INTENTION TO USE RFID-ENABLED SERVICES

Theoretical review and case study

by

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Preface

This master thesis is one of a series of papers and reports published by the Centre for Service Innovation (CSI). CSI is a coordinated effort by NHH to focus on the innovation challenges facing the service sector and involves 20 business and academic partners. It aims to increase the quality, efficiency and commercial success of service innovations and to enhance the innovation capabilities of its business and academic partners. CSI is funded through a significant eight year grant from the Research Council of Norway and has recently obtained status as a Centre for Research-based Innovation (SFI).

Summary

This thesis attempts to shed some light over the antecedents of customer's intention to use Radio Frequency Identification (RFID)-enabled services. Former research has primarily been concerned with the acceptance and implementation of RFID systems in cost-conscious businesses mainly focusing on enhancing efficiency in supply managements or the logistics process. As RFID-technology is increasingly introduced into the world of the consumers, little research has been conducted in the pursuit to understand these intention and adoption processes.

A research model is proposed. Theoretically founded on the Unified Theory of Acceptance and Use of Technology (UTAUT), the model is extended with three additional direct determinants namely; Perceived Risk Harm, Emotions, and Experience. The extension is based on empirical studies and additional affective theories. In addition, situational context and perception of control are selected as moderators. The potential influences of moderating variables have up until now been poorly investigated, and by adding these to the model a more holistic picture of the adoption processes is suggested.

560 independent survey respondents make up the data material from which the conclusions have been drawn. The results indicate that extending UTAUT with the suggested antecedents of intention does not significantly add to the predictive validity of the model, with only experience as an added antecedent posing any influence on intention. Only two UTAUT determinants were reported to exert any significant influence on intention. *Performance expectancy* (system characteristic) and *anxiety* (personality trait) were found to be robust determinants of intention unaffected by both situational context and perception of control.

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1.0 Introduction

1.1 Background – justification

The rapid development of information technology (IT) making it smaller, more precise, more user friendly, and more incorporated in our daily lives (e.g. smart phones, online-services, check-in at airports) has opened the door for developing more customized services for specific brands, stores or products. Radio Frequency Identification (RFID) based technology is one such technology platform that can function as a basis for service innovation. This technology has mainly been confined to the B2B services, primarily in logistics, but also in banking and retail companies offering in-store customer services. Much research has been done on the technical aspects related to RFID in these sectors where the main focus has been centered on increasing efficiencies in the supplier management process and lowering costs. Lately, service companies have employed RFID technology in the pursuit of enhancing customer overall value perception using RFID-enabled services to generate additional and unique value for the customer (Lee et al., 2008). *"However, the customers' point of view, in particular customer acceptance of RFID has been a rather neglected issue"* (Müller-Seitz et al. 2009, p.31).

As most of the applications involving RFID and the consumer directly are few, privacy concerns regarding this emerging technology and how it will impact the consumer have already been raised (Sill et al., 2008). The key to achieving success and potential benefits of technology-based services relies on the consumers' willingness and capabilities to adopt these services (Pavlou & Fygenson, 2006). Understanding consumer reactions could be beneficial in guiding the process of designing and implementing configurations of RFID software and hardware by balancing the firm's need for information, and existing and potential customer concerns. Most consumers are unaware of RFID as a term, how it affects products sold, and what benefits and risks that are involved at the consumer level (Juban & Wyld, 2004). Consumer benefit and risk perception must be assessed and the consequences evaluated when considering incorporating RFID technology to products or services.

RFID technology is based on information being passed between a sender and a reader device. A chip or tag acts as a wireless storage device that can be read by a scanner using radio waves. It is also possible to monitor the surroundings in which the chip is located, such as temperature, humidity and air pressure. The strength of this technology lies in the chip's ability to collect, store and move data from the real world to the virtual world where information processing and analysis can take place. This gives RFID-tags in products the ability to communicate to the receiver information about their current condition and history. Depending on the chip's qualities, one can have chips with a read-only ability or read-write ability, where the latter enables new information to be stored, enriching the data on the chip. Protecting the information and reducing access can be achieved by using password restrictions.

1.2 Intention to use RFID-based services

"One of the continuing issues of IS is that of identifying factors that cause people to accept and make use of systems developed and implemented by others" (King & He 2006, p.740)

The ability to predict behavior or influence behavioral actions are essential to those developing and introducing new services based on technology platforms such as RFID. As RFID technology may be considered novel and unfamiliar, or in some cases deterring, it is important to identify the relevant drivers influencing intention to use it, and those facilitating the adoption process. In addition, the way and manner in which the service is introduced and managed, and how the service qualities and applications are communicated, may have significant effects on potential users and their intention to use the new service system.

Technology in general, and specifically new technology, may challenge consumers in such a way that users have to consider and evaluate the new beneficial features and potential pitfalls surrounding the new technology-based service. How do consumers analyze the cost - benefit, or alternatively, risk - utility when assessing RFID-based services? What will encourage intention to use, and what are the potential barriers preventing adoption? This

paper will focus on the intentions to use RFID-based services, and looking into the actual adoption, what are the antecedents that drive this process.

1.3 Purpose of study

The purpose of this thesis is to shed some light over the antecedents for intention to adopt products with RFID-enabled services. Based on UTAUT and theory on cognitive and affective adoption theories, a model will be developed and work as a framework for the thesis. In the following, and after a brief discussion on each matter, the Research Question's (RQ) that will guide this paper are presented.

Intention to use

As more and more products and services are either partly or wholly accessible through technological services, identifying drivers for adoption of such technology is decisive for a service or a product's future success or failure. Locating the right drivers and balancing the perception of risk versus benefits will potentially facilitate an easier adoption process. The first research question guiding this thesis is therefore:

RQ 1: *What are the antecedents of intention to adopt products with integrated RFID based services?*

Emotional antecedents

Based on UTAUT as a theoretical framework the determinants of intention will be examined. Further, by adding the perception of risk harm and the effect of experience to the equation the hope is to get a more holistic overview of the antecedents of intention. In addition, and as put forward in the article of Beaudry and Pinsonneault (2010), complementing the existing cognitive-based perspective further research from an affective-based perspective could help predict a wide range of IT-related behaviors and adoption criteria. By also focusing on emotion-based drivers and the effect of these on behaviors might shed new knowledge on acceptance of novel information technologies, intention to use and usage of new technology-based service systems. In the context of this paper, new technology-based service systems will be exemplified through RFID-enabled services in an attempt to identify relevant antecedents in relation to this technology.

Incorporating the emotional aspect of behavioral intention, research question number two is formulated as:

RQ 2: *What is the relative significance of cognitive based versus affective based antecedents?*

Moderators

Looking at the user context through an individual versus social context, will this affect the relevance of the cognitive and/or affective drivers in a decisive manner? Understanding the context as either individual or social might create different ratings as to what drivers play a determining role when it comes to acceptance, adoption and usage of RFID-based technology services. In addition, the level of perceived control associated with RFID-enabled services may have an effect as to how users will evaluate concerns related to privacy issues.

The proposed moderators of intention are suggested in the following research question.

RQ 3: *Does the importance of cognitive/affective antecedents vary across (or are moderated by) individual and/or social context and the degree of control associated with RFID-enabled services?*

1.4 Contribution

1.4.1 Theoretical
There is little knowledge of the adoptions criteria of products with RFID-technology in the B2C context in general, but specifically from the consumers' point of view (Pramatari & Theotokis 2009; Müller-Seitz et al., 2009; Sill et al., 2008). Expanding this poor understanding of the mechanisms that take place and the antecedents that facilitate these processes will hopefully be a valuable contribution to the theory on this subject. Especially, adding affective-based perspectives complementing and extending existing cognitive-based research will serve as a theoretical contribution to the literature on technological adoption processes. Moreover, by including moderators the intentions is to gain further understanding as to how and which antecedents exert any influence on intention. Concerning privacy, the degree of access to personal data, the element of control users expect, or issues regarding commitment and sharing of information, may have a moderating

role towards adoption of RFID-based services. Addressing the element of control regarding RFID-services will hopefully enrich the theoretical foundation of RFID oriented adoption intentions. In addition, looking at drivers, varying or moderating, in individual and situational contexts, may be a valuable contribution to the RFID adoption theory.

1.4.2 Practical

The growth in service delivery options based on technology has seen a remarkable boom over the last decades. As such, successful technological developments have penetrated into various aspects of our lives, leaving the consumers increasingly familiar with using technology in a wide range of situations and in different applications. Service companies have employed several kinds of technologies to attract, streamline and sway consumers, and to maintain or enhance their business' competitive advantage. In addition, an increasing number of organizations outside the pure service industry are making substantial investments in this area in the hopes of making their products or service offerings stronger, more unique and superior to the competition.

In the case of RFID-technology, though the potential of capturing great value on both sides of the counter has been envisaged, the true value of such services will only be realized when consumers embrace them as desirable and preferred new systems. From a business perspective the successful, broad adoption of RFID-based services is therefore the critical piece in the puzzle, but also the last piece to fall in place. This thesis attempts to shed some light on the factors affecting the intention to use RFID-enabled services, and as such, provide some guidelines as to what service designers should focus on and what implementing strategies to apply.

1.5 Outline of report

The remainder of the report is organized in the following matter. Chapter two will take the reader through the literature review concerning RFID development and current areas of application before moving in to RFID opportunities and usage areas. In chapter three the theoretical foundation of the thesis is presented. Prominent extant user adoption models

and theories will be reviewed which have contributed to the development of the UTAUT. In addition, theories on emotive antecedents and the Theory of Trying will be presented, supporting the added antecedents eventually making up the research model. Chapter four presents current RFID-adoption models further contributing to the understanding of how consumers form intentions to adopt. Based on the reviewed theoretical adoption models these empirical contributions give an insight of how the theories fit to reality. The suggested antecedents of intention are presented in chapter five. Further, the proposed moderators influencing the direct determinants are discussed. Chapter six presents the reader with the theoretical research model and the accompanying hypotheses and introduces the case description. Limitations of current research are also discussed. Chapter seven, describing method, is followed by chapter eight presenting the results from the data analysis. Finally, in chapter nine the results are summarized, discussed and implications presented before further research is suggested.

2.0 RFID – Literature review

2.1 What is RFID?

Technical development

In recent years automatic identification systems have become popular in many service industries; purchasing, distribution logistics, industry, manufacturing companies, retail and material flow systems. Automatic identification systems exist to provide information on people, goods, animals and products in transit (Roberts, 2006). The most commonly used is the barcode system. This is a cheap solution, but with low storage capacity and no reprogramming abilities*. "In its simplest form, RFID is a similar concept to the bar coding"* (Roberts 2006, p. 18). A more sophisticated system is the RFID technology found in ATM cards, electronic travel cards and cell phones, so called smart cards. This is an electronic data storage system that requires a mechanical and physical contact with a reader to be able to transfer data (Roberts, 2006). The stored data can be protected from undesired access through encryption or installing pin codes and passwords. RFID technology therefore enhances *"data processes and is complementary to existing technologies"* (Roberts 2006, p. 18) and is by some considered to be the successor of the barcode system (Roberts, 2006).

RFID is a system that relies on contactless technology. The system is operated using a reader and a data-carrying sender device (transponder), and where the power to transfer information is supplied by the reading device. RFID is a generic term for technologies that use radio waves to automatically identify physical objects (Wang et al, 2010; Roberts, 2006). Developed during World War Two enabling the identification of friendly aircrafts, the technology has been around for more than 50 years. The assumed advantages of this technology given its diverse and versatile areas of application are, among others, increased visibility in supply chain management, reduced labor and inventory costs, increased automation, unique identification, real-time information and enhanced information (Slettemeås, 2009). In short, qualities predicted to rapidly revolutionize sectors from farming and transport to the hospitality industry (Bunduchi et al. 2011). Due to high costs of tags and lack of a unified RFID standard, the widespread adoption of RFID has been slow.

