not to forget, drastically cut costs by decreasing the need of human labour (Andrews, 2009; Rämne *et al*, 2010; Kotler & Armstrong, 2012; Ahlenius, 2017[1]). Moreover, consumer benefits are also to be derived. For instance, self-scanning systems reduce the perception of time needed for the grocery shopping activity (Dabholkar, Bobbit & Lee, 2003; Avery 2008; Bickers, 2009) and provide the consumer with a greater degree of freedom and control (Dabholkar, 1996; Nyberg, 1998; Liljander, Gillberg, Gummerus & van Riel, 2006). Because of these potential benefits, SSTs such as self-service kiosks (Liljander *et al*., 2006), self-service information systems (Kallweit, Spreer, & Toporowski, 2014), self-service checkouts (Avery, 2008; Bickers, 2009) and self-scanning systems (Dabholkar *et al.*, 2003) have

[1] In-person interview. 2017-02-10.

become a common sight in the Swedish grocery retail industry (Rämne *et al*, 2010). Here, the self-scanning system is one of the most common SSTs (Rämne *et al*, 2010; Wahlsten, 2017[2]).

Even though retailers see benefits in self-scanning systems, the implementation of these SSTs are related to high costs (Lee & Yang, 2012; Ahlenius, 2017; Harrisson, 2017[3]; Wahlsten, 2017), unsure returns on investment (Nyberg, 1998) and not to forget a relatively low success rate (Legris *et al.,* 2003; Kimes & Collier, 2015). SST benefits ought therefore not to be taken for granted, especially as a critical amount of technology users is required before any benefits can be derived (Parasuraman & Colby, 2001; Kotler & Armstrong, 2012). Here a scholarly pessimism exists. Despite the mentioned drawbacks, retailers seem to primarily focus on the potential benefits. Indeed, retailers are installing SSTs and other retail technologies at an increasing rate (Oehlsen, 2005; Rämne *et al*., 2010). In addition, it seems that practitioners expect that the consumer will automatically adopt the new technology (Liljander *et al*., 2006; Gelderman, Ghijsen & van Diemen; 2011). This however is not necessarily the case. The introduction of technology does not *per se* lead to its usage (Walker, Craig-Lees, Hecker & Francis, 2002; Gelderman *et al*., 2011; Kallweit *et al.,* 2014). On the contrary, new technology challenges the established *status quo* and is often met with resistance, insecurity and even fear from the consumer (Cambre & Cook, 1985; Parasuraman & Colby, 2001; Meuter, Ostrom, Bitner & Roundtree, 2003). In response to this concern, scholars have emphasized that enhancing the understanding of the consumer's attitudes towards the use of technology is of "paramount importance to companies providing technology-based products and services" (Tsikriktsis, 2004, p. 42).

In addition, there has been claimed that a great deal of today's technology is underutilized (Venkatesh, 2000; Venkatesh & Davis, 2000). Yet today, this is the case in grocery retail: more than a decade after the introduction of self-scanning, a discrepancy prevails. National market surveys show that six out of ten Swedish consumers: (i) have experience of, and (ii) tend to prefer and use the grocery retail SST of self-scanning (HUI, 2015; Visma Retail, 2017). Yet, 60 per cent of the Swedish consumers do not use the self-scanning systems on a regular basis (Ahlenius, 2017; Harrisson, 2017):

[2] E-mail interview. 2017-04-27.
[3] Telephone interview. 2017-02-17.

"Whereas one rather skilled store has a user ratio of 40 per cent, the average corporate share is far lower; somewhere between 25 and 35 per cent" (Harrisson, 2017).

1.2 Theoretical research problem

Over the last decades, countless attempts to develop theories addressing the question of user adoption of innovative technology have appeared: the innovation diffusion theory (Rogers, 1962), the theory of reasoned action (Fishbein & Ajzen, 1975), the theory of planned behaviour (Ajzen, 1985), the technology acceptance model (Davis, 1986; Davis, 1989; Davis, Bagozzi & Warshaw, 1989), technology readiness (Parasuraman, 2000; Parasuraman & Colby 2001; Parasuraman & Colby, 2015), to the most recent contribution: the technology readiness and acceptance model (Lin, Shih, Sher & Wang, 2005; Lin, Shih & Sher, 2007).

Among these theories, the technology acceptance model has received the largest attention (Chuttur, 2009; Yucel & Gulbahar, 2013). However, scholars have recently started to raise questions about its suitability (Lin *et al.*, 2007; Benbasat & Barki, 2007; Walczuch, Lemmink & Streukens, 2007; Godoe & Johansen, 2012). The question of technology adoption ought not to be approached solely through (i) the technology's degree of perceived usefulness and (ii) the technology's degree of perceived ease of use. The proposed theory lacks indeed one pivotal component: the very user of the technology (Lin *et al*., 2007; Walczuch *et al.*, 2007; Godoe & Johansen, 2012).

1.3 Research contribution

The topic of user acceptance of SST is not a new field of research. On the contrary, scholars have approached the topic by emphasizing:

- Consumer attitudes and consumer motivations to use SSTs (Dabholkar & Bagozzi, 2000; Dabholkar *et al.,* 2003, Liljander *et al*., 2006).
- Consumer evaluation of SSTs (Dabholkar, 1996; Kallweit *et al*., 2014).
- Consumer satisfaction with SSTs (Meuter *et al*., 2000; Orel & Kara, 2014).

Based on these lines of research, scholars have primarily studied what pros and cons can be derived for consumers and retailers when implementing SSTs. However, this approach

implies user acceptance and is thus rather prospective. Scholars have therefore stressed the need to approach SST from a retrospective consumer decision stage (Walker *et al*., 2002; Liljander *et al*., 2006; Gelderman *et al.*, 2011): the underlying factors to SST adoption.

This thesis places the emphasis on how the underlying characteristics of consumers affect their acceptance of new technologies. It thus approaches the topic of SST and technology acceptance retrospectively and therefore addresses the gap in the technology acceptance research described above. The contribution of this thesis is twofold. (i) It contributes to the academic discussion on technology acceptance and lays the ground for why it must be approached in a more holistic way, as called upon by scholars (Parasuraman & Colby, 2001; Walker *et al*., 2002; Liljander *et al*., 2006; Gelderman *et al.*, 2011). (ii) It contributes to a better understanding of SST acceptance by consumers, which can help practitioners such as grocery retailers to implement SSTs more successfully.

1.4 Research purpose

Technology readiness is a theoretical approach theorizing a number of consumer-specific attributes as predictors to technology adoption (Parasuraman, 2000; Parasuraman & Colby, 2001; Parasuraman & Colby, 2015). This thesis explores the effects of technology readiness on the *technology acceptance model* (Davis, 1986; Davis, 1989; Davis *et al*., 1989). Its ambition is to contribute to the technology acceptance literature and its practical implications with a view to help retailers manage SSTs optimally. In line with previous research (Lin *et al.*, 2007; Walczuch *et al.*, 2007; Godoe & Johansen, 2012), this thesis quantitatively investigates the direct impact of the consumer's attitudes towards technology on the consumer's perceived usefulness and ease of use of self-scanning technologies in the retail sector. This can be summarized through the following research question:

How is the consumer's attitude towards technology affecting his/her acceptance of the grocery retail self-scanning system?

2. Contextual background

The following section places the study in its current environment. The shift from full-service to self-service in the grocery retail market, and the concept of self-service technologies are in particular synthesised.

2.1 Self-service in grocery retail

Prior to self-service, "full-service" shops were the archetypes of grocery retail (Freeman, 1992; Nyberg, 1998; Kjellberg & Helgesson, 2007). This corresponds to a shop where the shop merchant fully waited on the shopper. By contrast, in the late 1910s, there was a revolutionary shift in the distribution channel (Freeman, 1992; Nyberg, 1998): a shop where the shopper was able to "produce a service independent of direct service employee involvement" (Meuter *et al*., 2000, p. 50) was introduced.

> "Inside the *Piggly Wiggly*, the visitors found a grocery store that did not look like a grocery store. There were no flour or cracker barrels, no display counters. There were no white-aproned clerks waiting to fetch groceries for them. Some employees were busy stocking the shelves, but they politely refused to select merchandise for visitors. Instead all the merchandise was placed on shelves within the shoppers' reach" (Freeman, 1992, p. 161).

Self-service reached Sweden after a large-scale transformation of the Swedish grocery retail value chain in the 1940s (Nyberg, 1998; Kjellberg & Helgesson, 2007). Today, 70 years later, self-service is the dominant mode in the Swedish grocery retail market (Rämne *et al*., 2010). Yet, much has changed since the time of *Piggly Wiggly*. About one decade ago, a digitalized shift in the concept of self-service occurred: the self-service technology of self-scanning was introduced in Sweden (Wahlsten, 2017).

2.2 Self-service technologies

A self-service technology (SST) is a "hard technology that directly or indirectly is operated by the customer in order to receive service" (Anselmsson, 2001, p. 11). SSTs are therefore defined as "technological interfaces that enable customers to produce a service independent of direct service employee involvement" (Meuter *et al*., 2000, p. 50).

There exists a multitude of SSTs (Meuter *et al*., 2000). Common SSTs in the retail setting include, but are not limited to: automated cashier systems (Avery, 2008; Bickers, 2009), self-ordering systems (Dabholkar, 1996), self-checkout systems (Anselmsson, 2001; Dabholker *et al*., 2003; Orel & Kara, 2014), self-service information systems (Kallweit *et al*., 2014) as well as self-scanning systems (Dabholkar *et al.,* 2003). This thesis approaches the latter.

2.2.1 Self-scanning

Illustrated by Avery (2008) and Bickers (2009) the self-scanning SST, commonly known as "self-scanning", is a partially customer operated alternative to the traditional cashier checkout system. Self-scanning consists of a portable hand carried device, which allows the grocery shopper to continuously scan and bag her groceries. Because the shopper can pre-register and bag each good, the self-scanning system allows the shopper to directly proceed to payment during the checkout procedure yet without taking away the final transactional control from the retailer because of randomized check-ups of the shopper's pre-scanned items. Self-scanning therefore allows the consumer to avoid checkout lines at the same time as it reduces the need for grocery retailers to staff each checkout.

3. Theory

The following section develops the theoretical framework of this thesis. Three approaches towards user acceptance of technology are emphasized: (i) the technology acceptance model, (ii) technology readiness, and (iii) the technology readiness and acceptance model.

3.1 The technology acceptance model

The technology acceptance model (TAM) (Davis, 1986; Davis, 1989; Davis *et al*., 1989) is based on the theory of reasoned action (Fishbein & Ajzen, 1975): a classical psychology approach, which explains how human behaviour is mediated through the individual's belief system (Chuttur, 2009; Yucel & Gulbahar, 2013). In comparison to the theory of reasoned action, which explains many divergent human tendencies, TAM focuses on a particular kind of behaviour: the rational acceptance of technology in the technology user (Davis, 1989). Evidence has shown that TAM is a strong and valid theory (King & He, 2006; Chuttur, 2009; Yucel & Gulbahar, 2013), and succeeds to consistently explain about 40 per cent of actual use (Legris *et al.*, 2003; Sauro, 2011a).

The purpose of TAM is twofold. (i) TAM predicts the user acceptance of computer-based information systems. (ii) TAM explains which modification ought to be brought to the particular computer-based information system so as to enhance its user acceptability (Davis, 1989; Chuttur, 2009; Yucel & Gulbahar, 2013).

TAM is constructed around two central concepts:

- *Perceived usefulness*, defined as: "the degree to which a person believes that using a particular system would enhance his or her job performance[4]" (Davis, 1989, p. 320).
- *Perceived ease of use*, defined as: "the degree to which a person believes that using a particular system would be free of effort" (Davis, 1989, p. 320).

[4] Because TAM was developed in real-life work practices the definition of perceived usefulness includes "job performance" (Davis, 1989). One must therefore realize that the theory as is, is not *per se* transferable to another setting. However, multiple replications throughout the years (King & He, 2006; Chuttur, 2009) have allowed TAM and its concepts to evolve significantly. TAM is therefore today a generic model applicable on most technologies and settings.

TAM theorizes that perceived usefulness and perceived ease of use are related to a positive use-performance relationship. That will say: if a system is perceived as more useful, on the one hand, and easier to use than another system, on the other hand, then the former system is more likely to be accepted by the user (Davis, 1989). TAM furthermore hypothesizes that perceived ease of use affects perceived usefulness positively: the easier the use of a system is being perceived, the more useful it is likely to be, *ceteris paribus* (Davis, 1989; Venkatesh, 2000; Venkatesh & Davis, 2000). In addition, TAM theorizes that the model does not exist in a theoretical vacuum. Divergent external factors are theorized to affect perceived usefulness and perceived ease of use. Depending on the effect of the external factor, the external factor will enhance or decrease the user's attitude towards using the system; which implies a possible decrease or increase of an actual system use, which follows by the theory of reasoned action (Fishbein & Ajzen, 1975; Davis, 1989; Venkathesh, 2000; Chuttur, 2009). *Figure 1* depicts TAM.[5]

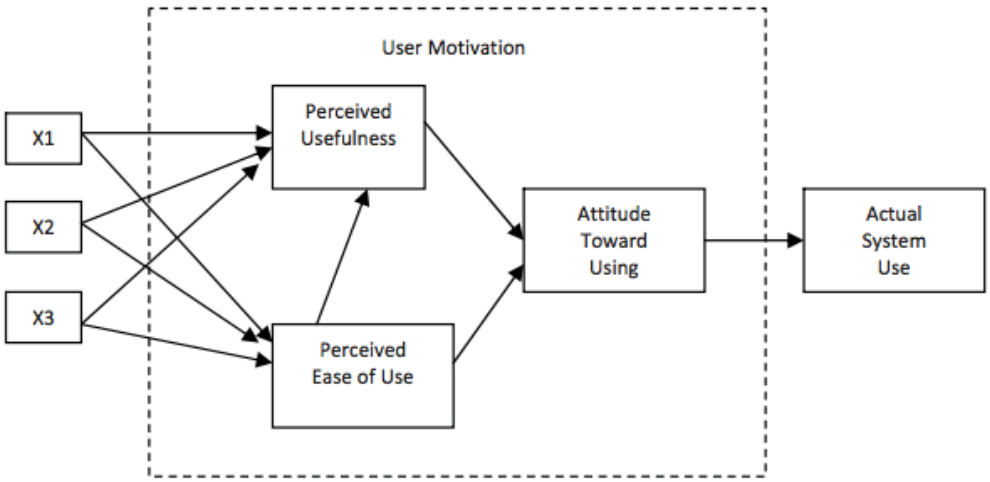

Figure 1. The Technology Acceptance Model (Davis, 1986, p. 24)

3.1.1 Criticism

Like all influential models, TAM has been widely criticised. It has been claimed that the external factor has "created an illusion of knowledge accumulation" (Benbasat & Barki, 2007, p. 213), "that there is no clear pattern with respect to the choice of the external variables considered" (Legris *et al*., 2003, p. 196) and that the external variable further generates "a state of theoretical chaos and confusion in which it is not clear which version of the many iterations of TAM is the commonly accepted one" (Benbasat & Barki, 2007, p. 211).

[5] The author is aware that Venkatesh and Davis (2000) have extended the original TAM to a more holistic TAM2. Because of TAM2's less comprehensive approach this thesis, such as many other contemporary scholars interested in technology acceptance, will be based on the original TAM.

TAM has also been criticized for its inadequacy. TAM is bound to a system-specific structure consisting of perceived usefulness and perceived ease of use. Yet, both the characteristics of the system and the characteristics of the user are interrelated (Lin *et al.*, 2005; Lin *et al*., 2007; Walczuch *et al*., 2007; Godoe & Johansen, 2012).