Towards a unified standard

Considered early adopters, lead users in the automotive and transportation sectors (Chao et al., 2007) and in the farming industry experimented with RFID applications in the late 1980s and early 1990s, when the focus was on technology development (Bunduchi et al., 2011). These developments lead to reduced costs, and enabled the diffusion of RFID applications to other sectors. Playing a significant role in promoting a more widespread adoption of RFID technology was the retailing and related manufacturing industries driving adoption through mandates and further development through the establishment of standardization organizations. Though not entirely successful, Wal-Mart and the U.S. Department of Defense attempted to force RFID supply chain applications on their suppliers in 2003 (Roberts, 2006; Bunduchi et al., 2011). This lay the foundation for positioning RFID as a *"critical technology in retailing to the manufacturers of fast moving consumer goods, and stimulating investment in RFID development"* (Bunduchi et al. 2011, p. 509). Overcoming the hurdles of the lack of a unified standard, efforts were intensified during the early part of 2000s, *"where ISO and EPCglobal emerged as the two most influential bodies in the development of RFID technologies"* (Bunduchi et al. 2011, p. 509). Ratification of the EPC standard by ISO in 2006 further reduced the fear of competing and incompatible RFID standards, increasing the number of implementations in other sectors (Bunduchi et al., 2011). As a result, retail and manufacturing sectors were the most widely reported adopters of RFID in the early 2000s. While the best-practice application is still lacking in many areas, further efforts concerning standardization of the technology during the mid-2000s has caused the pace of adoption to accelerate as the focus has shifted to *"developing a wider range of business applications in a variety of industry settings"* (Bunduchi et al. 2011, p. 510). Today, businesses are found in various stages of implementing RFID, from improving operational efficiency, gaining competitive advantages, to more experimental projects. As such, the RFID technology market is in rapid growth*, "with a total value that is expected to top US$7 billion by 2008 and increase to US$26.88 billion by 2017"* (Das & Harrop, 2007 in Wang et al., 2010) and quantities of RFID-tags sold more than doubling from 1.03 billion tags in 2006, to an estimated 2.15 billion tags sold in 2008 (RFID Market Projections 2008 to 2018 in Goethelas et al., 2009)

RFID technology– from barcode to radio waves

RFID is a system which uses radio waves (magnetic or electromagnetic fields) as a power source and to transfer data between the reader and the transponder device. The reader then does not require being in line-of-sight as barcode technology does, which in turn can enhance freedom and supply-chain visibility (Goethals et al., 2010). Data capacities of RFID transponders can range from one byte to several kilobytes.

RFID tags can be either read only or read-write, and normally allow for functionality such as environmental sensors, access, control and encryption (Slettemeås, 2009). One can also distinguish between active and passive transponders. A passive transponder indicates that the power required for operation is drawn from the electrical or magnetic field of the reader and not incorporated in the transponder itself. Energy from the reader is then used to transmit data from the transponder to the reader and from the reader to the transponder. Passive tags have unlimited lifespan and are cheaper to produce, but the trade-off is limited data storage capability and a shorter read range (Roberts, 2006). Active transponders have their own energy supply, such as an incorporated battery, which supplies all or part of the power for the operation of the microchip (RFID-tag) (Finkenzeller, 2010). Typically found as read-write devices, active tags are larger and more expensive than passive tags (Roberts, 2006). *"The use of battery places a limit on the life of the device, although with current battery technology this may be as much as 10 years"* (Roberts 2006, p. 19). In addition, semi-passive tags use a battery source powering the chip's circuitry *"but the device communicates by drawing power from the reader"* (Roberts 2006, p. 19)

The operating frequency of a RFID system is the frequency at which a reader transmits. Transmission frequencies are classified into three ranges; low (L), high (H) and ultra-high (UH), creating achievable ranges from a few millimeters up to 15 meters (Finkenzeller, 2010). RFID systems with a range up to 1 cm are typically called close-coupling systems. For operation, the transponder must be inserted into a reader or placed on a surface provided for this purpose (e.g. electronic door-locking, electronic tickets for public transport etc.) The close coupling between transponder and reader also facilitates greater amounts of power transfer, assisting microchips with non-optimal power consumption (Finkenzeller, 2010). *"Systems with read-write ranges up to one meter are known under the term remote-coupling*

system." (Finkenzeller 2010, p.22). RFID systems with range significantly above one meter are termed long-range systems. Here you can find both passive systems with typical a range of three meters, and active systems achieving a range of 15 meters and above (Finkenzeller, 2010)

2.2. RFID opportunities and usage areas

"RFID technology is, according to both industry and academia, one of the most promising new technologies for improving logistics and manufacturing excellence this decade" (Hergot & Skjelstad 2010, p. 457).

The first commercial implementation of RFID came in 1984 when General Motors attached RFID-tags to car frames to make sure that the right equipment was mounted on each frame. In the 1990s, RFID entered the supply chain for the purpose of managing production and distribution systems (Slettemeås, 2009). Since then RFID technology has been introduced to a wide range of sectors. Vast structures such as airports have successfully implemented RFID, increasing traceability during transportation, baggage tagging and supply of parts. The possibility of managing food trolleys, enabling a smooth access to car parks, organizing taxi arrivals have also been considered as potential areas for using RFID technology (Goethals et al., 2010). Management of livestock through RFID can enable automation in farming activities such as weighing and feeding. This would also help trace animals from their origin in situations where illegally imported meat or other livestock health issues are concerned. Returning to the car industry, according to Roberts (2006) Michelin has been planning to incorporate RFID-tags into their tires*. "The tag will store a unique number for each tire associated with the vehicle's identification number"* (Roberts 2006, p. 21) and have the ability to measure tire wear.

Current applications of RFID

Major industries benefitting from RFID are healthcare, retail and manufacturing. *"Within the healthcare industry, hospitals have implemented RFID to monitor patient movement and to maximize room utilization"* (Goethals et al. 2010, p.69). Seaborne transportation with the increasing numbers of ships and ports use RFID to track containers. In manufacturing, and

especially in the car industry, large amounts of parts and high diversity of models require strong flexibility. *"Using RFID one can identify containers, pallets, organize the inventory better and track the forklifts"* (Goethals et al. 2010, p.69). Estimated to be 150 times faster and in addition more accurate, handheld RFID readers can greatly reduce the time spent on physical inventory-taking as scanning of shelves and displays automatically create a list of items to replenish (Sill et al., 2008). Another area of current usage is library management, where RFID stickers speed up book identification, enable self-checkout and sort and control inventory faster. Passports containing RFID tags have been issued in countries such as Australia, New Zealand and Singapore (Sill et al., 2008). To improve customer service, Hong Kong banks have introduced credit cards with tags enabling an instant identification of any customer entering the banks (Goethals et al., 2010). In day-to-day routines, though most people currently are oblivious to the technology streamlining various activities, RFID-technology already effects our lives through applications such as automatic boarding systems, ski lift passes, anti-theft devices (electronic article surveillance) and the fact that *"most high-end cars are now equipped with an RFID tag in the car keys"* (Roberts 2006, p. 21). As with manufacturing, the military industry have benefitted from RFID through quick identification of ammunition amounts, food, water and other supplies needed during military operations (Finkenzeller, 2010).

Residual tags

Today one can find RFID technology as *""pure" RFID products, as an application (component part of a product), or as an attachment (fixed to a product but not part of it)"* (Slettemeås 2009, p.240). Further one can distinguish between tags that are terminated when brought out of a store, or residual tags (Cazier et al., 2008). Residual tags may remain active after the customer purchases them. For manufacturing and retail this enables the possibilities to extract benefits of closer interaction between products and consumer through user profiling. Here, data about the user is collected, systematized and stored in a profile. RFID acquainted products leave an information trail opening for the possibility of linking user profile and product records, such as location and product-customer engagements. Such information could potentially give retailers knowledge about the use of the product in everyday life (Slettemeås, 2009). Information which in turn can *"make it possible to tailor more individualized offers and promotions to consumers as they return to the store, by connecting*

their profiles, interests, and lifestyle choices to available products " (Slettemeås 2009, p. 224). Further, tagging of individual items are likely to have a more direct impact on individual consumers, *"particularly if tags are left active to help manage the return process in retail stores"* (Sill et al. 2008, p. 78)

Utilizing this technology by creating a unique customer experience, Prada has been using RFID tags to ensure instant customer information about available sizes and colors of all their garments in their New York City store since 2001 (Sill et al., 2008). Taking it one step further, the same store has dressing-rooms displaying runway shows with the clothing brought in to the dressing-room also providing suggestions *"or matching clothes and accessories to the items tagged"* (Slettemeås 2009, p. 224). Other more futuristic scenarios for implementing RFID technology can be envisioned as part of consumers' daily life. Potentially clothing with integrated tags could communicate to the washing machine the appropriate programs enhancing the quality and durability of the fabric, or refrigerators detecting expiry dates, level of stock or communicating the need for re-ordering food by composing a shopping list sent to you by e-mail (Slettemeås, 2009).

3.0 Theoretical foundation: Towards the Unified Theory of Acceptance and Use of Technology (UTAUT)

Alongside the evolvement of information communication technology (ICT), several models have been developed, built upon, modified and extended to try to capture and identify the key factors in acceptance of ICT, intention and/or usage. With varying quality concerning the ability to successfully predict technology adoption, the search for a model with a higher success rate culminated in the Unified Theory of Acceptance and Use of Technology (UTAUT) proposed by Venkatesh et al. (2003). Found to account for 70% of the variance in usage intention, *"UTAUT identifies the key factors in acceptance of ICT as measured by behavioral intention to use the technology and actual usage" (Oye et al. 2012, p. 6).* This makes UTAUT one of the most successful models to date.

Starting with the multi-attribute model by Fishbein and Ajzen (1975) I will in the following review three of these models recognized as the most influential. These three models are also part of the theoretical foundation from which the UTAUT (Venkatesh et al., 2003) originates. The models reviewed are; Theory of Reasoned Action (Fishbein & Ajzen, 1975), Theory of Planned Behavior (Ajzen, 1991) and the Technology Acceptance Model (Davis 1986; 1989). Complementing UTAUT and extending the theoretical basis I will also review the Theory of Trying (Bagozzi & Warshaw, 1990) and, taking into account the affective dimension of predicting technology adoption, the emotive framework proposed by Beaudry and Pinsonneault (2010). The way in which these models build upon each other and extend each other will be demonstrated by extending the graphical presentation accompanying each sub-chapter. As such, the last graphical presentation will summarize all the models, with the exception of UTAUT, and their related determinants.

3.1 Multi-attribute model

In the 60's and 70's marketing researchers began predicting consumer attitudes and behavior directly from cognitive structures. *"Most comprehensive models of the consumer decision process explicitly note the significance of attitude as an intervening variable in*

explaining and predicting brand choice behaviors"(Wilson et al., 1975 p. 39). Attitudes are thought as learned predispositions to respond to an object in a consistently favorable or unfavorable way (Fishbein & Ajzen, 1975). Attitudes are therefore relatively enduring. Attitudes can be created (1) through consumer belief structures – processing information-cognitive learning; knowledge about the object, its attributes, and the benefits provided, (2) directly by mere exposure or behavioral learning, or (3) as a response to strong situational or environmental forces, and after engaging in the behavior, forming attitudes about the experience.

Expectancy-Value theories

To isolate the determinants of motivated behavior, the expectancy-value approach gained most attention. The common ground of such models is that the *"the strength of a tendency to act depends upon (1) the strength of the expectancy that the act will be followed by a consequence and (2) the value of that consequence to the individual"* (Mazis et al. 1975, p.38). In other words, individuals choose between alternative actions relating weighted value (affective orientation) to the potential outcomes of these actions. The motivation to choose a given behavior over the other possible combinations of expectancy-value is determined by *"multiplying the value and expectancy components for each outcome and calculating the algebraic sum across outcomes"* (Mazis et al. 1975, p. 39).

Two of the most noteworthy expectancy-value theories are the ones proposed by Fishbein (1963) and Rosenberg (1953). Fishbein hypothesized that *"attitude toward an act (or object) is a function of (a) the strength of beliefs about an act (or object) and (b) the evaluative aspects of these beliefs"* (Mazis et al. 1975, p. 39). Though similar to the attitude model developed by Rosenberg (1953; 1956), a model strongly influenced by the means-end orientation (Mazis et al., 1975), Fishbein, as opposed to Rosenberg, distinguishes between attitudes toward an act or behavior, and attitude towards an object. Further, Fishbein specifies only one consequence with respect to value achievement (the likelihood of the behavior resulting in a salient outcome), while Rosenberg measurers the expectancy of both salient and opposite outcomes (Mazis et al., 1975). Later, these theories where further developed to be able to capture the multiple attributes an object (e.g., product or a brand) holds *"viewed as a bundle of attributes leading to costs and benefits of differential*

desirability to individuals or segments of the market" (Wilkie & Pessemier 1973, p. 428) or actions as having many consequences (Weddle & Bettman, 1974) . Consequently they were labeled multi-attribute models.

Fishbein and Ajzen multi-attribute model

The Fishbein and Ajzen multi-attribute model (1975) is one of the most influential of its kind. The model measures three components of attitude comprised of salient beliefs about the act or object that are considered during evaluation, object-attitude linkages, or the probability that a particular object has an important attribute, and evaluation of each of the important attributes.

By summing up the separate evaluations of the salient beliefs (the importance weight given to attribute *i* by the consumer (e_i)) weighted by the strength of each belief (the consumer's belief as to the extent to which a satisfactory level of attribute *i* is offered by the act or object B (b_i)) one can calculate the overall evaluation or attitude score for act or object B (A_b). In other words; overall affect reflects consumer's cognitions (beliefs) *"as to the degree to which given objects possess certain attributes weighted by the salience (importance) of each attribute to the individual"* (Wilkie & Pessemier 1973, p. 428). The weighing of each individual belief allows for adjustment reflecting the true importance of each attribute. To create dimensionality, it is necessary to include all relevant product attributes based on consumers' perceptions. Beliefs represent the extent to which each product offers satisfaction for the attribute in question. Algebraically the model is presented by the following equation where *i* represents the attribute or product characteristic and *n* the number of beliefs.

$$Ab = \sum_{i=1}^{n} biei$$

Though intended to explain consumer predispositions toward objects (brands or products) using an appropriate weighting of decision choice-related beliefs *"unweighted beliefs formulation, appeared to generate greater explanatory power than its weighted beliefs counterpart"* (Wuang 1975, p. 345) in terms of their relative ability to explain and diagnose attitude and actual behavior. Further supported by Bass and Wilkie (1973), the amount of

evidence suggests that importance weights are not likely to improve the explanatory capability of multi-attribute models. As a result most research is conducted using the unweighted alternative as depicted in Figure 1.

Multi-attribute Model
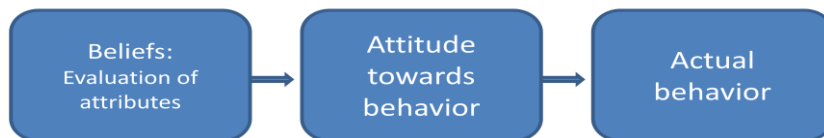
Figure 1: Multi-attribute Model

The main advantage of the Multi-attribute model as opposed to a unidimensional attitude scale (e.g.," overall like-dislike") is that it provides insight into attitudinal structures (Wilkie & Pessemier, 1973). The model should show what is important to consumers about a given product, making it easy to compare brands relative to each other. In respect to attributes perceived as important to consumers, such attitude scores will indicate a brand's performance in relation to these. Further the model is *"useful in diagnosing brand strengths and weaknesses"* (Agarwal & Malhorta 2005, p. 483).

Marketing managers have the power to control the physical characteristics and to some extent the associated image(s) of a brand. Gaining insight into the cognitive structures as well could improve important aspects of a marketing strategy such as guiding "*specific changes in a brand and its marketing support"* (Wilkie & Pessemier 1973, p. 428). Identifying the determinants of attitude such as salient beliefs would therefore enhance the efficiency of attitude change strategies (Mazis et al., 1975). Further, depending on the score, implementing or focusing on the "right" marketing strategy such as capitalizing on relative advantage, strengthening perceived product or specific attribute linkages, adding new attributes, or by influencing competitor's ratings, should increase the efficiency and effect of marketing campaigns.

In the model the overall evaluation of an object or an act (A_b) is not tied to any situational factor. In contrast, behavior always occurs in a situational context or is highly influenced by the environment. Further, other variables such as involvement and financial resources are not included in the model. Attitude alone does not determine behavior. Therefore, the

multi-attribute model does not determine behavior; rather it serves its purpose as a model explaining attitudes toward objects (Ryan & Bonfield, 1975).

3.2 Theory of Reasoned Action (TRA)

The TRA model developed by Martin Fishbein and Icek Ajzen (1975) extends the multi-attribute model and tries to compensate for the inability of the multi-attribute model to predict behavior. The model attempts to explain and predict the behaviors of people in specific situations (Legris et al., 2003) assuming that preceding the action executed is a *"deliberative process culminating in a conscious decision to act"* (Bagozzi & Warshaw 1990, p. 127). In other words, attitude towards an action and subjective norm have an impact on behavioral intention, which in turn predicts behavior (Fishbein & Ajzen, 1975). When impediments exist, goals, rather than intentions may be a more appropriate predictor of actual behavior (Ajzen, 1985). Goals, in the context of TRA, are therefore conceptualized as trying to perform a behavior potentially experienced as problematic due to obstacles in the personal or work environment (Bagozzi & Warshaw, 1990).The TRA is a psychological theory seeking to explain behavior (King & He, 2006) by defining the links between beliefs, attitudes, norms, intentions, and behavior of individuals. The model proposes a separation of behavioral intention from behavior, allowing an explanation on the factors that limit the influence of attitudes on behavior.

Predicting behavior by Intention

Intention is the cognitive representation of a person's readiness to perform a given behavior. On his website Ajzen (2006) defines behavior as: *"the manifest, observable response in a given situation with respect to a given target. Single behavioral observations can be aggregated across contexts and times to produce a more broadly representative measure of behavior".* Understood as the immediate antecedent of behavior, intention is therefore considered the best predictor of behavior. According to the TRA, individual behavior (*B*) is driven by the main dependent factor; behavioral intentions (*BI*) which in turn is predicted by the main independent factors; attitude toward behavior (*A*) and subjective norm (*SN*) related to performing behavior. Behavioral intention will therefore measure a person's

relative strength of intention to perform a behavior. As shown in Figure 2, the variables influencing behavioral intention in TRA build upon the multi-attribute model.
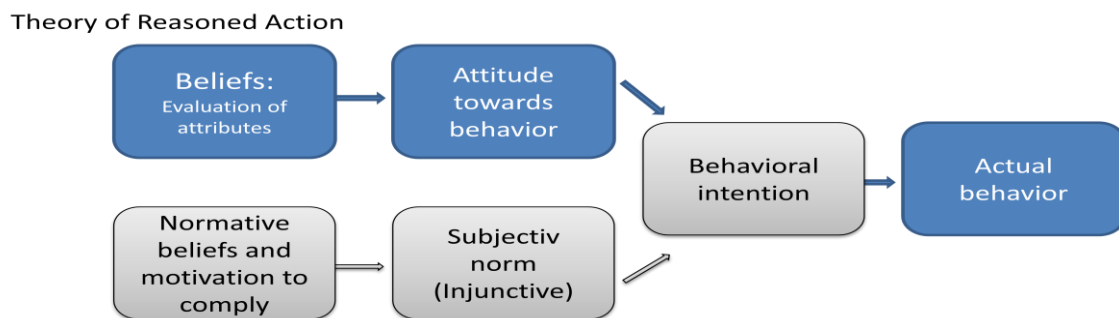
Figure 2: TRA building on the Multi-Attribute model

Behavioral Intention and Subjective Norm

Behavioral intention (BI) is determined by subjective norms. These norms are in turn determined by the normative beliefs of an individual and by one's motivation to act in accordance with the norms. Normative influences concerns one's perceptions that referent groups and individuals believe certain behaviors should (or should not) be performed (Kulviwat et al., 2009). Fishbein and Ajzen (1975) define subjective norms as *"the person's perception that most people who are important to him think he should or should not perform the behavior in question"* (p. 302). Social pressure is one such influential factor affecting individual's perception of appropriate behavior. This relationship is suggested because people may choose to perform a behavior even if they are not favorably inclined towards it as long as it is favorable to the reference group. The contribution of the opinion of significant others is weighted by the motivation that an individual has to comply with the wishes of that referent. Consequently, overall subjective norm can be expressed as the sum of the individual perception multiplied by motivation assessments for all relevant referents (Furneaux, 2005).

Behavioral Intention and Attitude

A person's attitude toward behavior (e.g. using technology) is defined as *"an individual's positive or negative feelings (evaluative affect) about performing the target behavior"* (Fishbein & Ajzen 1975, p. 216). Functioning as a pre-dispositional response system, attitudes are determined through an evaluation of one's beliefs regarding the consequences caused from a behavior (behavioral beliefs) and an evaluation of the appeal of these

consequences (outcome evaluations) (Rivis & Sheeran, 2003). Beliefs are defined by the person's subjective probability that performing a particular behavior will produce specific results. Thus, overall attitude can therefore be measured as the sum of the individual consequence multiplied by desirability assessments for all expected consequences of that behavior (Furneaux, 2005).

The multiattribute model posists that beliefs about the likelihood about the behavior in question will result in outcome *i (bi)* multiplied with the evaluation of salient outcome *i (ei)* produces the attitude toward behavior *B* (*Ab*) (Mazis et al. 1975). Adding to this the TRA includes the notion of subjective norm about behavior (*SN$_b$*). Subjectiv norm is made up of the beliefs that relevant others – referents – think I should perform the behavior *B* (*NBj*) multiplied with the motivation to comply with relevant referents (*MCj*). Both attitude toward behavior and subject norm about behavior is multiplied with a relative weight for performance (*W$_1$ and W$_2$*). Algebraiclly the the theory can be presented by the following equation:

$$B \approx BI = W1 \sum_{i=1}^{n} biei + W2 \sum_{j=1}^{n} NBjMCj$$

As claimed by Miller (2005), attitude and norms are not weighted equally in predicting behavior. *"[…] depending on the individual and the situation, these factors may be very different effects on behavioral intention; thus a weight is associated with each of these factors in the predictive formula of the theory"* (p.127). One's attitudes towards behavior combined with the subjective norms about behavior, each with their own weight, will lead one to one's intention to behave (or not), which in turn will lead to actual behavior. Representing these individual variances and the importance of each term are the empirically derived weights w_1 and w_2.

3.3 Theory of Planned Behavior (TPB)

Originating from the TRA, the theory of planned behavior (TPB) incorporates both social influence and personal factors as predictors (Rivis & Sheeran, 2003) by including perceived

behavioral control (PBC) as an additional determinant of intentions and behavior (see Figure 3). PBC is added to cover non-volitional behaviors to help predict behavioral intention and actual behavior. TRA, on the other hand, assumes volitional control over behavior and interest, leaving the construct of perceived behavioral control irrelevant (Ajzen, 2006). TRA suggests that reasoned behaviors are preceded by a deliberate process that culminates in the decision or intention to act (Fishbein & Ajzen, 1975) and where the two key assumptions are that *" (1) action is preceded by a deliberative process culminating in a conscious decision to act, and (2) if the individual tries to act, no impediments are likely to stand in the way, such as ability limitations, lack of money, environmental contingencies, and unconscious habit"* (Bagozzi & Warshaw 1990, p. 127). In practice, constraints such as limited ability, time, environmental or organizational limits, and unconscious habits will limit the freedom to act representing potential barriers which can prevent actual behavior even after a decision to act has been made. The TPB is therefore a theory which attempts to resolve these limitations by predicting deliberate behavior, since behavior can be deliberative and planned. According to research, *"adding PBC typically increases the explained variance in intention by five to twelve percent, and increases the explained variance in behavior by two to twelve percent over and above intentions"* (Rivis & Sheeran 2003, p. 219).

Behavioral Intention

In the TPB, behavior is a function of compatible intentions and perceptions of behavioral control (Ajzen, 2006). The TPB takes for granted, as with TRA, that individual behavior is driven by behavioral intentions. As mentioned, behavioral intention summarizes one's motivation to engage in a behavior, indicating how hard you are willing to try and how much time and effort you are willing to dedicate to be able to perform a given behavior (Rivis & Sheeran, 2003). In the TPB these behavioral intentions are a function of three constructs; (A) attitude toward specific behavior (positive or negative evaluations of performing a behavior), (SN) subjective norms surrounding the performance of the behavior, and (PBC) perceived behavioral control when performing a behavior, with each predictor weighted for its importance in relation to the behavior and population of interest.