3.2 Technology readiness

Technology readiness (TR) (Parasuraman, 2000; Parasuraman & Colby, 2001; Parasuraman & Colby, 2015) is a relatively new contribution to the scholarly discussion on technology acceptance. TR is defined the consumer "propensity to embrace and use new technology for accomplishing goals in home life and at work" (Parauraman & Colby, 2001, p. 18). The theory is though often referred to a consumer "amalgam of feelings, hopes, fears and frustrations about technology" (Parasuraman & Colby, 2001, p. XIII); the combination of beliefs, which form the consumer's mental readiness and mental willingness to accept and interact with new technology-based products (Liljander *et al*., 2006).

TR has been used to predict the consumer's degree of technology acceptance (Liljander *et al*., 2006; Lin *et al*., 2007; Walczuch *et al*., 2007; Godoe & Johansen, 2012; Kotler & Armstrong, 2012; Koivisto, Makkonen, Frank & Riekkinen, 2016). However, the theory was not derived as a predicting theory. TR was an explanatory and descriptive contribution to marketing theory: how scholars and professionals ought to capture the critical elements of successful marketing of products and services that are technology-intensive (Parasurman & Colby, 2001; Tsikriktsis, 2004). The original authors (Parasuraman, 2000; Parasurman & Colby, 2001) have though proposed TR as a predictor of technology-related use intentions. A suggestion, which by others (*e.g.* Tsikriktsis, 2004; Koivisto *et al.*, 2016), been found valid. TR, is therefore today, strongly equated to technology adoption.

TR is conceptualized through the technology readiness index (Parasuraman, 2000; Tsikriktsis, 2004; Parasuraman & Colby, 2015). This taxonomy measures TR on four aspects: optimism, innovativeness, discomfort and insecurity.

- Optimism is defined the tendency to possess "a positive view of technology and a belief that it offers people increased control, flexibility and efficiency in their lives" (Parasuraman & Colby, 2015, p. 60).

- Innovativeness is defined the tendency "to be a technology pioneer and thought leader" (Parasuraman & Colby, 2015, p. 60).
- Discomfort is defined the tendency to possess "perceived lack of control over technology and a feeling of being overwhelmed by it" (Parasuraman & Colby, 2015, p. 60).
- Insecurity is defined the tendency to possess "distrust of technology, stemming from scepticism about its ability to work properly and concerns about its potential harmful consequences" (Parasuraman & Colby, 2015, p. 60).

Whereas optimism and innovativeness are theorized being contributors to technology acceptance, discomfort and insecurity are theorized being inhibitors to technology acceptance (Parasuraman & Colby, 2001). Optimism, innovativeness, discomfort and insecurity are further arranged in two polar sets: optimism versus discomfort and innovativeness versus insecurity (Parasuraman, 2000). By weighting the concepts against each other (i) a dominant side and (ii) a multifaceted consumer profile can be derived.

3.2.1 Criticism

Even though TR has been stressed as a highly potential theory (Tsikriktsis, 2004) a major criticism towards TR is its inconsistency. Whereas some scholars (Tsikriktsis, 2004; Walczuch *et al*., 2007; Godoe & Johansen, 2012; Parasuraman & Colby, 2015) have been able to find evidence that fully or partially support its different components, others (Walker *et al*., 2002; Liljander *et al*., 2006; Gelderman *et al*., 2011) have found a weak, or even non-significant support for the theory. It has therefore been stressed that scholars need to further investigate TR (Parasuraman & Colby, 2001). For example: if the TR-concepts ought to be combined with each other (Liljander *et al.*, 2006; Gelderman *et al*., 2011), if the TR-concepts ought to be combined with other technology acceptance theories (Lin *et al*., 2007; Walczuch *et al*., 2007; Godoe & Johansen, 2012) or if the TR-concepts ought to be separated from the overall TR-construct (Walker *et al*., 2002).

3.3 The technology readiness and acceptance model

One of the most recent contributions to the scholarly discussion on technology acceptance is the technology readiness and acceptance model (TRAM) (Lin *et al.*, 2005; Lin *et al.*, 2007), which attempts to integrate the consumer-specific TR with the system-specific TAM. Two

fairly well established approaches exist to TRAM. The first one emphasizes the direct mediating effect between the accumulated technology readiness index and TAM (Lin *et al.*, 2007). The second one places focus on the direct mediating effect between the optimism, innovativeness, discomfort and insecurity dimensions developed in TR, and the TAM dimensions of perceived usefulness and perceived ease of use (Walczuch *et al*., 2007).

3.3.1 The agglomerated technology readiness index as a direct mediator

Lin *et al.* (2005) were the first to suggest that the individual-specific dimensions of TR could be combined with the system-specific dimensions of TAM. This contribution paved the way to a more holistic theory, referred to TRAM. This new approach was primarily called upon because of the inadequacy of TAM and TR as individual explanatory theories. Indeed, whereas TAM is a system-specific theory (Davis, 1989), TR is a consumer-specific theory (Parasuraman, 2000; Parasuraman & Colby, 2001; Parasuraman & Colby, 2015). Yet, both the characteristics of a system and those of its user are interrelated when it comes to users' acceptance of technology (Lin *et al.*, 2005; Lin *et al.*, 2007). In their attempt to combine the two technology acceptance theories, Lin *et al.* (2007) theorized the aggregated (Koivisto *et al*., 2016) consumer personality bound TR "to be a casual antecedent of both perceived usefulness and perceived ease of use, which subsequently affect [the] consumers [use intention]" (Lin *et al.*, 2007, p. 651). In comparison to TR and TAM, TRAM was therefore theorized as a model able to explain and predict why and how different technology users accept or reject new technologies. *Figure 2* illustrates Lin *et al*.'s (2007) TRAM approach.

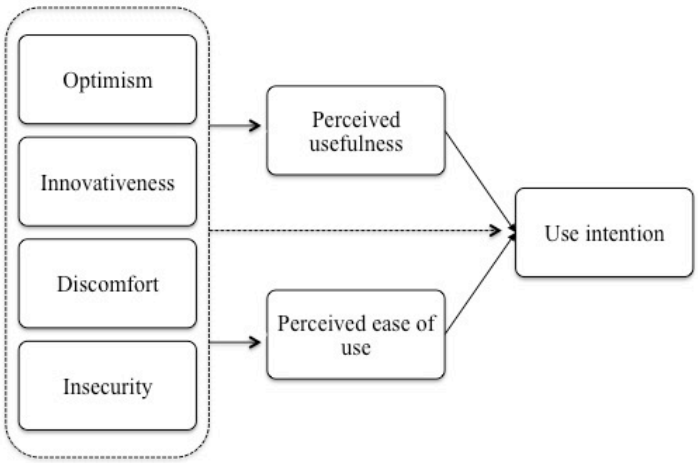

Figure 2. TRAM (The technology readiness index as direct mediator on TAM)

The hypothesized relationship between the technology readiness taxonomy and TAM was found to be valid. Indeed, as proposed, there was a mediating effect between the different

theoretical approaches and the consumer's technology adoption. It was therefore concluded that:

> "A fit appears to exist between consumer's technology readiness and their perceptions of system characteristics. For example, useful but complex (as opposed to less useful but easy-to-interact) e-services may be appreciated by high-TR consumers, rather than by low-TR ones, and vice versa" (Lin *et al*., 2007, p. 653).

3.3.2 The technology readiness variables as direct mediators

Walczuch *et al*. (2007) have approached the issue of merging TR and TAM differently, by directly linking the TR-constructs to the TAM-constructs. Thus, in line with TR, they hypothesize that optimism, innovativeness, discomfort and insecurity have a *direct* mediating effect on perceived usefulness and perceived ease of use, rather than an *indirect* effect through the aggregated technology readiness index (Lin *et al*., 2007; Koivisto *et al.,* 2016).

However, Walczuch *et al*.'s (2007) theoretical approach could only be partially supported. In this context, further research on the proposed approach and the underlying TR framework appeared as an acute necessity. As an attempt to strengthen the approach, Godoe and Johansen (2012) recently contributed to this research programme with their replication of Walczuch *et al*. (2007). Their "findings reveal that some, but not all, personality dimensions of [the technology readiness index] influence technology acceptance and usage" (Godoe & Johansen, 2012). *Figure 3* summarizes the approach of Walczuch *et al*. (2007) and Godoe and Johansen (2012).

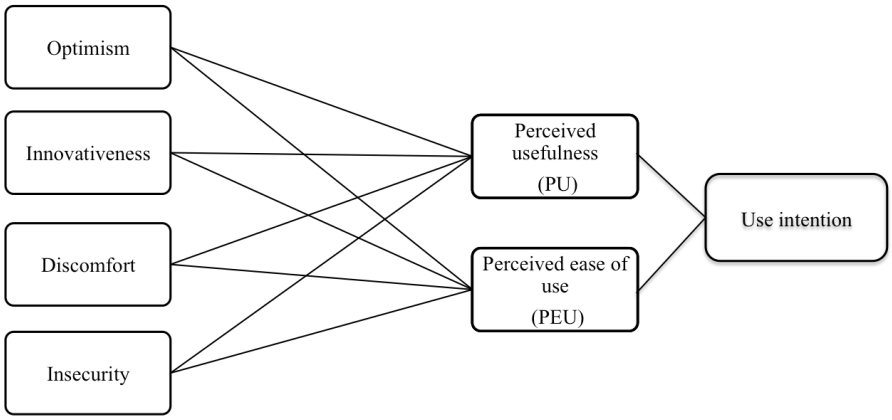

Figure 3. TRAM (The TR-constructs as direct mediators)

3.4 Where to go from here?

By approaching the theoretical idea of a direct mediating effect between the four TR-concepts and the two TAM-concepts, the present thesis adopts the approach of Walczuch *et al*. (2007). This is done by two reasons. (i) In spite of important contributions such as the questioning of the underlying TR theory and a finding of a non-significant relationship in the innovativeness measure Walczuch *et al*.'s (ibid.) approach is probably the TRAM theory, which has the least received attention by scholars. (ii) Walczuch *et al*.'s (ibid.) approach may also be better suited for the practical issue addressed in this study. Indeed, because the approach describes a direct explanatory effect, rather than an aggregation of multiple variables (Lin *et al.*, 2007) it has a lower degree of scholarly complexity, and ought therefore be an approach better suited for practitioners.

4. Conceptual framework

The following section develops the conceptual framework of this thesis. Based on SST literature, in combination with the theoretical framework, eight hypotheses are constructed. The section ends with a visualization of the conceptual model.

4.1 The effect of optimism

Optimism relates to the tendency to have "a positive view of technology and a belief that it offers people increased control, flexibility and efficiency in their lives" (Parasuraman & Colby, 2015, p. 60). Optimists are suggested to embrace technology, and in comparison to other consumers, would be less likely to focus on the negative aspects of eventual hardships and failures in new technologies, would they occur (Walczuch *et al*., 2007; Kotler & Armstrong, 20). Because optimists tend to see technology through a lens of possibilities, it can be assumed that optimistic consumers perceive self-scanners as both more useful and easier to use than non-optimistic consumers (Walczuch *et al*., 2007; Godoe & Johansen, 2012).

There are many SST studies, which have shown evidence of a positive relationship between optimism and SST adoption. In one of the first studies on SSTs, Dabholkar (1996) found that touch-screen ordering in the fast-food industry allowed the consumer a higher degree of control. The consumer's perception of control has further been found to be positively related to the consumer's acceptance of self-ordering kiosks found in restaurants (ibid.), and self-check in kiosks found at airports (Liljander *et al*., 2006). These findings are further supported by Dabholkar *et al*. (2003) who in their study of self-scanning SSTs found that control and efficiency[6], are key determinants to consumer acceptance of SSTs. Thus, it is suggested that:

$H1_a$: Optimism (OPT) has a positive effect on perceived usefulness (PU)
$H1_b$: Optimism (OPT) has a positive effect on perceived ease of use (PEU)

4.2 The effect of innovativeness

Innovativeness relates to the tendency "to be a technology pioneer and thought leader" (Parasuraman & Colby, 2015, p. 60), where the innovative consumer is theorized to be venturesome in the consumption of technology (Tsikriktsis, 2004; Kotler & Armstrong,

[6] In their study represented by 'personal freedom' and 'speed of delivery'.

2012). Innovative consumers are furthermore theorized to perceive technology as easy, as they possess a high level of technological knowledge, and a genuine interest in learning about new technology (Parasuraman & Colby, 2001). Because innovative consumers tend to see technology as intriguing (Kotler & Armstrong, 2012) it can be assumed that innovative consumers perceive self-scanners as more useful and easier to use than others (Walczuch *et al*., 2007; Godoe & Johansen, 2012).

In comparison to the other TR-concepts, it seems that innovativeness has been left rather unexplored by contemporary SST scholars (Liljander *et al*., 2006). In addition, for the few studies conducted, (i) the positive effect, and (ii) the reliability of the measure proposed by the TR-literature has been questioned (Roehrich, 2004; Walczuch *et al*., 2007; Gelderman *et al*., 2011, Godoe & Johansen, 2012). Indeed, empirical evidence indicates that there seems to be a lack of effectiveness in the innovativeness measure (Liljander *et al.,* 2006), mainly since the measure does not take into account the difference between domain-specific and general innovativeness (Liljander *et al.,* 2006; Gelderman *et al*., 2011). Indeed, whereas general innovativeness has been proposed as a weak predictor to technology acceptance, its counterpart, the domain-specific innovativeness have been proposed as strongly related to technology adoption (Goldsmith, Hauteville & Flynn, 1998; Liljander *et al*, 2006). Even though Liljander *et al.* (ibid.) in their study could support the innovativeness measure as a positive measure despite its general approach the measure only contributed marginally to the total explanatory degree.

However, stronger is the criticism towards the innovativeness measzsure. Here, Roehrich (2004) in particular, has directed sharp criticism, and stressed it a non-valid predictor to technology acceptance. In response to this scholarly concern, Parasuraman and Colby (2015) recently streamlined the technology readiness index and re-assessed the measure. After the re-assessment strong support for the measures reliability and validity was found. Thus, it is suggested that:

$H2_a$: Innovativeness (INN) has a positive effect on perceived usefulness (PU)
$H2_b$: Innovativeness (INN) has a positive effect on perceived ease of use (PEU)

4.3 The effect of discomfort

Discomfort relates to the tendency to possess a "perceived lack of control over technology and a feeling of being overwhelmed by it" (Parasuraman & Colby, 2015, p. 60). Consumers with a technological discomfort are theorized to possess general paranoia towards changes and innovation (Kotler & Armstrong, 2012), technophobia (Parasuraman, 2000; Parasuraman & Colby, 2001), technological anxiety (Meuter *et al*., 2003), and an overall negative state of mind occurring when interacting with new or alien technology (Cambre & Cook, 1985).

The SST literature (*e.g.* Dabholkar, 1996; Dabholkar & Bagozzi, 2002; Kallweit *et al*., 2014) have equalled discomfort with the lack of perceived usefulness and perceived ease of use in a particular technology. Here, Kallweit *et al*. (2014) show in their study of self-service information technologies that a decrease in perceived ease of use has a significant negative impact on the user acceptability; thus, that a negative relationship seems to exist between discomfort and consumer acceptance of SSTs. This conclusion is not dubious. Meuter *et al*. (2003), strongly emphasize that discomfort, such as technology anxiety, is a possible reason to why consumers avoid technology. Thus, in other words impose a negative relation between discomfort and the use of technology. It is therefore suggested that:

$H3_a$: Discomfort (DIS) has a negative effect on perceived usefulness (PU)
$H3_b$: Discomfort (DIS) has a negative effect on perceived ease of use (PEU)

4.4 The effect of insecurity

Insecurity relates to the tendency to possess "distrust of technology and scepticism about its ability to work properly" (Parasuraman & Colby, 2015, p. 60). Consumers that possess insecurity are rarely willing to rely on the technology (Kotler & Armstrong, 2012) and they are convinced that the technology will fail them at the most critical moment (Parasuraman & Colby, 2001). Consumers possessing insecurity has therefore been associated to both ambiguity (Godoe & Johansen, 2012) and an overall low usage of technology (Tsikriktsis, 2004). Indeed, as emphasized by both Parasuraman and Colby (2001), and Kotler and Armstrong (2012) consumers possessing insecurity are rarely a consumer who willingly adopts technology but do it, when there is no longer a choice. Because of this, it can be assumed that insecure consumers perceive self-scanners as both less useful and harder to use than other consumers (Walczuch *et al*., 2007; Godoe & Johansen, 2012).

Such as in the case of the innovativeness measure, scholars have found divergent effects what concerns insecurity. Walczuch *et al*. (2007) and Godoe and Johansen (2012) have for example, found evidence that insecurity is not *per se* related to a negative evaluation of perceived usefulness. On the contrary, "one would expect people to see the main value of a system regardless of how they handle it" (Godoe and Johansen, 2012, p. 41). Gelderman *et al*. (2011) have in line with this reasoning argued that the effect of insecurity is low, but primarily stressed the measure as weak and unreliable. Yet, instead of emphasizing its non-significance they mean that insecurity is a negative concept, but due to its weakness ought to be combined with the stronger measure of discomfort.

However, in the recent TR re-evaluation, Parasurman and Colby (2015) found that insecurity is indeed strongly related to lack of trust in technology, on the one hand, and a lower propensity to use technology, on the other hand; thus imposing a negative relation between insecurity and the overall acceptance of technologies. It is therefore suggested that:

$H4_a$: Insecurity (INS) has a negative effect on perceived usefulness (PU)
$H4_b$: Insecurity (INS) has a negative effect on perceived ease of use (PEU)

4.5 Conceptual model

Figure 4 illustrates the conceptual model of this thesis. The theoretical idea of a direct mediating effect between optimism, innovativeness, discomfort and insecurity, on the one hand, and perceived usefulness and perceived ease of use, on the other hand is adopted. Hypothesis $H1_a$ to $H4_b$ is depicted next to the proposed relation it wants to test. The proposed positive or negative effect is illustrated with a "(+)" for a positive effect and a "(-)" for a negative effect.

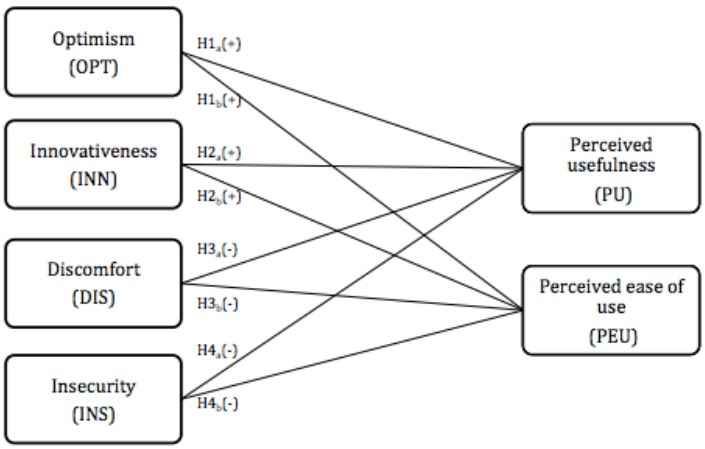

Figure 4. Conceptual model

5. Method

The following section explains the design of this study: which research approach is adopted, how the study was conducted, which considerations were made during the process and how the different choices have affected the data collection. The limitations of the present study end the section.

5.1 Methodology

This thesis adopted a positivist research approach. That will say: the idea of an observable and measurable social reality, which ought to be captured by value-free research, bound to an adequate scholarly method (Bryman & Bell, 2011; Saunders *et al*., 2012).

5.2 Research design

In order to enhance the authors pre-understanding of the studied phenomenon, a qualitative pre-study was conducted. Qualitative studies are in general not associated to the positivist research approach as they imply hermeneutics: subjective interpretations of the reality (Tashakkori & Teddlie, 2003; Bryman & Bell, 2011). However, qualitative pre-studies are not an un-common element in quantitative studies. On the contrary, qualitative pre-studies are frequently applied, and advocated, in social science (Saunders *et al.*, 2012); especially when entering a new research area. This, because it allows the researcher to obtain an understanding of the studied phenomenon before the quantitative data gathering procedure. This thesis therefore adopted, in partial and exclusively limited to the pre-study (Tashakkori & Teddlie, 2003), a qualitative research approach.

What concerns the main study; because this thesis wants to answer the research question: *how is the consumer's attitude towards technology affecting his/her acceptance of the grocery retail self-scanning system*, an explanatory research design was adopted. This ought to be a good choice because the present thesis wants to establish relationships between variables. In addition, following the positivist research approach, this thesis adopted a deductive reasoning where the author grounded hypotheses in established theory. Eight hypotheses were therefore derived and constructed in the way that they could be statistically tested for the underlying theoretical reasoning (Saunders *et al*., 2012). This approach is most likely the most suitable one, given that explanatory research designs are associated with quantitative and theory testing studies (Bryman & Bell, 2011; Saunders *et al.*, 2012).

Based on the theoretical background, and the findings of the pre-study, a survey consisting of self-administered questionnaires was created (Tashakkori & Teddlie, 2003; Saunders *et al.*, 2012). The choice to adopt a survey strategy was made for several reasons. First, Bryman and Bell (2011), and Saunders *et al.* (2012) stress a quantitative survey strategy as a suitable choice for explanatory studies. Second, unlike other data gathering techniques such as quantitative interviews or quantitative observations, a survey strategy is more effective in achieving scale (Saunders *et al*., 2012), which is needed to perform the statistical analyses (Pallant, 2013). Thus survey strategies are more feasible when the researcher wants to draw reasonable conclusions, and better suited the adopted positivist research approach. Third, prior studies on technology acceptance have primarily used quantitative data collection methods, which indicate that the adopted survey strategy ought to be a suitable approach.

5.3 Pre-study

To obtain insights of the self-scanning setting, three semi-structured interviews with one of the major Swedish grocery retailers were conducted. The different respondents were two corporate concept managers and one front-desk department managers, all of them informed on SSTs. The author sought, to as great extent as possible, conduct the interviews in person as interpersonal interviews offers the opportunity to obtain a more holistic idea of the nature of the answer (Bryman & Bell, 2011). Not to forget the possibility to clarify, repeat or rephrase the questions would it be necessary (Saunders *et al*., 2012). However, given the wish to answer by telephone and e-mail, one of the three interviews was conducted in person.

Due to the drawbacks of telephone as medium, the topics the author wanted to address were sent to the respondent on beforehand. The benefit of such an approach, even though a potential drawback is less spontaneous answers, is that the interviewees were given the possibility to prepare themselves for what kind of questions would be asked by the author during the interview (Saunders *et al*., 2012). More precise and thoughtful answers could therefore be collected. Not to mention that the pre-study could be more effective, allowing more time to be consecrated to the actual study. Yet, a shortcoming is the risk of skewed, pre-constructed answers (ibid.). Because of the potential drawbacks the respondents were asked if a confirmatory and complementing interview could be arranged in a later stage. *Table 1* illustrates a scheme of the conducted pre-study interviews. The semi-structured questions asked are to be found in *Annex 1*.

Table 1. Pre-study

Respondent	Corporate role	Date	Medium	Time
Nikko Harisson	Corporate manager	2017-02-17	Telephone	30 min
Henrik Wahlsten	Corporate manager	2017-02-27	E-mail	-
Mona Ahlenius	Department manager	2017-02-10	In-person	45 min

5.4 Quantitative method

5.4.1 Survey

This thesis adopted a survey strategy consisting of structured self-administered web-based questionnaires. This was done since self-administered questionnaires are one of the most efficient ways to collect quantitative data (Saunders *et al*., 2012). A possible drawback of this method is that the respondents need to answer the questionnaires without any researcher involvement and if inserting faulty data, it is rarely possible to recollect the data (Bryman & Bell, 2001). Because the understanding and interpretation of the respondents would be a product of the questionnaire the questionnaire was carefully planned and executed (Saunders *et al.*, 2012). Even though the questions are fully understood, another drawback is that there is a limited way of telling how much effort the respondents have put in answering the questions; not to mention to which extent they have been sincere with their answers. There is therefore an overall risk of loss in reliability. Taking these drawbacks into account, a self-administered questionnaire was still considered a suitable choice.

First, the application *Google Forms*[7] used as intermediate, offers a function which prevents the respondents of adding missing values; which otherwise is a common drawback of self-administered questionnaire (Saunders *et al.*, 2012). Second, because the questionnaire is self-administered, on the one hand, and digital, on the other hand, it was also easier to spread it and achieve scale, which was of great importance for the chosen research design.

5.4.2 Pilot survey

A pilot survey was conducted to refine the questionnaire (Bryman & Bell, 2011; Saunders *et al*., 2012). Two university professors were provided with the questionnaire and further asked to comment on the suitability of the chosen questions as measures. Five test respondents were

[7] https://www.google.com/intl/sv/forms/about/

provided with the questionnaire, and supplementary instructions concerning how to fill the questionnaire in. In line with Saunders *et al.*'s (2012) recommendation the test respondents were asked to answer the following questions:

- How long time did the questionnaire take for you to complete?
- How clear were the instructions to you?
- Which questions, if any, were unclear?
- Which questions, if any, were hard to answer?
- Was the layout appealing to you?
- Do you have any other comments?

Given the feedback from the professors and the test respondents, the survey was revised and the number of questions reduced. This approach is in line with deVaus's (in Saunders *et al*., 2012) recommendation: questionnaires ought not to be longer than necessary.

5.4.3 Data collection

The data collection was conducted during one week in April 2017. The web-based survey was distributed via *Facebook*[8], in particular through *Facebook* pages of supermarkets that provided self-scanning systems. This was done so as to enhance the likeliness to reach the self-scanning consumer. Respondents were invited by the author to participate and self-assess their attitudes towards technology, on the one hand, and self-scanning in grocery shops, on the other hand. In order to achieve scale, the respondents were offered to enter a lottery of prizes[9] as compensation for the participation.

5.4.4 Sampling frame

Because this study wanted to draw conclusions from a population who has personal experience from self-scanning, it is of great importance that the sample only consists of self-scanning shoppers. To avoid consumers without previous experience taking part of the data set, two "security items" were introduced in the questionnaire. These were:

- "Have you ever used a self-scanner when doing your grocery shopping"
- "I have previous experience from using the self-scanning system"

[8] www.facebook.com
[9] 10 movie tickets to a value of aproximately 150 SEK each.

Would the respondent answer negative on one of the items, the respondent would be thanked for his or her contribution and no further data be collected.

Because this study has adopted an explanatory research design, it strives to derive generalizations. Thus the sampling frame and its size is a matter of great importance (Saunders *et al*., 2012). The optimal sampling frame would have been a sampling frame without bias, and which allowed the researcher to conduct a simple random sampling of the total population (Bryman & Bell, 2011). As the author though did not have access to such a frame, a non-random sampling method was used. The benefit of a non-random sampling is its less broad scope, which make studies, such as a master thesis, more manageable. Because of this choice, pure generalizations cannot be derived and the result ought therefore not to be interpreted as an absolute truth (Saunders *et al*., 2012). A conclusion such as: "x per cent of the Swedish shoppers use self-scanning on weekly basis" should therefore be avoided.

Even though the sample is not necessarily representative of the total population valid conclusions can still be drawn. For example, as indicated in paragraph *5.5.2 External validity* there are alternative ways of validating a non-probability sample. These phenomena ought though to be further tested. For example, by using a more extensive random probability sampling method in order to avoid eventual collateral bias (Saunders *et al*., 2012).

5.4.5 Ethical considerations

During the quantitative data collection, a number of the ethical principles of the *Swedish Research Council* (Vetenskapsrådet, 2017) were adopted. The respondents were provided with an introductory cover letter indicating the purpose of the study. Here, they were further provided with the contact information of the author in case they would have any question. The respondents were informed that any participation was voluntarily and the approximate time needed to answer the questionnaire. The respondents were also provided with the information on how the data would be used, stored, shared and the final report be officially published. They were therefore asked to not include any personal information, and further reassured that all data collected would be treated in the strictest confidence.

5.4.6 Operationalization

A pivotal element for the deductive approach is the operationalization: the process that leads to the derivation of measures, which allows the studied phenomenon to be quantitatively assessed (Saunders *et al*., 2012).

This thesis used established multi-item scales from previous research on technology acceptance. These measures were adapted to fit the topic of the thesis and further translated into Swedish. Asking questions in the native language of the respondents is indeed preferable so as to minimize potential misunderstandings (Saunders *et al*., 2012). It must be stated, that there is a trade-off between using already established measures and conducting a fully original research. A drawback of using already established measures is a decrease in the study's originality. Yet, without well-developed questions the measures' reliability is decreased (Saunders *et al*., 2012). Hyman, Lamb and Bulmer (2006) therefore stress the use of pre-existing measures as a suitable approach. In addition, each construct regardless of its original form, was measured on a seven-point Likert scale. This strategy was chosen because the benefit of using a seven-point Likert scale, in comparison to the five-point alternative, is that the former offers a more varied range of alternatives (Sauro, 2011b). This ought to be a good choice, especially as Saunders *et al.* (2012) emphasize that respondents many times avoid answering by extreme values.

Technology readiness (TR)

To measure the consumer-specific TR, this study adopted an abbreviated technology readiness index scale (Parasuraman & Colby, 2015). The choice to use an abbreviated technology readiness index scale rather than original scale developed by Parasuraman (2000) was done due to shortcomings of the latter. Indeed, the full technology readiness index scale has been criticized for its lack of contemporary approach and its wide scope of items to measure (Parasuraman & Colby, 2015). Using a more contemporary and streamlined approach ought therefore be a good choice. However, using an abbreviated scale is not done without drawbacks. By using fewer items to measure an individual's TR a less accurate prediction may be the result. Moreover, because the abbreviated technology readiness index scale is a new approach, it has not yet been extensively validated. Yet, these drawbacks can be considered of minor problem compared to using obsolete items.

The abbreviated technology readiness index scale is found in *Annex 2*.

Technology acceptance model (TAM)

To measure the system-specific TAM, this study adopted Davis' (1989) six-item measure. Even though a 16-item and a 10-item measure also exist (Davis, 1989; Chuttur, 2009) a trade-off was made. Because more items imply that more questions need to be asked it may induce a decrease in the number of respondents completing the questionnaire (Saunders *et al*., 2012). The author therefore embraced the recommendation of deVaus (in Saunders *et al*., 2012): to not make the questionnaire longer than what is necessary to meet the research objectives.

The perceived usefulness index and the perceived ease of use index are found in *Annex 3* and *Annex 4*, respectively.

5.4.7 Statistical analysis

The data retrieved from the questionnaire was coded accordingly to the recommendations of Saunders *et al*. (2012). To prevent possible loss of data or coding errors, the codes were explained and saved in a detached codebook (Saunders *et al*., 2012; Pallant, 2013). The data was thereafter imported into the statistical computer-based program *IBM-SPSS.* Different statistical analyses, based on Pallant (2013), were used in order to analyse the data. The main ones are the following:

- Descriptive statistics were conducted to investigate the characteristics of the sample.
- Mann-Whitney U test was conducted to investigate the homogeneity of the sample.
- Factor analyses were conducted to investigate the dimensionality of the data.
- Reliability analyses were conducted to assess the internal consistency of the variables.
- Regressions were conducted to evaluate a predictive model of the linear relationship between the proposed variables.

5.5 Reliability

A measure's reliability refers to its robustness (Saunders *et al*., 2012). In other words: a measure's consistency in deriving persistent findings over time. To assess the reliability of the constructs, a Chronbach's α was computed for each variable. Following the recommendation of Nunnally (1978), and Gliem and Gliem (2003) the measures' Chronbach's α was assessed from unacceptable ($\alpha < .5$) to excellent ($\alpha > .9$) with the accepted cut-off of $\alpha = .7$. *Table 2* reports the results of these computations.