Attitude and subjective norm have been defined under the TRA model, and I will therefore concentrate on the third construct, *PBC*, and its effect on behavioral intentions.
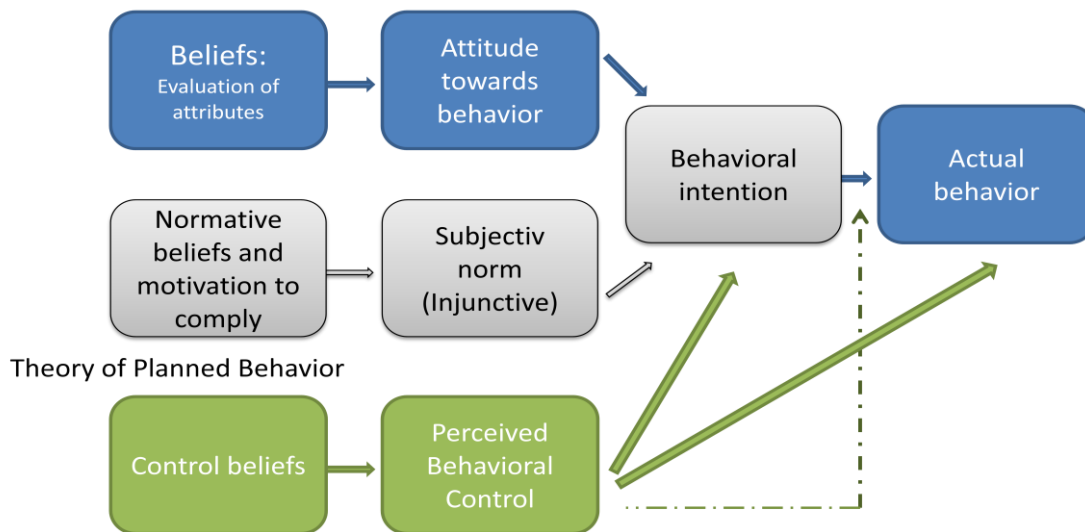
Figure 3: TRA and TPB

Perceived Behavioral Control

Perceived behavioral control is defined by Ajzen (1991) as, *"the perceived ease or difficulty of performing the behavior"* (p. 168). According to Ajzen (2006) PBC is also expected to moderate the effect of intention on behavior (indicated by the dotted line in Figure 3), in the way that a favorable intention produces the behavior only when perceived behavioral control is strong. In other words, you are more likely to intend to participate in a behavior if you are positively inclined towards it (attitude), if you experience social pressure to do so (subjective norm), and if you believe that it will result in a fruitful outcome (perceived behavioral control). Similarly, the stronger your intentions, the more motivated you are towards the behavior, the more likely you are to perform the behavior (Rivis & Sheeran, 2003).

As with attitude and subjective norm, it is assumed that PBC is determined by the total set of accessible control beliefs, i.e. beliefs about factors that may strengthen or weaken performance of the given behavior. The strength of each control belief is weighted by the perceived power of the control factor, and the products are aggregated. *"To the extent that it is an accurate reflection of actual behavior perceived behavioral control can, together with intention, be used to predict behavior"* (Ajzen, 2006).

Measuring the effect of PBC on Intention

PBC has motivational implications for behavioral intent, equivalent to that of attitude and subjective norm, but it does not translate into actual ability to predict behavior. False beliefs of own strength, talent or capacity will nonetheless form positive intentions in the mind of the person. This indicates that behavioral intention is driven by perceptions, independent of accuracy or stability, and affected by the level of motivation a person has to convert PBC into behavioral intention (Notani, 1998). Therefore, *"Accuracy of a PBC measure has an impact on the strength of the link between PBC and behavior"* (Notani 1998, p. 265).

The difficulty of assessing actual control in the model has led to the use of perceived behavioral control as a proxy (Furneaux, 2005). Even so, there is a fundamental difficulty with measuring PBC, as it may be hard or even impossible for people to predict in advance their PBC of future behaviors (Notani, 1998). In addition, unforeseen changes in behavioral control may occur between the time of measuring PBC and the actual execution of the behavior. Differences in sample attributes (e.g. lack of experience and self-knowledge, cognitive test-taking abilities or inclination for a rational approach) reflect some of the diverging results of PBC affecting BI and B. PBC was found to be a significant predictor of BI in samples comprising of students. As a predictor of behavior, on the other hand, PBC was only found significant when using a non-student sample representing the general adult population (Notani, 1998)

On a general basis emphasizing the different qualities of PBC, high PBC creates positive behavioral intentions independent of internal or external control problems. *"However, PBC is successful in predicting behavior only for behavior that pose control problems that are primarily under the control of the individual because these perceptions of control are more accurate"* (Notani 1998, p. 265)

Having experienced and/or executed the behavior beforehand implies that the subject has information on similar past behavior which in turn enables a more accurate assessment of one's PBC. Therefore, when considering familiar behavior, PBC is a significant predictor for both BI and B. Unfamiliarity with a behavior may result in lack of interest or even anxiety toward engaging in the behavior, and estimation of PBC will therefore be poor and inaccurate (Notani, 1998).

Improving the predictive power of PBC

According to his research, Notani (1998) identified four situations where PBC may provide higher accuracy when predicting behavior; (1) when the sample is made up of non-students rather than students (2) when PBC is conceptualized as concerning control of factors primarily internal to the individual versus external, (3) when the behaviors measured in relation to PBC are familiar rather than unfamiliar, and (4) when PBC is operatonalized as a global measure as opposed to a belief-based measure. When predicting BI, PBC is more successful for student samples and for familiar behaviors, but is equally predictive for the last two moderators. Although the results show that PBC can serve as a useful predictor of behavior under certain conditions Notani adds; *"Nevertheless, intention is still the stronger predictor, and consistency in predicting BI is dominated by attitude rather than PBC"* (Notani, 1998, p. 266).

Ajzen (1991) welcomes research that contributes to increase the predictability of the TPB model through additional variables. One such contribution, proposed by Rivis and Sheeran (2003), is by adding descriptive norm which allegedly should *"capture a significant proportion of the variance in intention or behavior after the theory's current variables have been taken into account"* (Ajzen 1991, p. 199). Social norm, in the TPB context, is categorized as an injunctive social norm concerning social pressure, such as a person's potential to gain approval or suffer sanctions from significant others for engaging in a behavior. Descriptive norms are concerned with what significant others actually do which in turn may provide informative inputs to the decision making process of other people (Rivis & Sheeran, 2003). Rivis and Sheeran (2003) argue that descriptive norms should be included in the TPB, contributing with *"an additional 5 percent to the variance in intention after attitudes, subjective norms and perceived behavioral control have been taken into account"* (p. 228) which should improve the predictive validity of the TPB significantly. The descriptive norm-intention relation is strongest amongst young adults such as children and students as they are more susceptible to social influences and are more strongly associated with imitating behavior of significant others in an attempt to gain group acceptance (Rivis & Sheeran, 2003).

3.4 Technology Acceptance Model (TAM)

The complexity of the TPB model limits its use in information system research (Oye et al., 2012). The Technology Acceptance model (TAM) is therefore an extension of the TRA into the research field of information systems (IS) sharing the same basic premises and components outlined in Ajzen and Fishbein's Theory of Reasoned Action (1975), though emphasizing the design of system characteristics. The theory proposes a model as to how users come to accept and use a new technology, or sometimes reject it, by explaining the relationship between internal psychological variables – such as beliefs, attitudes, and behavioral intention – and actual system usage (Davis, 1986; 1989). In the words of Davis et al. (1989); *"the goal of TAM is to provide an explanation of the determinants of computer acceptance that is general, capable of explaining user behavior across a broad range of end-user computing technologies and user populations"* (p. 985).

Perceived Ease of Use and Perceived Usefulness

As with TRA, the TAM model proposes that external variables intervene indirectly by influencing beliefs, attitudes and intentions fully mediated by perceived ease of use (PEOU) and perceived usefulness (PU) (Legris, 2003) (see: Figure 4). The assumptions are that these constructs have a significant influence on attitude towards using new technology and ultimately on actual use (Schepers & Wetzel, 2007) and are therefore the most important factors explaining system usage. The model therefore tries to explain the causal links between the main independent belief constructs, PU and PEOU, and the users' attitudes, intentions and actual adoption behavior (Szajna, 1996). Perceived usefulness is defined by Davis (1989) as *"the degree to which a person believes that using a particular system would enhance his or her job performance"* (p.320), and perceived ease of use as *"the degree to which a person believes that using a particular system would be free of effort"* (p.320). Though these definitions are designed and developed within an organizational context having been applied in a consumer context the model has shown to hold great validity and has persistently demonstrated high predictive power concerning consumer behavioral intention as well. Figure 4 displays how TAM positions itself in accordance to TRA and TPB, and in accordance to BI.
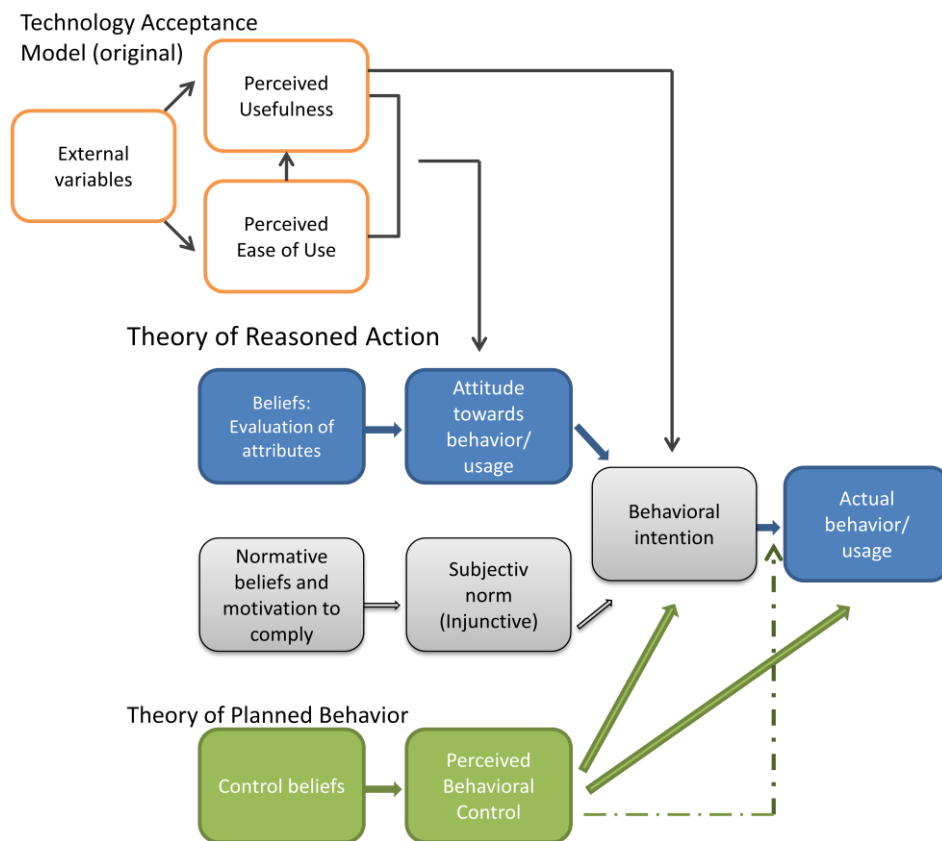
Figure 4: TRA, TPB and TAM

Intentions

Acceptance of an IS is determined by intentions to accept the system. Intentions are determined by attitude toward the IS and perceptions concerning usefulness. As mentioned, attitudes are formed from the beliefs (favorable or unfavorable) one holds about the system, or the desirability of using the system. The beliefs in TAM are made up of the target group's perceptions of the systems usefulness and ease of use (Szajna, 1996). Affecting indirectly through beliefs, attitudes or intentions are the external variables such as task, user characteristics, organizational factors, political influence and the development process (Szajna, 1996). The dependent constructs are, similarly to TRA and TPB, behavioral intention to use and actual system usage. As with TRA, TAM assumes that when individuals form an intention to act this will be an act without limitation neglecting the same practical constraints such as limited ability, time, environmental or organizational limits, and unconscious habits limiting this freedom (Furneuax, 2006).

The development of TAM

In the original TAM Davis et al. (1989) proposed that both PEOU and PU affect behavioral intention through attitudes (see: original TAM in Figure 5). Attitude and PU influence the individual's BI to use the system and actual use of the system is predicted by BI (Malhotra & Galletta, 1999). In the revised version of TAM, Davis et al. (1989) introduce a pre-implementation version and a post-implementation version (Szajna, 1996) (see: Figure 5). In the former model PEOU and PU both are expected to affect intention to use before actual implementation. In the post-implementation version, functioning as determinants of technology acceptance, PEOU works primarily through PU rather than directly on behavioral intention (King & He, 2006). PEOU is here found to function more as a pre-requisite or causal antecedent to PU, as opposed to a parallel, direct determinant of system usage. Once users have experience from using an IS PEOU is overshadowed as an influencing construct and *"subsequent intentions are formed from their perception of its usefulness. Intentions then are expected to predict future technology acceptance behavior"* (Szajna 1996, p. 86).
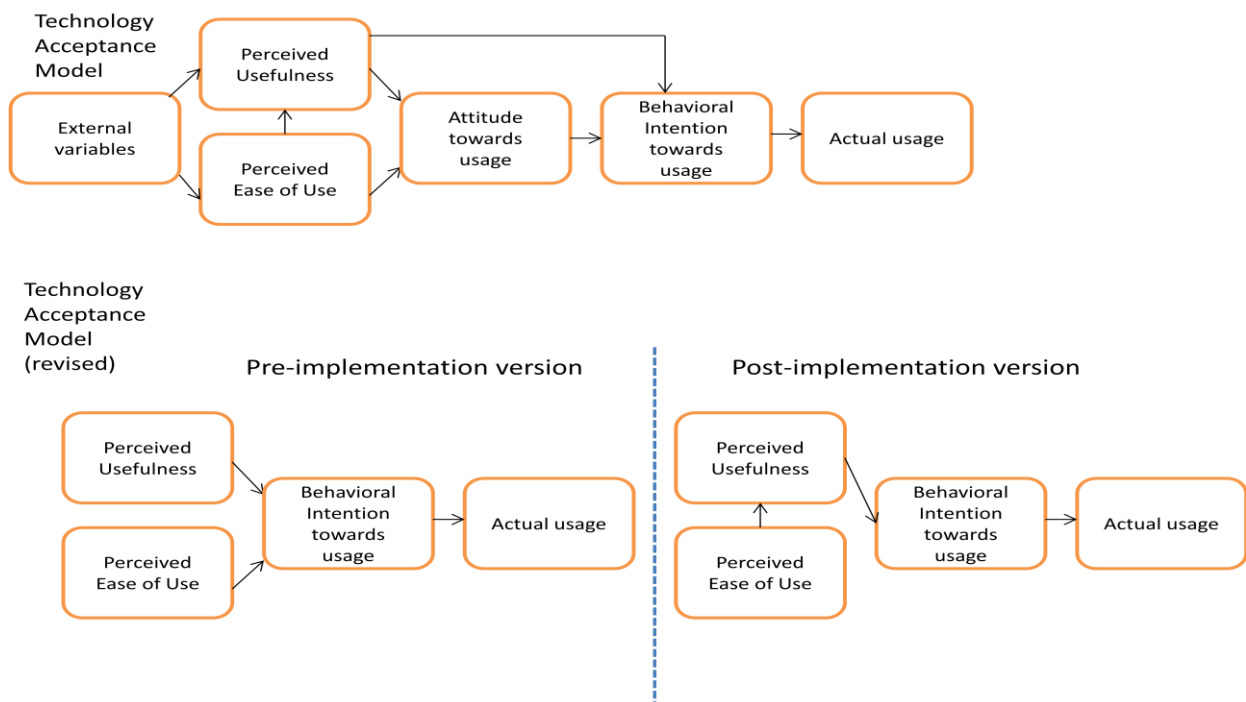
Figure 5: Original TAM with Pre and Post-implementation versions

Questioning the need for two versions of TAM, Szajna (1996) states that *" the consistent direct relationship of ease of use to usefulness and the lack of relationship between ease of use and intentions makes a case for a single version of the TAM similar to the original model"*

(p. 91). Further, she argues for adding an experience component associated with TAM to be able to capture and understand the belief-intention-acceptance relationship for the pre- and post-implementation versions. This is also supported by King and He (2006) confirming the consistently moderating effect of inexperienced versus experienced users.

Attitude in TAM

In addition, in the revised version of TAM, the attitude construct has been excluded from the model (Furneaux, 2006). This is because the link between PU and BI seemingly was of a more significant character; such as if a system is perceived to be useful, people may have a high BI even though they do not have a positive attitude toward it (Davis et al., 1989). Supporting this exclusion is the expectation that beliefs or attitudes differ or change with experience. This leaves the role of attitude, affecting intention or actual adoption behavior, limited and at best a partial mediator in relationship between prominent beliefs and the adoption behavior or intention (Venkatesh et al., 2003). As new technologies might seem complicated and in some instances intimidating, uncertainty concerns regarding a successful adoption influences the attitudes and intentions towards learning to use the technology prior to actual experience with the technology (Bagozzi et al., 1992). Therefore, *"Attitudes towards usage and intentions to use may be ill-formed or lacking in conviction or else may occur only after preliminary strivings to learn to use the technology evolve. Thus, actual usage may not be a direct or immediate consequence of such attitude and intentions"* (Bagozzi et al., 1992 in Oye et al. 2012, p.2). Instead the aforementioned technology acceptance measures PU and PEOU replace the attitudinal constructs from the TPB in an attempt to simplify the model making prediction of acceptance in fact easier to predict (Oye et al., 2012). According to Szajna (1996) the exclusion of attitude has shown good results in predicating intention and is therefore found to be useful in situations where intentions are of primary importance. Categorizing attitude together with usage as a consequence factor, King and He (2006) claim that *"the influence of perceived usefulness on behavioral intention is profound"* (p. 751). Contrary to this belief and supporting the relationships in the original TAM, Schepers and Wetzel (2007) refer to their results showing the *"significance of perceived usefulness and perceived ease of use towards attitude and behavioral intention to use"* (p. 99). Research has shown mixed conclusions regarding the mediating role of attitude in IT acceptance, ranging from full mediation between beliefs-intention-actual usage to only partially

mediating or not mediating at all. Such inconsistency about the role of attitude in IT acceptance might for some researchers advocate for a minor role in such studies, for others attitude must simply not be ignored, no matter how weak, as it is considered to pose greater effect on intention than that of PU.

Social Influence in TAM

Further, TAM does not include subjectiv norm or account for social influence in the adoption and utilization of new IS (Malhorta & Galletta, 1999). Davis chose to exclude this variable in the original TAM as he estimated that it had an insignificant effect on behavioral intention (Legris, 2003). Later, the construct was added in the model TAM 2. Social influence has been seen to impact individual behavior through three mechanisms, namely; internalization, identification and compliance (Venktatesh et al., 2003). As TAM extendes on the theoretical basis of TRA, distinguishing between user behavior caused by the influence of referents on one's intent or by one's own attitude was proven difficult. However, when differentiating between these processes one could ascertain the cause behind individual usage behavior (Malhorta & Galletta, 1999). Schepers and Wetzel (2007) found subjectiv norm to influence technology acceptance through PU (internalization effect, Kleman 1958). This representes *"the human tendency to interpret information form important others as evidence about reality"* (Schepers & Wetzel 2007, p. 91), in short, the beliefs of important others become one's own (Lewis et al., 2003). Influence through identification occurs when individuals *"seek to believe and act in a manner similar to those possessing referent power"* (Lewis et al. 2003, p. 662). As the influence is accepted because of congruency with one's own value system, commitment and enthusiasm connected to system usage should be created (Malhorta & Galletta, 1999). Inputs received from important others are therefore believed to influence one's cognition about the expected outcomes of technology use (Lewis et al., 2003). In the consumer market, Schepers and Wetzel (2007) translate subjectiv norm in the technology adoption process into taking the form of word-of-mouth. Further, subjectiv norm was found to affect intention to use in mandetory settings (compliance effect, Kleman 1958). In other words, performing behavior in compliance to what significant others tell you to do, fosters uninvested and pro forma system usage (Malhorta & Galletta, 1999). Behaving in compliance is independent of, or even in contrast to, own wishes or beliefs (Schepers & Wetzel, 2007). Rather, it is a result of altering intention as a respons to

social pressure (Venkatesh et al., 2003) through the expectation of gaining rewards or avoiding punishments. Such compliance tendency was especially found to have moderating effects when using student samples, as oppsed to non-student samples, generating both stronger effect sizes and stronger realtionships (Schepers & Wetzel, 2007). A potential explaination is the fact that students are often more homogeneous and have a stronger tendency to comply with authority. In addition, and supporting the call for an experience component in the model (Szajna, 1996; King & He, 2006), familiarity with the given technology significantly moderates the realtionships. This result also corresponds with the findings of Gefen (2003, in Schepers & Wetzel, 2007) explaining 40 percent of the variance in intention to use through habit. *"In these cases, repeated previous behavior dictates current behavior independently of rational assessments"*(Schepers & Wetzel 2007, p. 100).

TAM – Regarded and Critizised

Keeping in mind that *"for the entire TAM to be practically useful, beliefs and intentions must be strong indicators of eventual acceptance"*(Szajna 1996, p. 92),TAM has been highly regarded and widely used because of its high predictive power and simplicity in explaining IT acceptance behavior across various contexts (Venkatesh, 2000). Though it has shown to be a valid and robust model (King & He, 2006), TAM has also been criticized (e.g., Agarwal and Prasad (1998) explicitly criticized the absence of moderating influences in TAM). This has resulted in the model being extended and upgraded mainly by introducing additional or alternative beliefs factors, adding user resources and restrictions, and by examining antecedents and moderators of PU and PEOU (Furneuax, 2006)*.* In their paper King and He (2006) present TAM as *"the 'core' of a broader evolutionary structure that has experienced four major categories of modification"* (p. 741). These factors are; (1) prior external factors, (2) factors suggested by other theories (to increase predictive power), (3) contextual factors with potentially moderating effects, and (4) consequence measurers.

From TAM to TAM2

One of the most recognized extensions of TAM is TAM2. By answering the call for a modified model that incorporated both human and social variables TAM 2 was developed (Venkatesh & Davis, 2000). By adding subjective norm to the original TAM, Venkatesh and Davis (2000) hypothesized the construct's effect on both PU and intention to use. Extending the model

increased the predicative power from 17 percent to 42 percent (Venkatesh et al., 2003). Later, reviewing eight leading models developed to explain user acceptance of new technology Venkatesh et al. (2003) proposed the Unified Theory of Acceptance and Use of Technology (UTAUT) model.

3.5 The Unified Theory of Acceptance and Use of Technology

In the pursuit of creating a technology acceptance model that could deliver a higher prediction of success Venkatesh, Morris, Davis and Davis (2003) developed a comprehensive framework for technology adoption analysis – the Unified Theory of Acceptance and Use of Technology (UTAUT). The UTAUT framework is based on the review of eight prominent models, namely; (1) the Theory of Reasoned Action (TRA), (2) the Technology Acceptance Model (TAM), (3) the Motivational Model (MM), (4) the Theory of Planned Behavior (TPB), (5) a combination model of TAM and TPB (C-TAM-TPB), (6) the Model of PC Utilization (MPCU), (7) the Innovation Diffusion Theory (IDT), and (8) the Social Cognitive Theory (SCT). By reviewing these models and their extensions, the UTAUT framework has been tested and confirmed to be a useful tool for *"assessing the likelihood for success for new technology and to understand the drivers of acceptance in order to proactively design interventions (including training, marketing etc.) targeted to populations of users that may be less inclined to adopt and use new systems"* (Venkatesh et al. 2003, p. 426). The ultimate goal with UTAUT is then to explain the dependent constructs, namely the users' behavioral intention to use an information system and their subsequent usage behavior (Venkatesh et al., 2003).

3.5.1 The five remaining models constituting UTAUT

The theoretically foundation of Venkatesh et al.'s (2003) paper is based on the review of the aforementioned eight models, and by discussing similarities and differences, cumulating into the UTAUT model. By applying UTAUT as a general framework for this thesis, the choice of going in depth in only three of the eight models (TRA, TPB and TAM) mirrored in UTAUT is justified by the fact that these models represent the evolvement of the IS research field, functioning as building blocks leading up to the development of UTAUT. This is illustrated by

the fact that TRA originates from TPB and TAM again is adapted from TRA. In addition, TAM is the most widely applied conceptual model in the technology-acceptance literature and has further received extensive empirical support indicating model robustness.

Summing up, these three models have been leading in their fields and found to be applicable in various contexts or acting as a core construct from where improved models have been developed. Further, due to the fact that this is a master thesis of an exploratory nature, the choice of including additional theoretical inputs in the pursuit of gaining a more holistic and reflected picture of the technology acceptance process has been prioritized. By this I do not wish to undermine the contributions of the remaining five models. In the following, I will therefore give a brief introduction of the five remaining models and their main constructs before moving on to the UTAUT model itself.

3.5.1.1 Motivational Model (MM)

General motivation theory is a supported psychological explanation for behavior and has been applied to understand new technology adoption and use (Venkatesh et al., 2003). The theory divides between *extrinsic motivation* and *intrinsic motivation*. Extrinsic motivation is explained as the perception of a user wanting to perform an activity as it is perceived as being *"instrumental in achieving valued outcomes that are distinct from the activity itself"* (Davis et al. 1992, p. 1112) and is captured in the concept of performance expectancy in UTAUT. Intrinsic motivation, on the other hand, requires no apparent reinforcement and captures the individual's perception of wanting to conduct in an activity purely for the process of performing the activity in question (i.e. perceived fun)(Davis et al., 1992).