Table 2. Measure reliability

	N° of measurements	Chronbach's α	Degree of acceptance
Optimism	4	.801	Good
Innovativeness	4	.858	Good
Discomfort	3	.688	Questionable
Insecurity	3	.816	Good
Perceived usefulness	6	.960	Excellent
Perceived ease of use	5	.897	Good

With a Cronbach's α spanning from .688 to .960, the different constructs showed an overall evidence of internal consistency. These findings are not surprising given that the present study was built on established multi-item scales (Hyman *et al*., 2006; Saunders *et al.*, 2012).

5.6 Validity

A measure's validity refers to its ability to precisely measure what it intends to capture. Saunders *et al*. (2012) distinguish between internal and external validity.

5.6.1 Internal validity

Internal validity refers to the measure consistency. Internal validity was created in a three-step approach: (1) established measures were used (Hyman *et al*., 2006), (2) the measures were tested in confirmatory factor analyses (Pallant, 2013) and (3) a Chronbach's α was computed for the different measures (Saunders *et al*., 2012).

5.6.2 External validity

External validity refers to the extent to which the results of a study can be generalized to the entire population. Because the data in this thesis is derived from a non-random selection process, pure generalization ought to be avoided (Saunders *et* al., 2012). However, even though non-random sampling processes are not associated with generalizations, there are ways to increase the data's generalizability. In particular, the researcher can suppose that potential errors can be controlled. This can be done in multiple ways. One way to do it is to make the sample as representative as possible for the studied population (Bryman & Bell, 2011). This was done by approaching supermarkets, which offered SSTs to their shoppers, as explained in paragraph *5.4.3 Data collection*. Another way is to increase the sample size

(Saunders *et al*., 2012). Indeed, by increasing the sample size, variation ought to decrease (Pallant, 2013). This thesis approached the latter way by stimulating respondents to answer by offering a lottery of prizes, as described in paragraph *5.4.3 Data collection*. Third, the data can be assessed in the light of *e.g.* previous studies. The sample was therefore compared to available data from prior, and extensive national market research on self-scanning (Visma Retail, 2017; HUI Research, 2015). By doing so, sample deviation and its potential impact on the result could be identified and further logically evaluated.

Because of the awareness of the potential shortcomings, actions taken to reduce deviations, and attempts to control the potential errors; the discrepancy and choice to apply a non-random sampling method, should not undermine the external validity of this thesis.

5.7 Limitations

No study is without limitations. With this said, the author wants to emphasize a number of limitations found in the present study.

First, approaching the problem through a positivist approach implies that the study is limited to the applied method; in this case, the assumption of linear relationship between the proposed variables. The *Spearman's rank-order correlation* shown in paragraph *6.6* might not be fully relevant given the overall weak correlations. A more suitable approach could therefore have been to adopt a structural equation modelling analysis, which has been used by scholars such as Walczuch *et al.* (2007) and Godoe and Johansen (2012). Yet, even though a structural equation modelling analysis can be argued a more suitable approach it must be stressed that the method can be compared to "statistical brain surgery" (Sallis, 2017[10]) and far from what a master student in business would be able to conduct without knowledge in advanced statistics. Indeed, both Walczuch *et al.* (2007) and Godoe and Johansen (2012) seem to apply divergent approaches and justifications for their structural equations modelling analyses, even though approaching the same issue. In addition, not even Pallant (2013), whose critically acclaimed *SPSS Survival Manual: A step to step guide to data analysis using IBM SPSS*, gives an explanation on how to conduct a structural equation modelling analysis.

[10] Inquiry on how to handle heterogeneous data in factor analyses. 2017-04-18.

Second, even though this thesis shows evidence of both internal validity and external validity a possible self-selection bias cannot be excluded. The data was obtained in a digital environment and through a non-randomized sampling approach. This might impose a limitation due to a possible lack of variance despite actions taken to reduce the drawbacks. In addition, even if found reliable, the generic items proposed by Davis (1989), and Parasuraman and Colby (2015) were adapted to fit the study. Such an approach may have affected the result.

6. Result

The following section presents the results of this study. Computations and the underlying reasoning for the chosen computations are presented.

6.1 Preliminary analysis

Before any statistical computation was conducted, the 192 answers were screened and the statistical assumptions of normality, linearity and homoscedasticity controlled (Pallant, 2013).

6.1.1 Data screening

The data set was first checked for obvious mistakes[11]. Second, because the intermediate used, *Google forms,* prevents respondents from adding missing values the data set was cross-checked for biased answers[12]. Third, boxplots and histograms were created and inspected to find data points that appeared to be significantly different from the majority of the data set[13]. During the inspection, it was found that two respondents had answered in a homogenous way throughout the whole questionnaire. The respondents were without further justification removed from the data set. It was also found that one question had generated multiple outliers and extreme points in comparison to other questions. Carefully looking at the questionnaire, it was noticed that the particular question easily could be misunderstood. Due to this measurement error the item was dropped from the data set (Saunders *et al*., 2012). After dropping the faulty item five additional outliers could be identified. There are several approaches in the methodological literature regarding how to treat outliers. Tabarchnick and Fidell (2013) suggest that outliers, if found valid, should be kept but slightly modified so as not to distort the overall findings. Indeed, outliers are not *per se* faulty or bad data but variations in the sample (Bryman & Bell, 2011). The variables 5 per cent trimmed mean was consulted to derive how much problem the outliers would impose if being fully integrated in the data set (Pallant, 2013). No greater difference[14] was found between the mean and the 5 per cent trimmed mean, which implies that the outliers ought not create significant problems (ibid.). Yet, to minimize the negative impact of the outliers they were winzorized[15]: a procedure recommended by Tabachnick and Fidell (2013).

[11] *E.g.* if the age was written with letters instead of numbers.
[12] E.g. if the respondent had answered homogenously on all question.
[13] *I.e.* outliers and extreme points.
[14] A difference of < .2 per cent.
[15] *I.e.* assigned the next highest value found in the data set.

6.1.2 Normality

A prerequisite for many statistical computations is that the sample is (1) normally distributed, or that (2) the residuals of the data are normally distributed (Pallant, 2013). That will say, that the data is distributed as a bell shaped curve (Saunders *et al*., 2013). As a rule of thumb, the data is normally distributed when the measure's kurtosis and skewness is between the value of $-1 < x < 1$. To check that the assumption of normality was not violated each variable was tested for normality. *Table 3* illustrates a summary extract of the findings. In *Annex 5* the complete result of these computations are found.

Table 3. Normality assessment

	Mean	S.D.[16]	Skewness	Kurtosis
OPT2	5.990	1.035	-1.042	1.095
INN1	3.840	1.995	.090	-1.126
PEU1	6.480	.931	-1.739	2.012
PEU4	6.060	1.292	-1.263	.593
PEU5	6.290	1.000	-1.342	.961
PEU6	6.340	9.44	-1.326	.896

6 of the 26 variables had a skewness or kurtosis exceeding the value of $-1 < x < 1$. This indicated that they possibly violated the prerequisite of normality. By consulting the variables' graphic designs and Kolmogorov-Smirnov tests it could be further supported that the variables did violate the assumption of normality. When it comes to social science research it is not uncommon (Tashakkori & Teddlie, 2003; Saunders *et al.*, 2012). On the contrary, "many of the attributes we want to measure are in fact not normally distributed" (Pallant, 2013 p. 115).

When encountering not normally distributed data there are three ways to treat the data set during statistical analyses. The researcher can: (i) use the parametric technique, (ii) manipulate the data so it obtains a normal distribution and then use the parametric technique, or (iii) use a non-parametric technique (Pallant, 2013). This thesis uses a non-parametric technique. This choice was motivated because non-parametric tests are less sensitive to outliers and skewed data. Non-parametric tests can therefore be a better approach, even though being slightly weaker than a parametric test (ibid.).

[16] Standard deviation.

6.1.3 Linearity

Testing for linearity implies assessing the linear relationship between two or many variables (Pallant, 2013). This is pivotal to do when the researcher wish to derive a predictive model based on linear relationships, such as a regression analysis, which is the case of this study. The variables degree of linearity was examined through scatterplots and correlation matrixes (ibid.). A synthesized result of the computations is presented in paragraph *6.6 Spearman's rank-order correlation*. Furthermore, linearity was controlled and confirmed as part of the regression analysis in paragraph *6.7 Multiple regressions*.

6.1.4 Homoscedasticity

Such as for normality and linearity, the assumption of homoscedasticity, *i.e.* the "extent to which the data values for the dependent and independent variables have equal variances" (Saunders *et al*., 2012, p. 462) is of great importance in statistical testing. Indeed, measuring heterogeneous data implies that there is a possibility to overestimate the goodness of fit.

To check that the assumption of homoscedasticity was not violated two approaches was used. First, multiple Mann-Whitney U tests were conducted between different groups and variables of the sample. A synthesized result of these computations is presented in paragraph *6.3 Mann-Whitney U test*. The test found that all variables were not homogenous. This implies that divergent groups were identified, separated and individually investigated. Second, after conducting the necessary actions of the heterogeneous data, which follows in paragraph *6.4 Factor analyses*, the residuals' scatter plots were inspected and verified for homoscedasticity in the regression analyses (Pallant, 2013).

6.2 Sample characteristics

The total sample consisted of 192 respondents. After dropping irrelevant answers[17], 157 respondents remained. Age was reported between the age of 17 to 70, with the average age of 34.69 and the median age of 30. A great majority of the respondents, 84.5 per cent, was coming from city areas and the educational level was rather high: 61.9 per cent of the respondents indicated that they had a post-secondary education. The sample further consisted of 118 females and 39 males. Because females were strongly overrepresented in the gender

[17] *I.e.* respondents with no prior experience of self-scanning and the faulty answers found during the data screening.

distribution it was decided that a good idea could be to test for cross-categorical variances. This analysis follows in the paragraph below.

6.3 Mann-Whitney U test

The Mann-Whitney U test was used to assess if there were significant differences between different groups of respondents (Pallant, 2013). Overall, no significant difference was found on the respondents' demography or educational level. However, when comparing the sample structure across gender, statistically differences were found.

Depicted in *Table 4,* when testing the TR and TAM constructs across gender, the Mann-Whitney U test rejected the null hypothesis in half of the cases. This implies that there is a statistically significantly difference between the groups. In consequence, the sample partially violated the assumption of homoscedasticity. This result affected the choice how to continue with the following analysis. Indeed, as emphasized in *6.4 Factor analyses* the possible violation of the sample's homoscedasticity was taken into account.

Table 4. Mann-Whitney U test

	Null hypothesis	Sig	Decision
1	The distribution of OPT is the same across categories of GENDER	.018	Reject the null hypothesis
2	The distribution of INN is the same across categories of GENDER	.000	Reject the null hypothesis
3	The distribution of DIS is the same across categories of GENDER	.150	Retain the null hypothesis
4	The distribution of INS is the same across categories of GENDER	.030	Reject the null hypothesis
5	The distribution of PU is the same across categories of GENDER	.108	Retain the null hypothesis
6	The distribution of PEU is the same across categories of GENDER	.143	Retain the null hypothesis

6.4 Factor analyses

A factor analysis is an efficient tool to reduce superfluous data (Pallant, 2013) and gives the researcher a structured overview of which "groups of indicators tend to bunch together to form distinct clusters" (Bryman & Bell, 2011, p. 170). However, it is important to keep two things in mind when conducting factor analyses:

- A factor analysis is a rather subjective technique and therefore should not be taken as an absolute truth (Hair, Blac, Babin & Anderson, 2013).
- A factor analysis is dependent on scale and therefore a technique, which is better suited for large sample sizes (Hair *et* al., 2013; Tabachnick & Fidell, 2013).

When conducting a factor analysis, Tabachnick and Fidell (2013) suggest a sample size of n > 300. A factor analysis can though be run on far lower samples (Pallant, 2013). As a rule of thumb a sample size of n > 100, or as emphasized by Nunnally (1978): a 10-to-1 ratio for each item to be analysed, is sufficient. However, because a factor analysis is primarily recommended for large samples (Hair *et* al., 2013) a sample size of n > 150 as lowest recommendation is advocated (Tabachnick & Fidell, 2013). Given the 157 respondents, this thesis therefore passes the lower recommendation to conduct a factor analysis.

Because the Mann-Whitney U test indicated that there were groups, which significantly differed from others, multiple factor analyses were conducted. This approach ought to be the most suitable given that factors analyses assume homogeneity for the underlying factor structure (Tabachnick & Fidell, 2013). When splitting the data set into two different groups, the group consisting of men only, did not reach the rule of thumb sample size of n > 100. Thus, the results ought to be cautiously interpreted (Hair *et al*., 2013). In addition, the result obtained by separating the two groups did not result in radically different findings. Because of this result, the two groups were after being tested individually, merged into one group (Sallis, 2017) so as to facilitate the overall analysis.

6.4.1 Factor analysis on technology readiness

Following the recommendations of Pallant (2013)[18] a factor analysis with a Varimax rotation and a factor loading of .3 was conducted.

The Correlation Matrix, illustrated in *Table 5* was inspected for a significant amount of correlations exceeding r > .3. The matrix was also searched for values exceeding r > .9, where the latter could imply a risk of multicollinearity. From the matrix, it was found that the highest r-value was .709. The data set appeared therefore not to have any issues of

[18] Paragraph *6.4.1 TR* and *6.4.2 TAM* will only consider the recommendations of Pallant (2013).

multicollinearity. Furthermore, it appeared that the data set had a rather low, but yet a significant amount of patterned relationship.

Table 5. Correlation matrix

	OPT1	OPT2	OPT3	OPT4	INN1	INN2	INN3	INN4	DIS1	DIS2	DIS3	DIS4	INS1	INS2	INS3	INS4
OPT1	1															
OPT2	.574	1														
OPT3	.504	.566	1													
OPT4	.379	.486	.565	1												
INN1	.352	.273	.383	.315	1											
INN2	.282	.208	.375	.238	.709	1										
INN3	.316	.207	.308	.200	.537	.385	1									
INN4	.403	.242	.274	.217	.691	.649	.602	1								
DIS1	-.190	-.142	-.184	-.104	-.175	-.150	-.275	-.245	1							
DIS2	-.114	-.173	-.171	-.130	-.145	-.041	-.253	-.116	.395	1						
DIS3	-.150	-.156	-.143	-.153	-.034	.011	-.192	-.071	.380	.492	1					
DIS4	-.218	-.113	-.114	-.192	-.090	-.103	-.201	-.158	.309	.288	.407	1				
INS1	-.319	-.230	-.249	-.428	-.381	-.272	-.218	-.336	.299	.214	.357	.333	1			
INS2	-.307	-.255	-.297	-.399	-.320	-.204	-.216	-.206	.217	.202	.325	.303	.637	1		
INS3	-.319	-.246	-.217	-.344	-.251	-.198	-.250	-.235	.327	.158	.292	.242	.542	.614	1	
INS4	-.263	-.211	-.214	-.232	-.054	.016	-.072	-.100	.054	.290	.027	.257	.207	.321	.278	1

The Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity was inspected. The KMO had a meritorious value of .803, thus exceeding the recommended KMO value of .5. In addition, Bartlett's test of spherity indicated significance (Sig. = .000), thus below the recommended value of < .05. Finally, the diagonal row at anti-image correlation with an 'a' superscript was inspected for cut-offs > .5. The lowest anti-image correlation found was .665, thus higher than the critical cut-off.

Table 6 depicts the communalities provided by the factor analysis. It appears that two out of the 16 values were below the rule of thumb of .5. DIS4 and INS4 scored an extraction value of .318 and .422 respectively. This indicates that the scale could be improved by excluding these factors in a later stage.