3.5.1.2 Combined TAM and TPB (C-TAM-TPB)

As the name indicates, this is a hybrid model combining the predictors of TPB with PU from TAM. The core constructs in this model therefore are; *attitude toward behavior*, *subjective norm* (social influence in UTAUT), *perceived behavioral control* (facilitating conditions in UTAUT) and *perceived usefulness* (performance expectancy in UTAUT) (Venkatesh et al., 2003).

3.5.1.3 Model of PC Utilization (MPCU)

Triandis (1980) proposed a competing perspective to that represented in Fishbein & Ajzen's (1975) Theory of Reasoned Action (Venkatesh et al., 2003), arguing that *"behavioral intentions are determined by feelings people have toward the behavior (affect), what they*

think they should do (social factors), and by the expected consequences of the behavior" (Thompson et al. 1991, p. 125). Thompson et al. (1991) therefore tested Triandis' (1980) theory of human behavior by extending it to the IS context. Seeking to predict usage behavior, or PC utilization, rather than intentions the MPCU model (Thompson et al., 1991) is found to be *"particularly suited to predict individual acceptance and use of a range of information technology"* (Venkatesh et al. 2003, Table 1). The direct effects on behavior derived from Triandis (1980) are *social factors* (social influence in UTAUT), *affect*, *perceived consequences*, and *facilitating conditions* (facilitating conditions in UTAUT) (Thompson et al., 1991). Perceived consequences are further broken down to two dimensions; near-term consequences, represented by complexity and job-fit, and long-term consequences. In UTAUT one can find the two near-term components mirrored in the constructs of effort expectancy and performance expectancy respectively. Thompson et al. (1991) chose to exclude two of the original constructs from Triandis' (1980) theory when testing his theory in relation to PC utilization namely, behavioral intentions, as actual behavior was the focus of intention, and habits. Habits were excluded since previous usage was considered to have a *"tautological relationship with current use"* (Thompson et al. 1991, p. 126).

3.5.1.4 Innovation diffusion theory (IDT)

In the early 1960s Everett Rogers proposed a theory for the adoption of innovations in his book "Diffusion of innovations". Grounded in sociology IDT has been used to study a variety of innovations. Adapting the characteristics of innovation to the IS field was done by Moore and Benbaset (1991) when trying to refine *"a set of constructs that could be used to study individual technology acceptance"* (Venaktesh et al. 2003, Table 1 cont.). Thus, by selecting attributes from Rogers and adding PEOU and PU from TAM (Davis, 1989) and the image construct based on the work of Tornatzky and Klein (1982) the core constructs making up this model are; *relative advantage* (performance expectancy in UTAUT), *ease of use* (effort expectancy in UTAUT), *image* (social influence in UTAUT), *visibility*, *compatibility* (facilitating conditions in UTAUT), *results demonstrability*, and *voluntariness* of use. Relative advantage is understood compared to the previous version of an innovation. EOU reflects the difficulty of using the innovation. Image is defined as *"the degree to which use of an innovation is perceived to enhance one's image or status in one's social system"* (Moore & Benbasat 1991, p. 195). Visibility depends on the ability to view others using the same system. Compatibility of an innovation refers to the perception of consistency with existing values *"incorporating*

items that tap the fit between individual work style and organizational system usage" (Venkatesh et al. 2003, p. 453). Results demonstrability in the IDT theory concerns "the tangibility of results using the innovation, including their observability and communicability" (Moore & Benbasat 1991, p. 203). Lastly, voluntariness of use defines the perception of innovation usage being based on free will (Venkatesh et al., 2003) and is found as moderating social influence in UTAUT.

3.5.1.5 Social Cognitive Theory (SCT)

SCT (Bandura 1977; 1978; 1982; 1986) is based on the premise that *"environmental influences such as social pressure or unique situational characteristics, cognitive and other personal factors including personality as well as demographic characteristics, and behavior are reciprocally determined"* (Compeau & Higgins 1995, p. 190). By this it is meant that all three influences operate interactively as determinants of each in an ongoing reciprocal interaction (Compeau & Higgins, 1995). As one of the most influential theories of human behavior, Compeau and Higgins (1995) *"applied and extended SCT to the context of computer utilization"* (Venkatesh et al. 2003, Table 1 cont.). Core constructs in this theory are; *outcome expectations – performance*, defined as performance-related consequences of the behavior, *outcome expectations – personal*, defined as personal consequences related to behavior such as individual esteem and sense of accomplishment, *self-efficacy*, *anxiety* and *affect*. Outcome expectations are captured in the concept of performance expectancy in UTAUT. Further, the constructs labeled *encouragement of use* and *other's actual use* of the system are suggested to influence behavior indirectly *"through its influence on self-efficacy and outcome expectations"* (Compeau & Higgins 1995, p. 203).

Summing up the five models

The following table, Table 1, indicates the four independent UTAUT variables, their definitions and corresponding constructs found in the five models briefly reviewed in the previous sub-chapters. The table underscores the similarities in constructs across the various adoption models making up each of the independent UTAUT variables.

UTAUT variable	Definition	Construct	Model
Performance expectancy	The degree to which an individual believes that using the system will help him or her to attain gains in job performance	- Perceived usefulness - Extrinsic motivation - Job-fit - Relative advantage - Outcome expectations	- C-TAM-TPB - MM - MPCU - IDT - SCT
Effort expectancy	The degree of ease associated with the use of the system	- Complexity - Ease of use	- MPCU - IDT
Social influence	The degree to which an individual perceives that important others believe he or she should use the new system	- Subjective norm - Social factors - Image	- C-TAM-TPB - MPCU - IDT
Facilitating conditions	The degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system	- Perceived behavioral control - Facilitating conditions - Compatibility	- C-TAM-TPB - MPCU - IDT

Table 1: Summarizing the remaining models in UTAUT

3.5.2 Constructing the UTAUT model

Consistent with the eight models revised behavioral intention, as a predictor of actual behavior, has a *"significant positive influence on technology usage"* (Venkatesh et al. 2003, p. 456). The four core determinants and four moderating factors found in the model are condensed versions of the 32 variables found in the existing eight models (TRA, TPB, TAM, MM, C-TAM-TPB, MPCU, IDT and SCT). Proving its superiority in comparison to TAM and TAM2 (only capable of predicting technology adoption with a success rate of 30% and 40% respectively), "*the combinations of the constructs and moderating factors have increased the predictive efficiency to 70%*" (Oye et al. 2012, p.6).

Unified Theory of Acceptance and Use of Technology
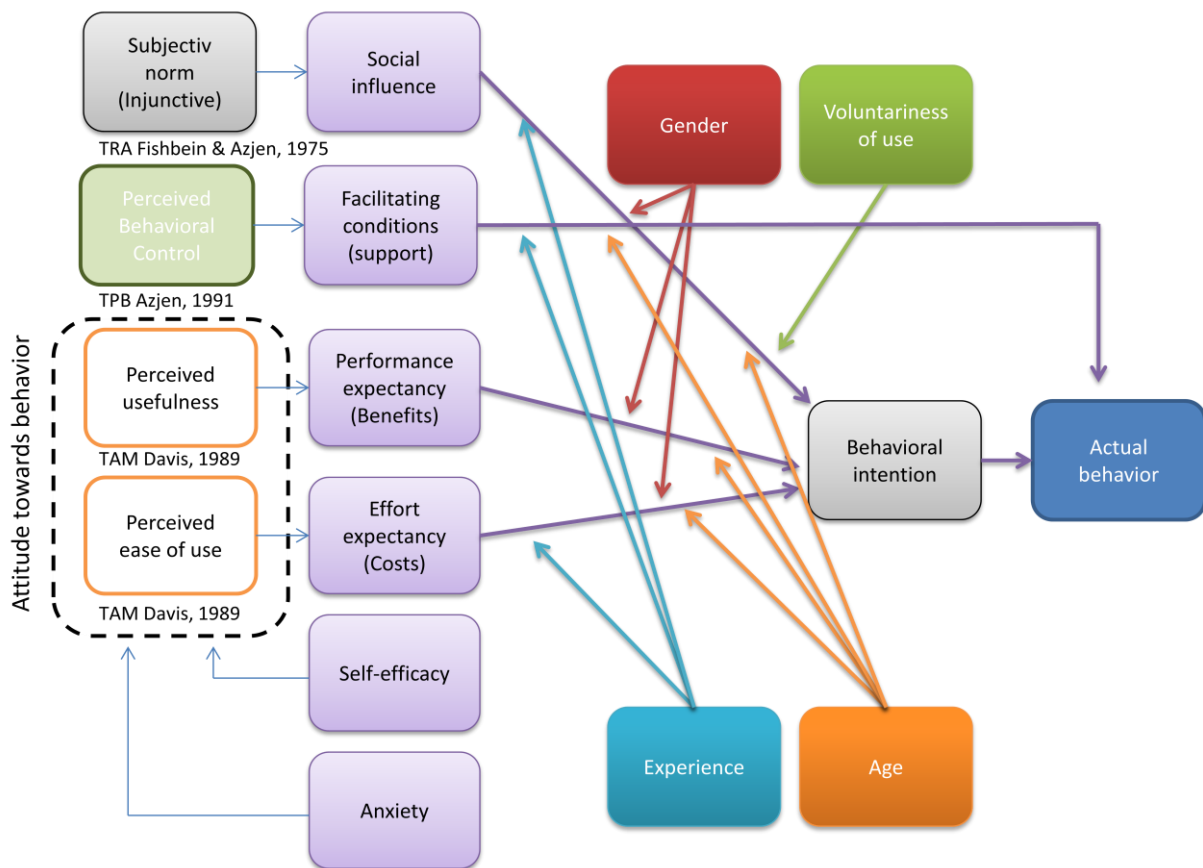
Figure 6: UTAUT

Direct determinants of Intention in UTAUT

As mentioned, UTAUT consists of four core determinants of behavioral intention, namely performance expectancy, effort expectancy, social influence and facilitating conditions. These determinants are in varying degree moderated by gender, age, experience and voluntariness of use. Performance expectancy, effort expectancy and social influence are found to be direct determinants of intention of use. Facilitating conditions is found to be a direct determinant of usage behavior. In addition to displaying the UTAUT model, Figure 6 indicates the variables that lie behind the direct determinants of UTAUT and from which relevant model the determinant has been derived from. Further, self-efficacy and anxiety have been highlighted in Figure 6 (though displayed as, and assumed to be, mediated through effort expectancy in UTAUT) as these variables will be incorporated later in the research model.

Performance expectancy is defined as *"the degree to which an individual believes that using the system will help him or her to attain gains in performance"* (Venkatesh et al. 2003, p. 447). Considering the prior models reviewed in this paper, performance expectancy relates to the PU construct in TAM (similarly in TAM 2). Found to be the strongest predictor of intention, Venkatesh et al. (2003) find reason to expect performance expectancy to be moderated by gender and age, having stronger effect on men and younger users.

Effort expectancy is the degree of ease associated with the use of the system (Venkatesh et al. 2003, p. 450), relating to PEOU in TAM (similarly in TAM 2). Consistent with the reviewed theoretical background, this construct has an impact in the early stages of usage and losing relevance as experience increases and intention to use is more instrumentally oriented rather than social. The construct is hypothesized to be moderated by age, gender and experience, where the effects are mainly found on women, older workers and those with limited experience.

Social influence is *"the degree to which an individual perceives that important others believe he or she should use the new system"* (Venkatesh et al. 2003, p. 451). Similarly found as subjective norm in TRA, TPB and TAM2, the constructs hold the notion that individual behavior is influenced by how one believes others will view you once you have applied the technology. Significant only in mandatory settings, compliance in early stages of technology experience can be caused by ill-informed individual opinions. Gradually this gets substituted by own experience based on instrumental rather than social intention to use the system (Venktaesh et al., 2003). Social influence in voluntary settings influences perceptions of the technology through internalization and identification (Venktatesh et al., 2003). Affecting the social influence-intention relationship are all the moderating variables; gender, age, voluntariness and experience to the point that social influence was found to be non-significant when analyzing the data without the inclusion of these moderators. Strongest effects of social influence are found primarily with female users, older workers under mandatory settings and with those with limited experience.

Lastly, *facilitating conditions* is *"the degree to which an individual believes that an organizational and technical infrastructure exists to support the use of the system"* (Venkatesh et al. 2003, p.453). PBC from TPB reflects the *"perceptions of internal and*

external constraints on behavior and encompasses self-efficacy, resource facilitating

conditions, and technology facilitating conditions" (Venkatesh et al. 2003, p. 454 Table 12)

and is one of three constructs making up this concept. As the effect of facilitating conditions

on intention are fully mediated by effort expectancy, *"when both performance expectancy*

constructs and effort expectancy constructs are present, facilitating conditions becomes non-

significant in predicting intention" (Venkatesh et al. 2003, p. 454). Similarly as with the TPB,

PBC or facilitating conditions in UTAUT influence usage when moderated by age and

experience. Training and support therefore have the strongest effect amongst older workers

with increasing experience.

3.5.2.1 Attitude in UTAUT

Out of the eight reviewed models six theories include a direct determinant of intention

serving a similar purpose as that constituted in the concept of attitude (Venkatesh et al.,

2003). The four constructs in question are; attitude toward behavior (TRA, TPB and C-TAM-

TPB), intrinsic motivation (MM), affect toward use (MPCU), and affect (SCT). Serving as the

strongest predictor of BI in TRA, TPB and MM, attitude as a direct determinant of intention is

revealed as non-significant in other models such as C-TAM-TPB, MPCU and SCT. Upon closer

examination and supported by previous model tests Venkatesh et al. (2003) argue that the

significance of attitudinal constructs are dependent on the omission of specific cognitions.

Only when performance and effort expectancy are excluded from the model does the

attitudinal construct have a significant position, giving reason to believe that affective

reactions operate through effort expectancy (Venkatesh et al., 2003). *"Therefore, we*

consider any observed relationship between attitude and intention to be spurious and

resulting from the omission of the other key predictors (specifically, performance and effort

expectancy" (Venkatesh et al. 2003, p. 455). Consequently, attitude has no direct or

interactive influence on intention in UTAUT.

3.5.2.2 Self-efficacy and Anxiety in UTAUT

Playing a pivotal role in shaping individuals' feelings and behavior, SCT posits that self-

efficacy directly influences intention (Compeau & Higgens, 1995). Perceived self-efficacy is

defined as *"people's beliefs about their capabilities to produce designated levels of*

performance that exercise influence over events that affect their lives" (Bandura 1994, p. 71).

Self-efficacy will therefore affect cognitive, motivational, affective, and selection processes

determining how people feel, think, motivate themselves and behave. Depending on the sense of self-efficacy, individuals will evaluate different tasks as challenges to be conquered or threats to be avoided (Bandura, 1994). Self-efficacy is therefore expected to influence behavioral intention.

The technology anxiety construct, proposed by Meuter et al. (2003) *"expresses the ability and willingness of customers to use technologies"* (Pramatari et al. 2009, p. 6). Anxiety in UTAUT is defined as *"evoking anxious or emotional reactions when it comes to performing a behavior (e.g. using a computer)"* (Vankatesh et al. 2003, Table 1. cont.)*.* Since individuals tend to avoid activities that evoke anxiety, anxiety is expected to influence intention to use (Compeau & Higgins, 1995).

Though considered to have a *"significant impact on computer use"* (Compeau & Higgens 1995, p. 203) in SCT anxiety and self-efficacy are not considered to be direct determinants of intention. Based on the research of Venkatesh (2000), Venkatesh et al. (2003) argue that though these constructs are found to be *"empirically distinct from effort expectancy (perceived ease of use)"* (Venkatesh et al 2003, p. 455), anxiety and self-efficacy are found to be fully mediated by PEOU and will therefore only pose an indirect influence on intention (Venkatesh et al., 2003). Thus, the constructs of anxiety and self-efficacy are not included in UTAUT

3.6 The Theory of Trying (TT)

To expand the theoretical background, frequency and recency of trying are added to the review. Labeled as experience (Szajna, 1996; King & He, 2006) or habit (Gefen, 2003; Schepers & Wetzel, 2007), the effect of previous efforts are suggested to affect intention in a direct or moderating way. The Theory of Trying is therefore considered a theoretical contribution in this respect.

The main concerns regarding TRA and TPB is the assumption that the only consequences of one's behavior are those that follow when the purchase or action have taken place. In most real life situations achieving one's goal requires a multitude of intermediate behavioral goals

before achieving the end-state consequence goal. In addition, a certain degree of dedication and sacrifice is required. Barriers, perceived or existing, may stand in the way of achieving one's end-goal and therefore influence behavioral intent and consequently behavior.

In their article "Trying to consume" (1990) Bagozzi and Warshaw discuss the difference between reasoned behaviors and goals. Distinguishing between behavior or outcomes subject to environmental impediments and those that are not the aspect of trying in itself is important as they represent intermediate goals which in turn influence behavior (Kassaye & Schumacher, 1998). The authors propose the model theory of trying (TT) focusing on the pursuit of achieving a goal (trying), and not the action per se, when aiming to explain goal-oriented behavior. The term goal is restricted to those behaviors where individuals think hindrances stand in the way, such as scarce supply, scarce resources or the limiting factor of time, lack of willpower and unconscious habits (Bagozzi & Warshaw, 1990). Suggesting that impediments influence expectations and attitudes that shape the intention to try or actual trying, Bagozzi and Warshaw (1990) found that expectations of success or failure influenced individual's attempts to lose weight (Ahuja & Thatcher, 2005). Further, intentions are expected to reflect a state of mind, driving action as opposed to trying. Trying, on the other hand, reflects action and elements of actual behavior and is defined as *"doing all the necessary pre-behaviors and otherwise satisfying all necessary conditions that are within volitional control for the performance of the subjective behavior"* (Ahuja & Thatcher 2005, p. 434).

The theoretical foundation for TT is built upon the theories of goal pursuit (TGP, Bagozzi & Edwards, 1998) and the TPB, neither of which takes into account the influence of past trying on future trying. Trying, encompassing the intention of thoughts and efforts directed at end-state goals such as behavioral changes is an important and key component of most goal-directed and reasoned behavior (Kassaye & Schumacher, 1998).

Trying equivalent to Intention

TRA and TBP define behavior as a consequence of intentions *"which by definition does not obtain for uncertain consequences or outcomes"* (Bagozzi & Warshaw 1990, p. 128) such as intermediate behavioral goals. By simply eliciting the consequences found to be most salient and examining their implications for the target behavior, the theories ignore the question of

why these consequences are most prominent or why these end-state goals are pursued (Bagozzi & Warshaw, 1990). Bagozzi and Warshaw (1990) modify the TPB by replacing behavior with trying as the dependent criterion. *"Since trying is equivalent to behaving in the case of reasoned behavior, we lose no generality by making this change"* (Bagozzi & Warshaw 1990, p. 129). Following the goal analogue; *"trying to achieve a goal is determined by intention to try, which in turn is determined by attitude and social norm toward trying"*(Bagozzi & Warshaw 1990, p. 129).
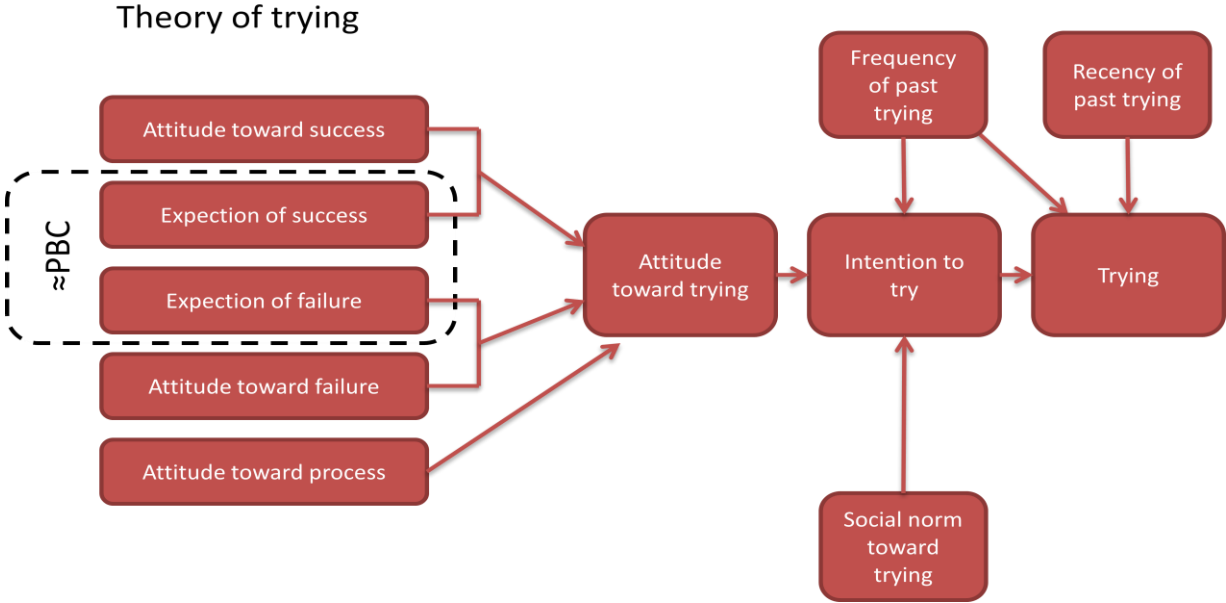
Figure 7: Theory of Trying

Explaining the model

Attitude toward trying is determined by an *"intervening set of attitudes toward success, failure and the process of striving"* (Bagozzi & Warshaw 1990, p. 130). Viewing the TT model in Figure 7 attitude toward trying is dependent on (1) attitude toward success and expectation of success, (2) attitude toward failure and expectation of failure, and (3) attitude toward process. Though the model assumes a direct link between intention and trying, and where processes involved in trying are necessary to convert intentions into action, intentions alone cannot be decisive for action (Ahuja & Thatcher, 2005). Taking into account both individual willpower and situational control, one must also consider expectations of success and failure and attitude towards this in relation to trying. The process of striving manifests individual intention to try, and combined with willpower and situational control this will determine if the attempt will lead to success or failure. Thus, the expectation of failure

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includes the perception of risk associated with trying to induce successful behavioral change when accounting for elements perceived as hindrances (e.g. scarce supply, scarce resources or the limiting factor of time, lack of willpower and unconscious habits). Hypothesized to influence intentions and behavior directly *"the PBC is very close to the meaning of expectations of success and failure that are included in the models"* (Bagozzi & Warshaw 1990, p. 127). Following the same logic as with PBC, rating the expectations of success as high, will consequently contribute greatly to a positive intention to try.

The authors find support in research saying that *"past behavior adds independent predictiveness over attitude and social norm in the determination of behavioral intention"* (Bagozzi & Warshaw 1990, p. 130). Further, having mainly been ignored in previous research, the authors refocus the attention on the distinction between past frequency and past recency of trying and how these effects arise. This is done in an attempt to *"provide a rational for the effects of past actions"* (Bagozzi & Warshaw 1990, p. 131). Their model therefore includes the importance of habit as an antecedent of product and service usage by proposing the inclusion of frequency of past trying and recency of past trying on intention to try and actual trying.In the following frequency and recency of trying will be explained in more detail.

3.6.1 Frequency of trying

Attitudes towards trying may be well-defined, but not necessarily perfect reflections of past trying, rather made up of partially self-generated inferences (Bagozzi & Warshaw, 1990). Under such circumstances, past frequency of trying will add an independent influence on intention to try and trying reflecting *"whatever script the individual has regarding trying"* (Bagozzi & Warshaw 1990, p. 131). Strong effects of past frequency on intention to try will occur when attitude and intentions in respect to an act are unclear or lie in the near/distant future, reflecting behavioral expectation rather than intention. In addition, past trying will influence future trying independently in situations where trying is not determined by intention alone. On the other hand, when frequency reflects the individual's experience of the focal act influencing assessments of the expectation and attitude constructs, attitude will then reflect frequency. Behavior will therefore range from mindless (common) to mindful behavior depending on the *"degree to which past frequency adds independent predictiveness*

to intention to try over and above attitude and social norm" (Bagozzi & Warshaw 1990, p.131).

3.6.2 Recency of trying

Recency of past trying affecting trying will mainly revolve around accessibility and the ability to retrieve memories, as experience closer to the present are easier to recall. Thus, recency *"is part of one's overall experience with the focal act"* (Bagozzi & Warshaw 1990, p. 132). Frequency and recency are related constructs. *"Nevertheless, we expect recency to make an independent contribution to the prediction of trying other than made by intention to try and frequency alone"* (Bagozzi & Warshaw 1990, p.132). Operating through frequency of past trying, recent trials will therefore have a disproportionately large effect on intention to try, posing an effect on elements in the model, such as the expectations of failure or success (Bagozzi & Warshaw, 1990). In addition, the authors foresee the likelihood of recency inducing availability and anchoring/adjustment biases with corresponding effects. Since recency is expected to influence all expectation measures on both sides of the equation, recency is not included as an independent predictive measure on trying, but as a predication of trying, as trying is not an expectation in itself. The construct will therefore avoid reflecting potential biases in intent. The predictive power of recency relies on the biases generated in reported intentions to try, and how these affect trying either as a suppressor variable or assuming the status of self-fulfilling prophesies (Bagozzi & Warshaw 1990).