Table 6. Communalities (TR)

	OPT1	OPT2	OPT3	OPT4	INN1	INN2	INN3	INN4
Extraction	.583	.719	.696	.599	.786	.715	.593	.770
	INS1	**INS2**	**INS3**	**INS4**	**DIS1**	**DIS2**	**DIS3**	**DIS4**
Extraction	.521	.642	.634	.422	.713	.762	.657	.318

In line with the proposed theory of TR, the Total Variance Explained, depicted in *Table 7,* suggested a four component solution. Indeed, four components achieved the Kaiser's criterion with Eigienvalues > 1 (5.191, 2.101, 1.594 and 1.242). These four components had a cumulative explained variance of 63.301 per cent.

Table 7. Total Variance Explained (TR)

	Initial Eigenvalues		
	Total	% of variance	Cumulative %
1	5.191	32.446	32.446
2	2.101	13.131	45.577
3	1.594	9.964	55.542
4	1.242	7.760	63.301

The generated screeplot, depicted in *Figure 5* was consulted. The screeplot suggested, in comparison to Kaiser's criterion that primarly components 1 and 2 should be extracted. This is most likely due to the fact that component 1 and 2 capture more of the explained variance, in comparison to component 3 and 4. However, given that the proposed theory consisted of four constructs, further supported by Eigenvalues > 1, all four components were kept.

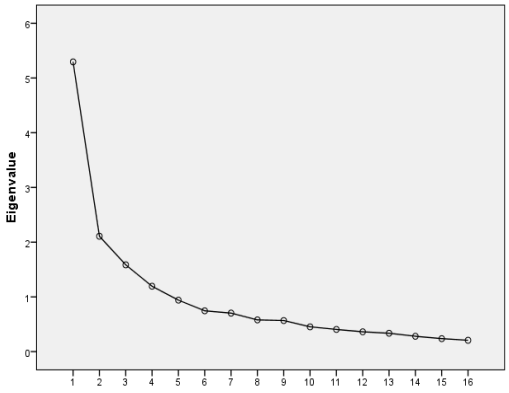

Figure 5. Screeplot (TR)

Consulting the Rotated Component Matrix, *Table 8*, one can see the four-component solution suggested by the Kaiser's criterion. Inspecting INS4 and DIS4, as suggested by the communalities, both factors seem rather troublesome with a low factor loading, .343 for INS4

and .563, which is just above the cut off of .5 for DIS4. This in combination with significant (> .3) cross-loadings on both factors. The significant cross-loading is especially troublesome for INS4. Even though grouping with the other insecurity factors, INS4 cross-load component 2 with a stronger negative effect than the positive effect to its own group; thus indicating a low fit of the factor.

Table 8. Rotated Component Matrix (TR)

	Component			
	1	**2**	**3**	**4**
OPT1		.681		
OPT2		.832		
OPT3		.783		
OPT4		.660	-.386	
INN1	.840			
INN2	.822			
INN3	.682			-.325
INN4	.853			
DIS1				.673
DIS2				.784
DIS3				.760
DIS4			.313	.563
INS1			.766	
INS2			.828	
INS3			.762	
INS4		-.393	.343	

Following the discussion above, INS4 was removed and the factor analysis re-computed. Indeed, when a factor is excluded modifications are made in the analysis. The factor analysis should therefore be re-computed at each change. The different steps were thereafter repeated. In total, two items were dropped: INS4 and DIS4. After dropping the factors a stronger explanatory model was verified.

6.4.2 Factor analysis on the technology acceptance model

Provided the extensive explanation of the factor analysis procedure in paragraph *6.4.1 Factor analysis on technology readiness,* a synthesized presentation will follow for the factor analysis of the TAM factors. In *Annex 6,* the complete list of tables and figures are attached.

The correlation matrix indicated a significant number of correlations exceeding r > .3 and one correlation exceeding r > .9[19]. The KMO had a marvellous value of .921 and a significant (Sig. 000) Bartlett's test of spherity. The lowest anti-image correlation value was .886 and the lowest value of the communalities was .587. The Principal Component Analysis suggested a two component solution suppported by Eigienvalues > 1[20]. The cumulative explained variance was 78.651 per cent. The generated screeplot suggested that two compontents should be extracted. Inspecting the factors in the Rotated Component Matrix one could see a consistent grouping, though with a few cross-loadings.[21]. Because of the significant cross-loadings on PU1, PU5 and PU6, the factors were dropped individually or in pairs. By doing so, a weaker model was to be found. The factors were therefore included in the model in spite of their significant cross-loadings.

In the final model, PEU4 was dropped because of three reasons: (i) its low factor loading in comparison with the other factors, (ii) its significant cross-loading on PU (.329), and (iii) its rather low score on the communalities (.587) in comparison to other factors. As a result of dropping PEU4, a stronger explanatory model was verified.

6.5 Construction of variables

The TR and TAM variables were created by adding the cleansed items in a single category. That will say: four items for optimism, four items for innovativeness, three items for discomfort, three items for insecurity, six items for perceived usefulness and five items for perceived ease of use. Each category was thereafter divided by the total number of items in the same category as illustrated by the box below.

$$\boldsymbol{OPT} = \frac{(OPT1 + OPT2 + OPT3 + OPT4)}{4}$$

$$\boldsymbol{PEU} = \frac{(PU1 + PU2 + PU4 + PU5 + PU6)}{5}$$

[19] Because it only was one correlation exceeding r > .9, it ought not create a great risk of multicollinearity.
[20] 6.986 and 1.665.
[21] However, these cross-loadings are suggested by the theory. Indeed, it is known that perceived ease of use contributes to a stronger perceived usefulness. This could for example be seen by the significant cross-loadings between PEU4 and PEU6 on the PU component.

6.5.1 Description of the variables

To describe the variables, a mean, a standard deviation and the internal consistency were computed. *Table 9* summarizes these computations.

Table 9. Variable descriptions

	N	Mean	S.D.	Chronbach's α
OPT	157	5.589	.960	.801
INN	157	4.119	1.500	.856
DIS	157	3.722	1.319	.688
INS	157	4.620	1.438	.816
PU	157	5.234	1.592	.960
PEU	157	6.260	.875	.897

6.6 Spearman's rank-order correlation

The linearity of the variables was assessed with Spearman's rank-order correlation. From the correlation matrix depicted in *Table 10,* both positive and negative significant correlations could be found. Significant correlations were found between independent and dependent variables (as proposed by the hypotheses), between dependent and dependent variables (as suggested by TAM) and between independent and independent variables (as suggested by TR). Three significant correlations, which is in the interest of this thesis, were obtained: (i) OPT on PU, with a significance of $p < .001$, (ii) DIS on PU with a significance of $p < .05$, and (iii) DIS on PEU with a significance of $p < .05$.

Table 10. Spearman's rho correlation matrix

	OPT	INN	DIS	INS	PU	PEU
OPT	1					
INN	.442**	1				
DIS	-.236**	-.194*	1			
INS	-.448**	-.353**	.379**	1		
PU	.300**	.096	-.163*	-.048	1	
PEU	.139	-.046	-.170*	.010	.595**	1

* sig. $p < .05$
** sig. $p < .001$

6.7 Multiple regressions

6.7.1 Testing the assumptions

When conducting regression analyses, there are three assumptions, which ought to be fulfilled: (i) linearity, (ii) normality and (iii) homoscedasticity of the residuals. These underlying assumptions were checked and verified for each regression through: the regression's correlation matrix, the normal probability plot of the regression's standardised residuals and the residuals' scatter plots (Pallant, 2013).

(i) To not violate the assumption of linearity, there should be at least a few correlations with the dependent variable. This was indeed the case for the different variables. However, they did not reach a correlation above .3, which Pallant (2013) stresses as preferable.

(ii) To not violate the linearity assumption, the residuals should lie in a reasonable straight diagonal line on the normal probability plot of the regression's standardised residuals (Pallant, 2013). This was the case for the conducted regressions. Illustrated in *Figure 6;* such a line, in this case the normal probability plot of the regression's standardised residuals between OPT, INN, DIS, INS and PU, is depicted.

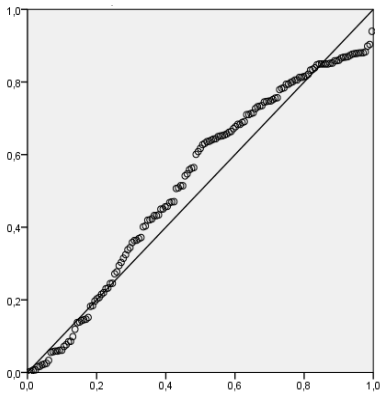

Figure 6. Normal probability plot of the regression's standardised residuals

(iii) To not violate the assumption of homoscedasticity, the residuals' scatter plots were inspected for a grouped, rectangular pattern (Pallant, 2013.), within the values of 3.3 or -3.3 (Tabachnick & Fidell, 2013). It can be seen in *Figure 7* that no data value was found outside the values of 3.3 or -3.3 (the two outer red lines), thus implying a low degree of troublesome outliers. Furthermore, the data was concentrated in a rectangular-like way (the red inner rectangle), which suggests homoscedasticity.

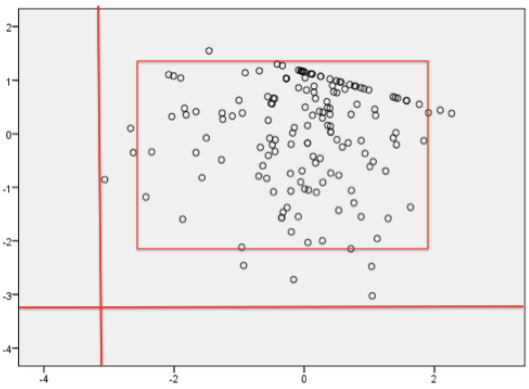

Figure 7. Scatter plot test for homoscedasity

Result of the testing

With a weak support for the correlation assumption, and support for the linearity and homoscedasticity assumptions, the data was evaluated as fit for conducting multiple regressions.

6.7.2 Proposed equations

Two regression models were created to explain the dependent variables of perceived usefulness and perceived ease of use. The proposed models are illustrated in the two following equations:

$$PU = \beta_0 + \beta_1 OPT + \beta_2 INN - \beta_3 DIS - \beta_4 INS + \varepsilon$$
$$PEU = \beta_0 + \beta_1 OPT + \beta_2 INN - \beta_3 DIS - \beta_4 INS + \varepsilon$$

What the equations illustrate is that optimism and innovativeness are hypothesized to contribute positively to perceived usefulness and perceived ease of use, on the one hand, and that discomfort and insecurity are hypothesized to contribute negatively to perceived usefulness and perceived ease of use, on the other hand.

6.7.3 Regression one

The regression corresponding to equation one (PU) is depicted in *Table 11*. From the regression, one can see that only one independent variable (OPT) was statistically significant (sig. < .05) and that the overall equation had a significance of .086; thus, being non-significant as a complete model.

Table 11. Initial regression on PU

	Total Variance Explained				Collinearity statistics
	Initial Eigenvalues				
Model	β	Std. Error	t	Sig.	VIF
(Constant)	1.948	1.125	1.730	.086	
OPT	.550	.150	3.662	.000	1.398
INN	-.020	.092	-.216	.829	1.293
DIS	-.167	.101	-1.651	.101	1.197
INS	.199	.102	1.948	.053	1.447

Because three factors were not significantly separated from zero, a better predictive model could be created. The regression, depicted in *Table 12,* was therefore obtained:

Table 12. Final regression on PU

	Total Variance Explained				Collinearity statistics
	Initial Eigenvalues				
Model	β	Std. Error	t	Sig.	VIF
(Constant)	2.663	.726	3.669	.000	
OPT	.460	.128	3.593	.000	1.000

The R for the regression was .328. This implies that the total variation in perceived usefulness is explained by R^2 (.328 x .328), 10.7 per cent. Because the final regression only consists of one variable, the Variance Inflation Factor (VIF) was 1, which indicates no sign of multicollinearity.

6.7.4 Regression two

The regression corresponding to equation two (PEU) is depicted in *Table 13*. From the regression one can see that all independent variables were statistically significant (sig. < .05). Indeed, INN achieved the highest significance with a significance value of .044 thus below the cut-off of .05. So was also the case of the complete model with a sig. of .000.

Table 13. Final regression on PEU

	Total Variance Explained				Collinearity statistics
	Initial Eigenvalues				
Model	β	Std. Error	t	Sig.	VIF
(Constant)	5.155	.618	8.342	.000	
OPT	.263	.082	3.188	.002	1.396
INN	-.103	.051	-2.029	.044	1.293
DIS	-.136	.056	-2444	.016	1.197
INS	.122	.056	2.182	.031	1.447

The R for the regression was .329. This implies that the total variation in perceived ease of use is explained by R^2 (.329 x .329), 10.8 per cent. Because the final regression consisted of multiple items, the VIF was checked for multicollinearity. No VIF-value was exceeding the cut-off of 5 (Pallant, 2013), which indicates that there is no reason to be concerned with multicollinearity.

6.7.5 Modified equations

The suggested models were in their original form hypothesized to contribute positively to perceived usefulness and perceived ease of use for the variables of optimism and innovativeness, and contribute negatively to perceived usefulness and perceived ease of use, for the variables of discomfort and insecurity. Given the result of the multiple regressions it was found that this was not the case. Following the evidence of the conducted test the equations were adapted to the findings. The adapted equations are illustrated below:

$$PU = \beta_0 + \beta_1 OPT + \varepsilon$$
$$PEU = \beta_0 + \beta_1 OPT - \beta_2 INN - \beta_3 DIS + \beta_4 INS + \varepsilon$$

Which translates into:

$$PU = 2.663 + .460 OPT + \varepsilon$$
$$PEU = 5.155 + .263 OPT - .103 INN - .136 DIS + .122 INS + \varepsilon$$

What these two equations illustrate is the result of the consumer-specific TR on the system-specific TAM. That will say, if for example the degree of optimism can be enhanced with one point, the consumer will positively evaluate perceived usefulness and perceived ease of use with .440 point and .263 point, respectively; thus enhance the likeliness of technology acceptance.

6.8 Hypotheses testing

Eight tests were conducted to answer the proposed hypotheses. *Table 14* summarizes the tests conducted. The table informs about the regression's effect (β-value), the extent to which the slope of the regression is significantly divergent from zero (t-value), the regression's significance (p-value) and how these numbers ought to be interpreted (result) (Pallant, 2013).

Table 14. Hypotheses testing

	β	t-value	p-value	Result
$H1_a$	.460	3.593	.000**	Supported
$H1_b$	.263	3.188	.002*	Supported
$H2_a$	.001	-.216	.829	Not supported
$H2_b$	-.103	-2.029	.044*	Significant but opposite effect
$H3_a$	-.167	-1.651	.101	Not supported
$H3_b$	-.136	-2.444	.016*	Supported
$H4_a$	.199	1.948	.053	Not supported
$H4_b$	.122	2.182	.031*	Significant but opposite effect

* Sig. $p < .05$
** Sig. $p < .001$

Three of the eight hypotheses could be fully supported. $H1_a$, $H1_b$ and $H3_b$ had all a β-coefficient in line with the suggested effect, and a p-value below the cut-off .05; therefore indicating significance. This implies that optimism has a positive effect on both perceived usefulness and perceived ease of use, and that discomfort has a negative effect on perceived ease of use. Whereas optimism in the case of perceived usefulness has a moderate power of .460, it has a weaker power of .263 in the case of perceived ease of use. Furthermore, optimism is by all the different concepts the most powerful: *i.e.* β OPT > β INN, β DIS and β INS, respectively. Discomfort has, as expected, a significant negative effect on perceived ease of use. However, the effect is rather weak with a power of -.136.

Two of the eight hypotheses could be partially supported. $H2_b$ and $H4_b$ had both a p-value below the cut-off .05; therefore indicating significance. Curiously enough, evidence was found that innovativeness has a negative effect on perceived ease of use, with a weak power of -.103, and insecurity has a positive effect on perceived ease of use, with an even weaker power of .031. Innovativeness and insecurity therefore affects TAM with an opposite effect than the one proposed by the hypotheses.

Three of the eight hypotheses, $H2_a$, $H3_a$, and $H4_a$ could not be supported. These hypotheses had a p-value above the cut-off .05: .829 in the case of innovativeness on perceived usefulness, .101 in the case of discomfort on perceived usefulness, and .053 in the case of insecurity on perceived usefulness. In comparison to $H2_b$'s and $H4_b$'s reversed and significant effect, $H3_a$'s negative effect on perceived usefulness could be supported with a negative β-

value of -.167. Discomfort's negative effect on perceived usefulness was though not significant on the .05-level. If considering a slightly higher cut off, such as .125, which still could be argued as fairly reasonable, it would also be significant and thus fully supported. However, by changing the cut off to a higher significance level a weaker predicting model is derived (Pallant, 2013). The significance level was therefore kept as a 95 per cent confidence interval. $H2_a$, the positive relationship between innovativeness and perceived usefulness, $H3_a$, the negative relationship between discomfort and perceived usefulness, and $H4_a$, the negative relationship between discomfort and perceived usefulness, were therefore rejected.

6.9 Summary of the results

In sum, five of the eight hypotheses were significant. Of these hypotheses, $H1_a$, $H1_b$ and $H3_b$ were fully supported. The remaining two hypotheses, $H2_b$ and $H4_b$ were partially supported, as they were significant but had an opposite effect than the proposed hypotheses. Three of the eight hypotheses, $H2_a$, $H3_a$, and $H4_a$ were non-significant and therefore rejected. *Figure 8* illustrates the result of the testing.

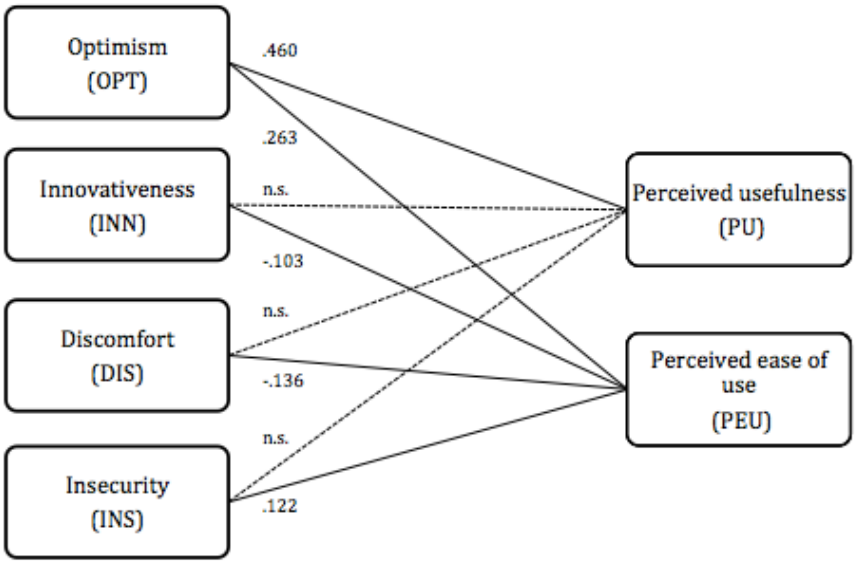

Figure 8. Final results

7. Analysis

The following section analyses the findings of this thesis. The results are discussed and put in a wider scholarly perspective.

7.1 The effect of technology readiness on the technology acceptance model

7.1.1 The effect of optimism

Hypotheses $H1_a$ and $H1_b$ proposed that consumer optimism affects perceived usefulness and perceived ease of use positively. Empirical evidence shows that optimism on perceived usefulness has a significant positive impact of .460 ($H1_a$), and that optimism on perceived ease of use has a significant positive impact of .263 ($H1_b$). This result is in line with the hypothesis stated, previous SST research findings (Dabholkar, 1996; Dabholkar *et al.*, 2003), and with the technology acceptance literature (*e.g.* Parasuraman, 2000; Tsikriktsis, 2004; Lin *et al*., 2007; Walzuch *et al*., 2007). Both hypotheses are therefore accepted.

With a β-value spanning from .263 to .460, optimism has a moderate effect on perceived usefulness and perceived ease of use, respectively. Its effect does also differ significantly from the effect of the other TR-measures. Indeed, optimism has almost twice the effect as lowest in comparison to the next strongest relationship[22]. Empirical evidence therefore shows that consumer optimism is a key determinant of technology adoption as proposed by Dabholkar *et* al. (2003). Consumers with technological positivism are consequently more likely to accept and therefore also use a grocery store's self-scanning system, following the reasoning of the proposed theoretical framework.

7.1.2 The effect of innovativeness

Hypotheses $H2_a$ and $H2_b$ proposed that consumer innovativeness affects perceived usefulness and perceived ease of use positively. Empirical evidence shows that innovativeness on perceived usefulness has a non-significant impact of .001 ($H2_a$), and that innovativeness on perceived ease of use has a significant negative impact of -.103 ($H1_b$). None of the hypotheses are therefore in line with the hypothesis stated.

[22] OPT-PEU with a β-value of .263 versus DIS-PEU with a β-value of -.136.

The former hypothesis ($H2_a$), is highly non-significant with a p-value of .829. The hypothesized effect with its β-value of .001 indicates furthermore that no effect is found for the proposed hypothesis. This finding goes against the theory formulated by Parasuraman (2000), Parasuraman and Colby (2001), Tsikriktsis (2004) and Parasuraman and Colby (2015). However, as suggested by Liljander *et al.* (2006) and Gelderman *et al.* (2011), there might be a built-in flaw in the innovativeness measure. Indeed, research (Goldsmith *et al*., 1998; Liljander *et al.*, 2006; Gelderman *et al.*, 2011) has found that innovativeness ought to be separated into two categories: general innovativeness and domain-specific innovativeness. Where the former, represented by the technology readiness index (Parasuraman, 2000) as suggested by Liljander *et al*. (2006), is a weak or non-significant predictor towards technology adoption, the latter is strongly associated to consumer adoption of technology (Goldsmith *et al*., 1998; Liljander *et al.*, 2006). The findings of this thesis support this claim by the great non-significance, in combination with a non-existing effect. A suitable conclusion to adopt is therefore the suggestion of Roehrich (2004): innovativeness, and in particular general innovativeness (Liljander *et al.*, 2006) ought not to be used as a predictor of technology adoption. Consequently, $H2_a$ is rejected.

The latter hypothesis ($H2_b$), turns out to provide one of the most intriguing findings. Instead of the proposed positive effect, evidence is found that innovativeness tend to decrease perceived ease of use. The negative effect found is however rather low with a significant negative impact of -.103. Several explanations may be given to the negative effect. A first possible explanation is raised by Walzuch *et al*. (2007): "innovative people are more critical towards technology since they are aware of the newest developments and possibilities" (p. 212). A second possible explanation is proposed by Godoe and Johansen (2012) who relates to Walzuch *et al*. (2007) but frames it differently: "highly innovative people are more willing to adopt and try new technologies as compared to people characterized by low levels of innovativeness. However, innovative people would easily cease to use a system due to their high standards for new technological development" (Godoe & Johansen, 2012, p. 46). Building on these possible explanations it can be fruitful to return to the definition of innovativeness: "to be a technology pioneer and thought leader" (Parasuraman & Colby, 2015, p. 60).

Parasuraman and Colby (2001) suggested that innovative consumers feel pleasure to learn about new and complex technologies, and therefore tend to adopt highly innovative

technology. Relating innovativeness to technology adoption on this basis can though be a mistake. One must always keep in mind that general and domain-specific innovativeness may differ (Liljander *et al.*, 2006). Whereas an innovative consumer might adopt a complex technology, as suggested by Godoe and Johansen (2012), the empirical findings of this thesis show that they do not feel stimulated by a technology, which is perceived easy to use. A possible explanation to the significant negative impact is thus as follows: the easier a technology is being perceived, the less likely an innovative consumer is to adopt the particular technology. Consumers that are innovative are consequently more likely to reject and therefore also not use a grocery store's self-scanning system.

7.1.3 The effect of discomfort

Hypothesis $H3_a$ and $H3_b$ proposed that consumer discomfort affects perceived usefulness and perceived ease of use negatively. Empirical evidence shows that discomfort on perceived usefulness has a non-significant negative impact of -.167 ($H3_a$), and that discomfort on perceived ease of use has a significant negative impact of -.136 ($H3_b$). Both the hypotheses are therefore in line with the proposed theory, imposing a negative effect on the TAM constructs. However, only $H3_b$ is significant with its effect. Yet, by slightly decreasing the confidence interval $H3_a$ would also be fully supported and therefore strengthen the theoretical approach. The reason to the measure's non-significance can be many.

First, a possibility is always the loss of meaning given the adaptation of the measures to the study. Second, sample variances are common, and due to the limitations of this thesis' sampling frame it is not dubious that a similar result can be the result of the non-random sampling approach. Third, because the statistically pre-requisites were not completely achieved, there is a risk that the minor divergence has affected the result. Yet, given the p-value of .101 it is still within a reasonable frame to be accepted, even though the decision was to not change the confidence interval in this study so not to lose in the overall predicting power.

Yet, given the significance of $H3_b$ this thesis suggests that consumers facing technological discomfort are more likely to reject and therefore less willing to adopt a grocery store's self-scanning system.

7.1.4 The effect of insecurity

Hypothesis $H4_a$ and $H4_b$ proposed that consumer insecurity affects perceived usefulness and perceived ease of use negatively. Empirical evidence shows that insecurity on perceived usefulness has a non-significant positive impact of .199 ($H4_a$), and that discomfort on perceived ease of use has a significant positive impact of .122 ($H4_b$). These results are highly intriguing as they go against the theory, which stresses insecurity as a strong inhibitor towards technology adoption (Parasuraman & Colby, 2001).

Several reasons may explain the positive effects. A first possible explanation is a weakness in the measure after its adaptation to fit the studied phenomena. Many underlying items had to be re-phrased and translated into another language imposing that meaning can have been lost in the process, even though careful measures were taken to prevent such a thing (Saunders *et al.*, 2012). A second possible explanation is the cross-loadings from optimism on insecurity. As noted by Pallant (2013) cross-loadings exceeding the cut-off .3 can be troublesome and was the case for many factors for the TAM measures (see: *Annex 6*). Even though this issue was raised, discussed and logically evaluated, the actions taken were maybe not radical enough to reduce potential shortcomings. A third possible explanation can have been an issue with the statistical approach. Even though the logical reasoning was valid and the measures evaluated correctly, factor analyses are indeed neither a solid nor unbiased statistical method (Hair *et al*., 2013). To conclude, a fourth possible explanation is the one raised by Gelderman *et al.* (2011): insecurity might be a weak and unreliable measure to use as indicator for technology acceptance. This idea is not scholarly alien, Walczuch *et al*. (2007) and Godoe and Johansen (2012) have also, such as the empirical evidence in this thesis, found support for the standpoint that insecurity is not *per se* related to a negative evaluation of technologies. Consequently, $H4_a$ and, $H4_b$ are rejected.

7.1.5 Summary

Taking the results into account, it seems to be the case that the consumer's attitude towards technology does play a significant role in the acceptance of technology (Lin *et al.*, 2007; Walzuch *et al*., 2007; Godoe & Johansen, 2012). Indeed, optimism, discomfort and innovativeness have all a significant impact on perceived usefulness and perceived ease of use. Thus, as evidence in this study show, the consumer's characteristics play a significant role in the acceptance of interactive consumer technologies, such as the self-scanning SST.

7.2 The importance of technology readiness

Both of the conducted regressions achieved in the final model p-values below p <.000. This implies that the models are highly significant, even at a 1 per cent confidence interval, and that the present study's empirical evidence show a good fit to the data (Pallant, 2013).

The regression, which is conducted with perceived usefulness as dependent variable achieves a R^2-value of .328. This indicates, that the significant consumer characteristics can explain 10.7 per cent of the variation in perceived usefulness. The regression, which is conducted with perceived ease of use as dependent variable achieves a R^2-value of .329. This indicates, that the significant consumer characteristics can explain 10.8 per cent of the variation in perceived ease of use. As a preliminary analysis, the explanatory degree of 10.7 per cent, and 10.8 per cent respectively are rather low (Saunders *et al*., 2012; Pallant, 2013). Yet, even though showing a low explanatory degree, the effects are significant. Moreover, they are similar to the findings of previous studies, which therefore further strengthen their validity. For example, the study of Walzuch *et al.* (2007) found an explanatory degree of 10.89 for perceived usefulness, which is almost identical to the empirical evidence of this thesis:

> "Overall our model showed a good fit to the data as evidence by the R^2 values for the dependent variables […] 'usefulness' (R^2 = 0.33 (p < 0.0001))" (Walzuch *et al*., 2007, p. 210).

In addition, taking into account that TAM, succeeds to predict about 40 per cent of technology adoption (Legris *et al*., 2003; Sauro, 2011a), a contribution of approximately 11 per cent enhances TAM's total explanatory degree. Indeed, the strong TAM theory (King & He, 2006; Chuttur, 2009) would with a similar approach have an even stronger explanatory power of approximate 44 per cent. Moreover, the significant positive effect between perceived ease of use and perceived usefulness (Davis, 1989; Venkatesh, 2000; Venkatesh & Davis, 2000), is not taken into account in this study but only the direct mediating effect between optimism, innovativeness, discomfort, insecurity on perceived usefulness and perceived ease of use, respectively. The empirical evidence of this thesis therefore contributes to a more holistic technology acceptance theory, with a greater explanatory power, which is what scholar has called upon (*e.g.* Parasuraman & Colby, 2001; Benbasat & Barki, 2007; Lin *et al*., 2007).

8. Conclusion

The following section concludes this thesis. It casts light on implications for scholars as well as for practitioners and make suggestions for future research.

8.1 Theoretical contribution

This study contributes to the academic research in multiple ways. First, it partially validates previous research on the direct mediating effect of technology readiness on technology acceptance (Lin *et al*., 2007; Walzuch *et al*., 2007; Godoe & Johansen, 2012) such as the direct mediating effect of optimism, on perceived usefulness and perceived ease of use[23]. Walzuch *et al*. (2007) could support a positive direct mediating effect between optimism on perceived usefulness (.18) and optimism on perceived ease of use (.31). Godoe and Johansen (2012) were able to replicate these findings. Indeed, they found a positive direct mediating effect between optimism on perceived usefulness (.30), and optimism on perceived ease of use (.46). This study found a positive effect of .460 for optimism on perceived usefulness, and a positive effect of .263 for optimism on perceived ease of use. In addition, the empirical evidence of this study provide not only a stronger significance (.000 for optimism on perceived usefulness, and .002 for optimism on perceived ease of use) than the one found by Walzuch *et al*. (2007), but almost an identical significance for the ones found by Godoe and Johansen (2012). Hence, the previous proposed theory could be confirmed, and similar mechanisms be derived

Second, scholars have called upon research that does not solely focus on TAM's external factor in specific situations (Benbasat & Barki, 2007). By emphasizing the underlying consumer characteristics and their effect on technology acceptance, this thesis shifts attention from unique external factors to technology readiness as a pervasive underlying concept of technology acceptance (Lin *et al*., 2007; Walzuch *et al*., 2007; Godoe & Johansen, 2012). In line with this standpoint, this thesis therefore argues for technology readiness as an "external factor" valid over multiple situations. This approach is not only more theoretical intriguing as it sets off to create a more general approach towards technology adoption, it is also more precise as it takes both consumer-specific and system-specific attributes into account. By finding that optimism, innovativeness, discomfort and insecurity do have an explanatory

[23] Because optimism showed evidence of the strongest explanatory power, and therefore is the strongest contributor to technology acceptance, emphasis is put on this variable instead of variables with a lower explanatory power.

power on perceived usefulness and perceived ease of use it also contributes by strengthening the explanatory power of the technology acceptance model and thus helps build a more holistic approach of technology adoption. Taking the 10.7 per cent of the variation in perceived usefulness, and the 10.8 per cent of the variation in perceived ease of use, into account, a stronger explanatory power is indeed given to the predictive power of the two main components of the technology acceptance model. Here, the significant positive inter-variable relationship between perceived ease of use and perceived usefulness (Davis, 1989; Venkatesh, 2000; Venkatesh & Davis, 2000) is not taken into consideration. Thus, the impact ought to be even greater.

Third, empirical evidence found a shortcoming in the underlying theory. For example, in contrast to Parasuraman (2000), Parasuraman and Colby (2001), and Parasuraman and Colby (2015), a significant negative direct mediating effect for innovativeness on perceived ease of use was observed. Empirical evidence, in line with the findings of Liljander *et al.* (2006), Walzuch *et al*. (2007), Gelderman *et al*. (2011), and Godoe and Johansen (2012) therefore supports the idea of a potential built-in error in the innovativeness measure. Indeed, whereas innovativeness have been proposed to be related to technology adoption (Parasuraman, 2000) the empirical evidence of this study points out that innovative consumers are more likely to not adopt technology; especially in the case when technology is perceived as easy to use. This finding is highly intriguing, similar to the findings of Walzuch *et al*. (2007), and Godoe and Johansen (2012), and ought therefore not to be neglected but further investigated by future studies. Maybe, this could be the result of innovativeness as a too general and non-specific measure as proposed by Liljander *et al.* (2006), and Gelderman *et al*. (2011)?

8.2 Managerial implications

Managing a self-service technology (SST), is rarely a challenge *per se*. After all, it is a technological solution, which shoppers are supposed to operate themselves (Meuter *et al*., 2000). The real challenge for the retail industry seems to be how to get shoppers use this particular technology (Walker *et al.*, 2002; Liljander *et al.*, 2006; Gelderman *et* al., 2011; Kallweit *et al.,* 2014). This thesis addresses this topic, and through its empirical evidence proposes practical solutions to solve some of the managerial implications related to consumer acceptance of SSTs, such as the grocery retail self-scanning system.

First, it is beneficial to once again stress that SSTs are a costly investment (Legris *et al*., 2003; Lee & Yang, 2012; Kimes & Collier, 2015) from which no benefits can be derived until a critical mass of consumers accepts and use the systems (Parasuraman & Colby, 2001). Retailers can therefore no longer sit back and wait until the consumers accept the particular technology (Walker *et al.*, 2002; Liljander *et al*., 2006; Gelderman *et al.*, 2011; Kallweit *et al.,* 2014). Action is needed!

Second, it is pivotal that retailers try to understand the driving forces of the consumers' acceptance of technology. Indeed, the years to come more sophisticated retail technologies will enter the retail environment (Rämne *et al*., 2010). From this study, retailers can benefit because it illustrates how the consumer's basic idea of technology directly affects the consumer technology adoption. For instance, empirical evidence found that technological optimism is a key determinant to consumer acceptance of self-scanning. This implies that retailers that wants to affect the shoppers to use the self-scanning system must inform the consumer in a better way how the shopper benefit of the technology. Here it is pivotal to stress in what way the self-scanning system offers the shopper an "increased control, flexibility, and efficiency" (Parasuraman & Colby, 2001). Because of earlier SST studies, it seems that control in particular is of interest. Indeed, consumer control has been found to be of relevance in the acceptance of SSTs (Dabholkar, 1996; Dabholkar *et al*., 2003; Liljander *et al*., 2006), the evaluation of SSTs (Dabholkar, 1996; Kallweit *et al*., 2014), and the satisfaction with SSTs (Meuter *et al*., 2000; Orel & Kara, 2014). Addressing the shopper's optimism, and in particular the aspect of control, ought to be a winning concept.

Third, as noted by Andrews (2009), retailers install self-service technologies with the view of decreasing costs. However, the present study found evidence of a significant decrease in the consumer's acceptance of self-scanning through the channel of discomfort. This implies that consumers back away from the technology because they possess a "perceived lack of control […] and a feeling of being overwhelmed by it" (Parasuraman & Colby, 2015, p. 60). This may be the result from the retailers freeing significant parts of the human labour (Andrews, 2009). Indeed, it has been found that consumers might feel anxiety when technologies take over routines where the consumer was able to get interpersonal information (Parasuraman & Colby, 2001). Instead of seeing the freed labour derived from installing an SST as a cost that can be cut, retailers ought according to the empirical evidence of this study welcome this labour as a competitive tool. For example, the labour could be used to provide the consumer

with customized information (Gelderman *et al.*, 2011). The latter would stimulate the system's attractiveness by showing its benefits; thus enhance the optimism, and provide sufficient support, thus decrease the consumer's discomfort. There is indeed a big difference between simply giving the consumer the option to use a self-service technology, such as the scanning-scanning system, and actively showing and informing her how the system can be used.

Taking these recommendations into account a greater technology acceptance could be derived. Hence, a similar approach to the managerial problem of consumer acceptance of SSTs would allow retailers to use the SST to its full potential rather than let it turn into one of so many underutilized-technologies (Venkatesh, 2000; Venkatesh & Davis, 2000).

8.3 Future research

This study raises new questions. A fundamental question is the technology readiness approach and its validity. In line with recent literature (*e.g.* Tsikriktsis, 2004; Liljander *et al.*, 2006; Walczuch *et al.*, 2007, Gelderman *et al*., 2011; Godoe & Johansen, 2012; Koivisto *et al*., 2016), the present thesis finds the technology readiness taxonomy to be consistent, but also divergent in contradictive ways. A future research direction could therefore be to replicate the study of Parasuraman and Colby (2015), especially in the light of the findings of Liljander *et al*. (2006) and Gelderman *et al*. (2011): researchers ought to distinguish between general and domain-specific innovativeness. Conducting a similar confirmatory investigation before any other TR-research, such as a replication of this study, could therefore be of great academic interest. Indeed, this thesis assumes that the measures are valid, and the technology readiness-approach can further be applied on the Swedish setting.

In addition, by finding a discrepancy in the innovativeness measure, this study provides an alternative explanation to how the consumer characteristics of innovation affect technology adoption. This new finding provides intriguing insights, which ought to be further investigated. Indeed, innovative consumers cannot be neglected due to their role as lead users[24], and their importance for the diffusion of technology (von Hippel, 1986; Kotler & Armstrong, 2012). Thus, by finding a direct negative relation between innovativeness and perceived ease of use this study may play an important role on the re-evaluation of (i) the

[24] Following the definition of innovativeness (Parasuraman & Colby, 2015).

innovativeness measure, (ii) the role of the innovative consumer in the diffusion of technology, (iii), and in the acceptance of consumer-operated retail technologies in particular.

References

Ajzen, I. (1985). "From intentions to actions: A theory of planned behaviour". In Kuhl, J. & Beckmann, J. (eds.). *Action-control: From cognition to behaviour*: 11-39. Springer: Heidelberg.

Andrews, C.K. (2009). *'Do-it-yourself': Self-checkouts, Supermarkets, and the Self-service Trend in American Business*. University of Maryland: Maryland.

Anselmsson, J. (2001). *Customer-Perceived Service Quality and Technology-Based Self-Service*. Doctoral dissertation. Lund Business Press: Lund.

Avery, P. (ed.). (2008) "Self-Service at Supermarkets and Grocery Stores". *NetWorld Alliance.* [online]. Available at: https://www.kioskmarketplace.com/whitepapers/self-service-at-supermarkets-and-grocery-stores/ [2017-02-01].

Benbasat, I. & Barki, H. (2007). "Quo vadis, TAM?". *Journal of the Association for Information Systems*. 8(4): 211-218.

Bickers, J. (ed.). (2009). "Basics of self-checkout". *NetWorld Alliance.* [online]. Available at: https://www.kioskmarketplace.com/whitepapers/self-checkout/ [2017-02-28].

Bryman, A. & Bell, E. (2011). *Business research methods*. 3rd Ed. Oxford University Press: Oxford.

Cambre, M.A. & Cook, D.L. (1985). "Computer Anxiety: Definition, Measurement, and Correlates". *Journal of Educational Computing Research*. 1(1): 37-54.

Chuttur, M.Y. (2009). "Overview of the Technology Acceptance Model: Origins, Developments and Future Directions". Indiana University, USA. *Sprouts: Working Papers on Information Systems*. 9(37): 1-22.

Dabholkar, P.A. (1996). "Consumer evaluations of new technology-based self-service options: an investigation of alternative models of service quality". *International Journal of Research in Marketing*. 13(1): 29-51.

Dabholkar, P.A. & Bagozzi, R.P. (2002). "An attitudinal model of technology-based self-service: moderating effects of consumer traits and situational factors". *Journal of the Academy of Marketing Science*. 30(3): 184-201.

Dabholkar, P.A., Bobbit, L.M. & Lee, E. (2003). "Understanding consumer motivation and behavior related to self-scanning in retailing: Implications for strategy and research on

technology-based self-service". *International Journal of Service Industry Management*. 14(1): 59-95.

Davis, F.D. (1986). *Technology Acceptance Model for Empirically Testing New End-User Information Systems: Theory and Results*. Doctoral dissertation. Sloan School of Management, Institute of Technology: Massachusetts.

Davis, F.D. (1989). "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology". *MIS Quarterly*. 13(3): 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): 982-100.

Fishbein, M. & Ajzen, I. (1975). *Belief, Attitude, Intention and Behaviour: An Introduction to Theory and Research"*. Addison-Wesley: Reading.

Freeman, M. (1992). "Clarence Saunders: The Piggly Wiggly Man". *Tennessee Historical Quarterley*. 51(3): 161-169.

Gelderman, C.J., Ghijsen, P.W.T. & van Diemen, R. (2011). "Choosing self-service technologies or interpersonal services - The impact of situational factors and technology-related attitudes". *Journal of Retailing and Consumer Services*. 18(5): 414-421.

Gliem, J.A. & Gliem, R.R. (2003). "Calculating, Interpreting and Reporting Chronbach's Alpha Reliability Coefficient for Likert-type Scales". Paper presented at the *Midwesr Research to Practice Conference in Adult, Continuing, and Community Education*. Available at: https://scholarworks.iupui.edu/handle/1805/344 [2017-05-07].

Godoe, P. & Johansen, T.S. (2012). "Understanding adoption of new technologies: Technology readiness and technology acceptance as an integrated concept". *Journal of European Psychology Students*. 3(1): 38-52.

Goldsmit, R.E., Hauteville, F. & Flynn, L.R. (1998). "Theory and measurement of consumer innovativeness - A transnational evaluation". *European Journal of Marketing.* 31(3/4): 340-353.

Hair, J., Black, W., Babin. & Anderson, R. (2013). *Multivariate data analysis*. 7th ed. Pearson: Harlow.

HUI. (2015). “Digitala och mobila köpbeteenden i dagligvaruhandeln - Personlig. Uppkopplad. Sammankopplad.” *HUI Research*. [online]. Available at: https://www.visma.se/siteassets/retail/digitala-kopbeteenden/visma-retail-studie-digitala-och-mobila-kopbeteenden.pdf [2017-02-09].

Hyman, L., Lamb, J. & Bulmer, M. (2006) “The Use of Pre-Existing Survey Questions: Implications for Data Quality”. Paper presented at the European Conference on Quality in Survey Statistics. 24-26 April, Cardiff. Available at: http://ec.europa.eu/eurostat/documents/64157/4374310/22-Use-of-pre-existing-survey-questions-implications-for-data-quality-2006.pdf/e953a39e-50be-40b3-910f-6c0d83f55ed4 [2017-02-01].

Ingene, C.A. (2014). “Retail evolution”. *Journal of Historical Research in Marketing*. 6(2): 279-299.

Kallweit, K., Spreer, P. & Toporowski, W. (2014). “Why do customers use self-service information technologies in retail? The mediation effect of perceived service quality”. *Journal of Retailing and Consumer Services*. 21(3): 268-276.

Kimes, S.E. & Collier, J.E. (2015). “How Customers View Self-Service Technologies: There can be substantial differences between managers’ and customers’ perspectives on new self-service technologies”. *MITSloan Management Review*. 57(1): 25-26.

King, W.R. & He. J. (2006). “A meta-analysis of the technology acceptance model”. *Information & Management*. 43(6): 740-755.

Kjellberg, H. & Helgesson, C.-F. (2007). "The mode of exchange and shaping of markets: Distributor influence in the Swedish post-war food industry". *Industrial Marketing Management.* 36(7): 861-878.

Koivisto, K., Makkonen, M., Frank, L., & Riekkinen, J. (2016). ”Extending the Technology Acceptance Model with Personal Innovativeness and Technology Readiness : A Comparison of Three Models”. In J. Versendaal, C. Kittl, A. Pucihar, & M. K. Borstnar (Eds.), BLED 2016 : Proceedings of the 29th Bled eConference "Digital Economy" (113-128).

Kotler, P. & Armstrong, G. (2012). *Principles of Marketing*. 14th edn. Pearson: New Jersey.

Lee, H.-J. & Yang, K. (2013). "Interpersonal service quality, self-service technology (SST) service quality, and retail patronage". *Journal of Retailing and Consumer Services*. 20(1): 51-57.

Legris, P., Ingham, J., & Collerette, P. (2003). "Why do people use information technology? A critical review of the technology acceptance model". *Information & Management*. 40(3): 191-204.

Liljander, V., Gillberg, F., Gummerus, J. & Riel, A.C.R.v. (2006). "Technology readiness and the evaluation and adoption of self-service technologies". *Journal of Retailing and Consumer Services*. 13(3): 177-191.

Lin, C.-H., Shih, H.-Y. & Sher, P.J. (2007). "Integrating Technology Readiness into Technology Acceptance: The TRAM Model". *Pyschology & Marketing*. 24(7): 641-657.

Lin, C.-H., Shih, H.-Y., Sher, P.J. & Wang, Y. (2005). "Consumer adoption of e-service: integrating technology readiness with the technology acceptance model". Paper presented at the *Technology Management: A Unifying Discipline for Melting the Boundaries* conference. 31st July to 4th August, Portland. Available at: http://ieeexplore.ieee.org/abstract/document/1509728/authors [2017-04-05].

Meuter, M.L., Ostrom, A.L., Bitner, M.J. & Roundtree, R. (2003). "The influence of technology anxiety on consumer use and experiences with self-service technologies". *Journal of Business Research.* 56(11): 899-906.

Meuter, M.L., Ostrom, A.L., Rountree, R.I. & Bitner, M.J. (2000). "Self-service technologies: understanding customer satisfaction with technology-based service encounters". *Journal of Marketing*. 64(3): 50-64.

Nordkvist, M. (ed.). (2015). *Dagligvaruhandeln i Norden 2015*. Ica nyheter: Solna.

Nunnally, J.C. (1978). *Psychometric theory*. 2nd edn. McGraw-Hill: New York.

Nyberg, A. (1998). *Innovation in distribution channels: An evolutionary approach.* Doctoral dissertation. Handelshögskolan: Stockholm.

Oehlsen, N. (2005). "Self-checkout picks up speed". *Cards & Payments*. 18(8): 24-29.

Orel, F.D. & Kara, A. (2014). "Supermarket self-checkout service quality, customer satisfaction, and loyalty: Empirical evidence from an emerging market". *Journal of Retailing and Consumer Services*. 21(2): 118-129.

Pallant, J. (2013). *SPSS Survival Manual: A step to step guide to data analysis using IBM SPSS*. 5th edn. McGraw-Hill: Maidenhead.

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.

Parasuraman, A. & Colby, C.L. (2001). *Techno-ready marketing: How and why your customers adopt technology*. New York Free Press: New York.

Parasuraman, A & Colby, C.L. (2015). "An Updated and Streamlined Technology Readiness Index: TRI 2.0". *Journal of Service Research*. 18(1): 59-74.

Reeves, J. (2016). "This is how the retail industry is dying". *MarketWatch*. [online]. Available at: http://www.marketwatch.com/story/this-is-how-the-retail-industry-is-dying-2016-04-28 [2017-03-15].

Riel, A.C.R.v., Semeijn, J., Ribbink, D. & Bomert-Peters, Y. (2012). "Waiting for service at the checkout: Neagetive emoitional responses, store image and overall satisfaction". *Journal of Service Management*. 23(2): 144-169.

Roehrich, G. (2004). "Consumer innovativeness concepts and measures". *Journal of Business Research*. 57(6): 671-677.

Rogers, E.M. (1962). *Diffusion of Innovations*. 1st ed. Free Press of Glencoe: New York.

Rämne, U., Gustafsson, N., Vestin, H., Lindblom, J. & Kilander, K. (2010). "Härifrån till framtiden - detaljhandeln i Sverige 2025". *Handelns Utredningsinstitut,* HUI. Fristående rapport. [online]. Available at: http://handelsradet.se/wp-content/uploads/2016/01/2010-Harifran-till-framtiden-HUI.pdf [2017-05-08].

Saunders, M., Lewis, P. & Thornhill, A. (2012). *Research Methods for Business Students*. 6th edn. Pearson: Harlow.

Sauro, J. (2011a). "Measuring Usefulness". *MeasuringU*. [online]. Available at: https://measuringu.com/usefulness/ [2017-03-18].

Sauro, J. (2011b). “Should You Use 5 Or 7 Point Scales?”. *MeasuringU*. [online]. Available at: https://measuringu.com/scale-points/ [2017-03-23].

Tabachnick, B.G. & Fidell, L.S. (eds.). (2013). *Using multivariate statistics*. 6th ed. Pearson: Boston.

Tashakkori, A. & Teddlie, C. (eds.). (2003). *Handbook of mixed methods in social & behavioral research*. Thousand Oaks: Sage Publications.

Tsikriktsis, N. (2004). “A Technology Readiness-Based Taxonomy of Customers: A Replication and Extension”. *Journal of Service Research.* 7(1): 42-52.

Udland, M. (2015). “Why retail is hard business”. *Business Insider*. [online]. Available at: http://www.businessinsider.com/why-retail-is-a-hard-business-2015-11?r=US&IR=T&IR=T [2017-03-13].

Venkatesh, V. (2000). “Determinants of Percieved Ease of Use: Integrating Control, Intrinsic Motivation, and Emotion into the Technology Acceptance Model”. *Information Systems Research*. 11(4): 342-365.

Venkatesh, V. & Davis, F.D. (2000). “A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies”. *Management Science*. 46(2): 186-204.

Vetenskapsrådet. (2017). *Forskninsetiska principer inom humanitisk-samhällsvetensplig forskning*. Vetenskapsrådet: Stockholm. [online]. Available at: http://www.codex.vr.se/texts/HSFR.pdf [2017-02-26].

Visma Retail. (2017). “Självscannare är mer lojala kunder”. *Visma*. [online]. Available at: http://media.visma.se/pressreleases/sjaelvscannare-aer-mer-lojala-kunder-1770485 [2017-01-31].

Von Hippel, E. (1986). “Lead Users: A Source of Novel Product Concepts”. *Management Science*. 32(7): 791-805.

Yucel, U.A. & Gulbahar, Y. (2013). “Technology Acceptance Model: A Review of the Priopr Predictors”. *Egitim Bilimleri Fakultesi Dergisi*. 46(1): 89-109.

Walczuch, R., Lemmink, J., & Streukens, S. (2007). “The effects of service employees’ technology readiness on technology acceptance”. *Information & Management*. 44(2): 206-215.

Walker, R.H. Craig-Lees, M., Hecker, R. & Francis, H. (2002). “Technology-enabled service delivery: An investigation of reasons affection customer adoption and rejection”. *International Journal of Service Industry Management*. 13(1): 91-106.

Interviews

Ahlenius, M. (2017). In-person interview. 2017-02-10.

Harrisson, N. (2017). Telephone interview. 2017-02-17.

Sallis, J. (2017). Inquiry on how to handle heterogeneous data in factor analyses. 2017-04-18.

Wahlsten, H. (2017). E-mail interview. 2017-04-27.

Annex 1 – Interview guide[25]

The respondent

1. Can you tell me a little bit about yourself?
2. Can you describe your role in the company?

Self-scanning

3. Can you describe (show me) the different stages of self-scanning?

Introduction of self-scanning:

4. When did your store introduce self-scanning?
5. What was the main reason for its introduction?
6. What effects have the self-scanning system had on your employees?
   [How many work hours have been freed since its introduction? What have you done with them?]
7. Can you describe how you presented the new self-scanning system for your customers?
   [Ask for real-life examples]

Investment

8. How big was the investment?
9. In what ways did the mother company contribute to the investment?
10. Before introducing the self-scanning system, did you compute a ROI *[return on investment]*?
11. Have you done a follow-up on the ROI; what did it show?

Customers and self-scanning

12. How big is your customer base?
13. How many of your customer base (%) is using the self-scanning?
14. How many of your customer base (%) is using the self-scanning on regular basis? [*e.g. 1-2 a month]*
15. How big part of your turnover is represented by self-scanning?

The self-scanning customer and degree of information

16. How would you describe the self-scanning customer?
17. Have you investigated your customers' attitudes towards self-scanning?
    [What did your investigation show?]
18. What do you think is the customer's perception of self-scanning?
    [Ask for real-life examples]
19. What do you think can be a reason to why a consumer choses to not use it?
    [Ask for real-life examples]
20. Is there a component the customer would like to improve? What?
    [Ask for real-life examples]
21. Do you consider you have enough information *[support]* for the self-scanning customer?
22. How is the information *[support]* provided?
    [Ask for real-life examples]
23. What else *[if anything]* could usually be done?
24. Can you give me an example *[if possible]* of when a customer has made you aware of insufficient information *[support]* from the store?

[25] The questions were asked in Swedish, but translated into English for the purpose of this thesis.

Annex 2 – The technology readiness index

Measure for optimism (Parasuraman & Colby, 2015, p. 64)

Item no.	Measures for optimism
OPT1	New technologies contribute to a better quality of life
OPT2	Technology gives me more freedom of mobility
OPT3	Technology gives people more control over their daily lives
OPT4	Technology makes me more productive in my personal life

Measure for optimism - Swedish

Item no.	Measures for optimism
OPT1	Teknik bidrar till en högre levnadsstandard
OPT2	Jag anser att teknik ger mig större rörelsefrihet
OPT3	Teknik ger folk större kontroll över sina liv
OPT4	Jag anser att mitt liv är mer produktivt tack vare teknik

Measure for innovativeness (Parasuraman & Colby, 2015, p. 64)

Item no.	Measures for innovativeness
INN1	Other people come to me for advice on new technologies
INN2	In general, I am among the first in my circle of friends to acquire new technology when it appears
INN3	I can usually figure out new high-tech products and services without help from others
INN4	I keep up with the latest technological developments in my areas of interest

Measure for innovativeness - Swedish

Item no.	Measures for innovativeness
INN1	Andra kommer till mig för att få råd och tips om ny teknik
INN2	Jag anser att jag är den i min vänskapskrets som först inskaffar sig ny teknik
INN3	Jag kan vanligtvis, utan hjälp från andra, lista ut hur ny teknik fungerar
INN4	Jag håller mig uppdaterad om den teknologiska utvecklingen

Measure for discomfort (Parasuraman & Colby, 2015, p. 64)

Item no.	Measures for discomfort
DIS1	When I get technical support from a provider of a high-tech product or service, I sometimes feel as if I am being taken advantage of by someone who knows more than I do
DIS2	Technical support lines are not helpful because they don't explain things in terms I understand
DIS3	Sometimes, I think that technology systems are not designed for use by ordinary people
DIS4	There is no such thing as a manual for a high-tech product or service that's written in plain language

Measure for discomfort - Swedish

Item no.	Measures for discomfort
DIS1	När jag får teknisk support (t.ex. av en Internet- eller telefonleverantör) känner jag att det finns en obalans mellan min och supportens teknikkunskap
DIS2	När jag fåt teknisk support (t.ex. av en Internet- eller telefonleverantörI förklarar inte alltid den tekniska supporten på ett sätt så att jag förstår
DIS3	Ibland tycker jag att tekniska lösningar och datasystem inte är anpassade till vanligt folk
DIS4	Högteknologiska produkter har sällan en instruktionsbok som är skriven på ett begripligt språk

Measure for insecurity (Parasuraman & Colby, 2015, p. 64)

Item no.	Measures for insecurity
INS1	People are too dependent on technology to do things for them
INS2	Too much technology distracts people to a point that is harmful
INS3	Technology lowers the quality of relationships by reducing personal interaction
INS4	I do not feel confident doing business with a place that can only be reached online

Measure for insecurity - Swedish

Item no.	Measures for insecurity
INS1	Folk är alldeles för beroende av teknik och teknologiska lösningar
INS2	För mycket teknik och högteknoogiska produkter distraherar folk till den punkten att det är skadligt
INS3	Högteknologiska produkter sänker kvaliteten på personliga relationer
INS4	Jag känner mig inte bekväm med att handla från en butik som bara kan nås online

Annex 3 – Perceived usefulness

Table 5. Perceived usefulness (Davis, 1989, p. 326)

Item no.	Measures for perceived usefulness
PU1	Electronic mail enables me to accomplish tasks more quickly
PU2	Using electronic mail increases my productivity
PU3	Using electronic mail improves my job performance
PU4	Using electronic mail enhances my effectiveness on the job
PU5	Using electronic mail makes it easier to do my shopping
PU6	Overall, I find the electronic mail system useful in my job

Measure for perceived usefulness - Swedish

Item no.	Measures for perceived usefulness
PU1	Självscanning tillåter mig att shoppa snabbare
PU2	Jag är mer produktiv när jag självscannar
PU3	Självscanning förbättrar min shopping
PU4	Jag är mer tidseffektiv när jag självscannar
PU5	Att självscanna underlättar min shopping
PU6	I det hela anser jag att självscanning är användbart när jag shoppar

Annex 4 – Perceived ease of use

Perceived ease of use (Davis, 1989, p. 326)

Item no.	Measures for perceived ease of use
PEU1	Learning to operate the electronic mail system is easy for me
PEU2	I find it easy to get the electronic mail system to do what I want
PEU3	It is easy for me to remember how to perform tasks using the electronic mail system
PEU4	My interaction with the electronic mail system is clear and understandable
PEU5	I find [that it does not] take a lot of effort to become skilful at using electronic mail
PEU6	Overall, I find the electronic mail system easy to use

Measure for perceived ease of use - Swedish

Item no.	Measures for perceived ease of use
PEU1	Det är lätt att lära sig hur självscannern fungerar
PEU2	Jag tycker det är lätt att få självscannern att göra det jag vill
PEU3	Jag kommer alltid ihåg att scanna och väga varje vara
PEU4	Självscannern är lätt att förstå sig på
PEU5	Det är inte svårt att bli en skicklig självscannare
PEU6	I det hela anser jag att självscanning är enkelt att använda

Annex 5 – Normality assessment

	Mean	S.D.	Skewness	Kurtosis
OPT1	5.830	1.067	-.625	-.208
OPT2	5.990	1.035	-1.042	1.095
OPT3	5.110	1.380	-.404	-.171
OPT4	5.420	1.331	-.595	-.056
INN1	3.840	1.995	.090	-1.126
INN2	3.060	1.823	.576	-.706
INN3	5.200	1.563	-.823	-.126
INN4	4.380	1.774	-.218	-.988
DIS1	3.980	1.662	-.029	-.788
DIS2	3.330	1.704	.337	-.763
DIS3	3.810	1.679	-.029	-.953
DIS4	3.810	1.816	.139	-.947
INS1	4.790	1.758	-.406	-.880
INS2	4.500	1.663	-.376	-.734
INS3	4.570	1.622	-.608	-.322
INS4	2.610	1.832	.901	-.365
PU1	5.530	1.611	-.923	.101
PU2	4.999	1.734	-.439	-.721
PU3	4.999	1.781	-.487	-.737
PU4	5.100	1.833	-.784	-.282
PU5	5.290	1.769	-.887	-.242
PU6	5.500	1.727	-.989	-.014
PEU1	6.480	.931	-1.739	2.012
PEU2	5.930	1.116	-.842	-.038
PEU4	6.060	1.292	-1.263	.593
PEU5	6.290	1.000	-1.342	.961
PEU6	6.340	9.44	-1.326	.896

Annex 6 – Factor analysis on the technology acceptance model

Correlation Matrix[a]

		PU1	PU2	PU3	PU4	PU5	PU6	PUE1	PUE2	PUE4	PUE5	PUE6
Correlation	PU1	1,000	,772	,731	,810	,801	,852	,465	,516	,459	,478	,590
	PU2	,772	1,000	,791	,781	,751	,776	,411	,457	,404	,433	,487
	PU3	,731	,791	1,000	,799	,788	,816	,381	,374	,446	,418	,485
	PU4	,810	,781	,799	1,000	,813	,830	,358	,408	,468	,428	,521
	PU5	,801	,751	,788	,813	1,000	,910	,437	,468	,512	,471	,567
	PU6	,852	,776	,816	,830	,910	1,000	,475	,467	,573	,522	,628
	PUE1	,465	,411	,381	,358	,437	,475	1,000	,588	,526	,738	,739
	PUE2	,516	,457	,374	,408	,468	,467	,588	1,000	,492	,633	,674
	PUE4	,459	,404	,446	,468	,512	,573	,526	,492	1,000	,667	,620
	PUE5	,478	,433	,418	,428	,471	,522	,738	,633	,667	1,000	,799
	PUE6	,590	,487	,485	,521	,567	,628	,739	,674	,620	,799	1,000

a. Determinant = 1,669E-5

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,921
Bartlett's Test of Sphericity	Approx. Chi-Square	1666,627
	df	55
	Sig.	,000

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6,986	63,512	63,512	6,986	63,512	63,512	4,881	44,369	44,369
2	1,665	15,139	78,651	1,665	15,139	78,651	3,771	34,282	78,651
3	,557	5,063	83,714						
4	,425	3,867	87,581						
5	,306	2,782	90,363						
6	,254	2,307	92,670						
7	,228	2,071	94,741						
8	,183	1,665	96,407						
9	,169	1,536	97,943						
10	,155	1,409	99,351						
11	,071	,649	100,000						

Extraction Method: Principal Component Analysis.

Communalities

	Initial	Extraction
PU1	1,000	,819
PU2	1,000	,787
PU3	1,000	,815
PU4	1,000	,852
PU5	1,000	,854
PU6	1,000	,900
PUE1	1,000	,744
PUE2	1,000	,629
PUE4	1,000	,587
PUE5	1,000	,835
PUE6	1,000	,830

Rotated Component Matrix[a]

	Component	
	1	2
PU1	,835	,350
PU2	,849	
PU3	,875	
PU4	,892	
PU5	,866	,321
PU6	,873	,372
PUE1		,841
PUE2		,747
PUE4	,329	,691
PUE5		,885
PUE6	,348	,842

Rotated Component Matrix[a]

	Component	
	1	2
PU1	,835	,350
PU2	,849	
PU3	,875	
PU4	,892	
PU5	,866	,321
PU6	,873	,372
PUE1		,841
PUE2		,747
PUE4	,329	,691
PUE5		,885
PUE6	,348	,842

Annex 7 – List of abbreviations

DIS: Discomfort

INN: Innovativeness

INS: Insecurity

KMO: Kaiser-Meyer-Olkin test for sampling adequacy

OPT: Optimism

PEU: Perceived ease of use

PU: Perceived usefulness

SST: Self-service technology

TAM: Technology acceptance model

TR: Technology readiness

TRAM: Technology readiness and acceptance model

VIF: Variance inflation factor