Social Norm in TT

In addition, Bagozzi and Warshaw (1990) suggest the influence of social norm toward trying as society influences individual behavioral intention. Also, the effect of prior attempts may be included in other independent variables such as the above mentioned attitude and social norm.

TT outperforming both TGP and TPB

The paper attributes the TT strong explanatory power, predominantly ascribed to the adding of recency and frequency of past trying on trying. As a result TT is found to outperform both the TGP and TPB in predicting trying and intention to try. Both social norm and attitude were

proven to be linked to trying regardless of recency and frequency. Also, distinguishing between past recency and past frequency of trying was proven to be important. The results showed that recent past trying helped predict future trying. The frequency of past trying was a significant predictor of intention to try, but did not predict trying. This was explained by the stronger effect of recency on trying, overshadowing the effect of frequency. Significant predictors of attitude towards trying were; attitude toward success multiplied with expectation of success and attitude towards process. *"However, neither of the failure-related terms worked out as expected in either time period"* (Bagozzi & Warshaw 1990, p. 138) as they did not affect attitude toward trying. Behavior or outcome where the consequence of failure comes with an element of conclusiveness may upgrade the element of failure to become a *"significant determinants of overall attitude toward trying"* (Bagozzi & Warshaw 1990, p. 138). In addition, adding to the explanatory potential of the model, the TT was found to capture instrumental actions such as intentions and efforts of trying that remain unsuccessful, processes which are important to identify to be able to explain consumption more fully (Bagozzi, 1990).

Figure 8 visualizes the contribution of the reviewed models so far and their proposed influence on attitude, intention and behavior
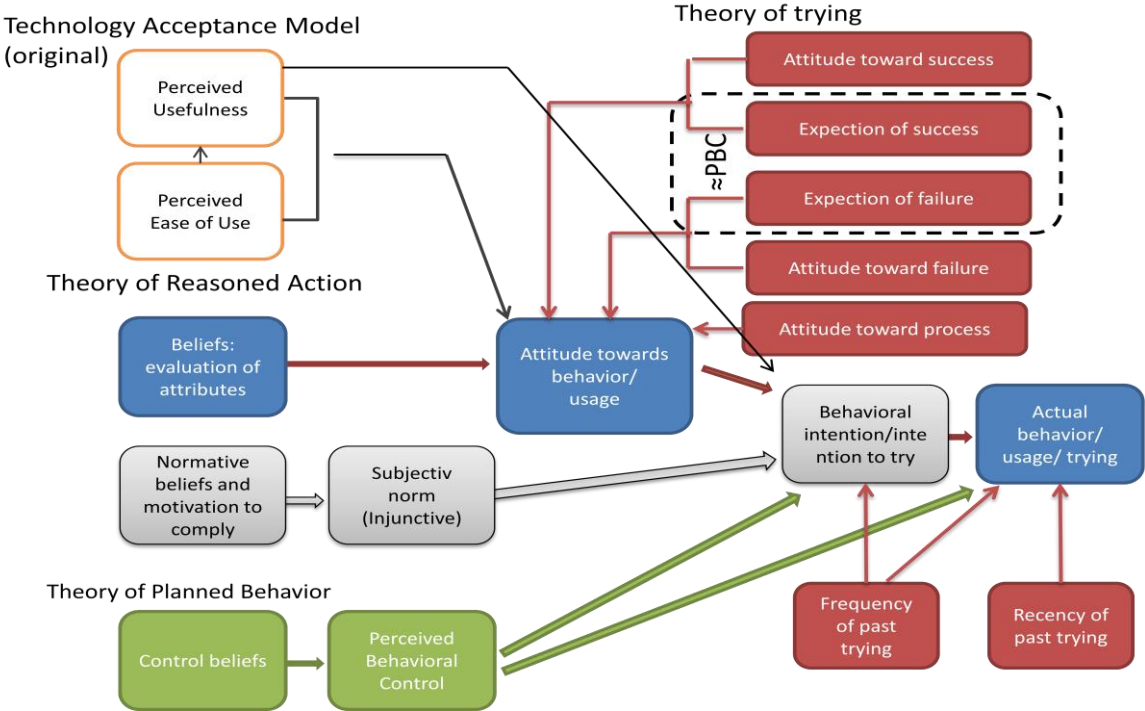
Figure 8: TRA, TPB, TAM and Theory of Trying

3.7 Emotional antecedents

When reviewing the models that cumulate into the UTAUT model and the UTAUT itself, the lack of emotional variables have been prominent in these purely cognitive processing models. As many existing models mainly focus on the cognitive factors, complex structures, such as attitude, with its multiple components, is only partly constituted (Sun & Zhang, 2006). Adding the aspect of affective processing is suggested in the pursuit to increase predictability and also understanding of consumer intention.

"While few dispute the importance of emotions in managerial and consumer decision making, most research methods are biased toward reason" (Zaltmann 1997, p. 426 in Allen et al., 2005). In this lies the critique of mainstream research methods in marketing relying mainly on attitude models excluding emotive consideration (Allen et al., 2005). A call for greater consideration of emotional experience in the pursuit of understanding consumers' motivation and/or behavior is not new to the field. Resurrected as a construct in its own right, affect was considered to have explanatory power on attitude and behavior by the mid-1980s (Agarwal & Malhorta, 2005). Still, there were powerful voices (e.g. Fishbein expectancy-value model) in the research field advocating human action driven by reason. Such cognitive models offer rules of thumb for arriving at modal salient beliefs, but they are not hard science, leaving the possibility of overlooking some salient beliefs that could account for the incremental prediction of emotive information (Allen et al., 2005). In their article, Allen et al. (2005) try to reveal and identify; (1) the role of emotive information in explaining variance in attitude towards an act relative to cognitive information, and also (2) considering the relative influence of emotive versus cognitive antecedents *"Are there conditions in which emotive information is more likely to improve prediction relative to cognitive information?"* (Allen et al. 2005, p. 495) By adding affect to the model as an additional antecedent an important question arises regarding under which conditions the different antecedents are most likely to predict attitudes. Experience is in the context of their paper viewed as having a moderating role, where emotive information concerning the behavior in question is expected to exert stronger influence the more experience one has acquired. *"As an antecedent of attitude, emotions could be expected to have a more pronounced role for more experienced individuals"* (Allen et al. 2005, p. 496).

Including affect in attitudinal models

The attitude model (Fishbein & Ajzen, 1975) has been questioned as being too logical and purely based on utilitarian beliefs without considering affective experiences. Defined as evaluative judgments about performing a target behavior (Fishbein & Ajzen, 1975) an attitude should represent items of knowledge based on three general classes of information; cognitive information, emotional information, and information about past behaviors (Allen et al. 2005). The cognitive component of attitude is the knowledge and perceptions that are acquired by combination of direct experience with the attitude object and related information from various sources. Emotions or feelings associated with the particular brand or product refer to the affective component of attitude, and the cognitive component is the tendency that an individual will undertake a specific action or behave in a particular way with regard to the attitude object. Thus, by *"treating emotive experience as a distinct source or kind of information that persons may draw on as a basis for their evaluations"* (Allen et al. 2005, p. 495) calls for an inclusion of affect in attitudinal models.

Increasing predictive power by adding emotions

The reported results support Allen et al.'s (2005) hypothesis. Emotions are found to supplement cognitive information offering incremental predictive power. This strengthens the incentives for adding the unique role of emotive information as an antecedent of attitude. In addition, *"emotional reports contribute a greater proportion of variance (relative to cognitive variables) in predicting attitudes of the experts versus the novices"* (Allen et al. 2005, p. 497). Beliefs were not found to predict experts' attitude, but provided good prediction of attitudes for novices. A possible explanation for this is that only after repeated performances are you able to integrate complex emotions with personal evaluations of a behavior. An alternative explanation is that the, *"motives that perpetuate a behavior will differ from those that initiate it"* (Allen et al. 2005, p. 498). With this backdrop Allen et al. (2005) emphasize the importance of recording both emotional experiences in addition to consumers cognitive states, in order to be able to understand the effect of emotional motives on attitude. *"Rich emotional experience is a common aspect of many consumption domains. We see no reason why it should not be integrated into common research methods like multi-attribute attitude models"* (Allen et al. 2005, p. 499)

3.7.1 Introducing an Emotive Framework

As cognitive-models have mainly been used and developed to predict IT use, Beaudry and Pinsonneault (2010) put the limelight on emotional effects to fully be able to capture all of the antecedents of behavior. Previously mentioned cognitive theories and models, such as TAM (Davis, 1989) and UTAUT (Venkatesh et al., 2003) predict IT usage purely based on *"perceptions and beliefs about the instrumental nature of technology such as effort and performance expectancy, perceived compatibility, and relative advantage"* (Beaudry & Pinsonneault 2010, p. 690). Considering the influential power emotions have on our everyday lives, rationally or irrationally guiding beliefs and attitudes, decision making and eventually actions, little research has been done regarding emotional aspects of technology acceptance. The studies focusing on emotions have typically looked into the emotions occurring during initial usage of an innovation. But, emotions play an important role also before actual adoption takes place such as through expectation about how a new technology or product will affect them, coincide with existing values, routines, etc.

Emotions as drivers of initial IT use

In their paper, Beaudry and Pinsonneault (2010) therefore study how emotions are related to intention to use and usage of a new IT system both directly and indirectly through adaption behaviors. They define emotions as *"a mental state of readiness for action that arises from the appraisal of an IT event"* (Beaudry & Pinsonneault 2010, p. 699). The authors argue that emotions are important drivers of behavior and examine how emotions can influence initial IT use, and how emotions experienced early in the implementation of new IT applications relate to IT use. "*Technological artifacts trigger emotional reactions from individuals when they interrupt the sequence of events in one's routine*" (Rafaeli & Vilnai-Yavetz 2004, in Beaudry & Pinsonneault 2010, p. 690). They suggest that emotions can be instrumental in furthering our understanding of user acceptance and resistance in IT implementation research in general. Given the strong connections between emotions and IT use, this is an area that demands more research and understanding when trying to capture the whole picture of acceptance, adoption and usage of technology-based services and information technology. In the context of their article *"emotions and adaption behaviors serve to bridge the gap between the moment one's routines are interrupted, included an*

awareness of future interruption, and the time new routines are established or the old routines reestablished" (Beaudry & Pinsonneault 2010, p.690).

Explaining the Model

In their quest for providing a complementary perspective to understanding acceptance and antecedents of IT use, Beaudry and Pinsonneault (2010) have developed a framework where they classify emotions into four categories and a complementary model suggesting the direction of influence on attitude, intention and actual usage (see: Figure 9). The authors specify that *"it is not the IT event or the IT artifact per se that triggers emotions, but the unique psychological and evaluative assessment of the event/artifact by an individual"* (p.694). These four categories are; (1) *Loss emotions* – reflecting IT events (RFID products) "as a threat and the perception of lack of control over its consequences" (p. 694), hereunder anger, dissatisfaction, frustration and disgust. (2) *Deterrence emotions* – anxiety, worry, fear and distress are those emotions that occur when the *"IT event is perceived as a threat and the individual feels that he/she has some control over its consequences"* (p. 696). (3) *Challenge emotions* – triggered when positive outcomes of opportunities are likely to occur, and where individuals feel they have some control. Such appraisal of a challenge might evoke emotions such as *"excitement, eagerness, playfulness, arousal and flow"* (p. 697). (4) *Achievement emotions* – described as a *"result from the appraisal of an upcoming event that will generate positive outcomes"* (p. 698). Relevant emotions experienced here are happiness, satisfaction, joy and pleasure.

Hypothesized to be negatively associated with IT use, anger and anxiety represent the loss and deterrence emotions. Challenge and achievement emotions, represented by excitement and happiness, are assumed to have a positive effect on consumers' intention to use innovation. The study results indicate that excitement and happiness (positive emotions) explained 47 percent of the variance of IT use. The negative emotions anger and anxiety explained 14 percent of IT use. Different emotional classes therefore affect IT use either indirectly or directly through adaption behaviors and through different paths. Following the logic of attitudinal theories (attitudes towards objects positively affect intention to use, which in turn influences actual usage/adoption) the significance of including emotions as an antecedent of attitude is further illustrated.
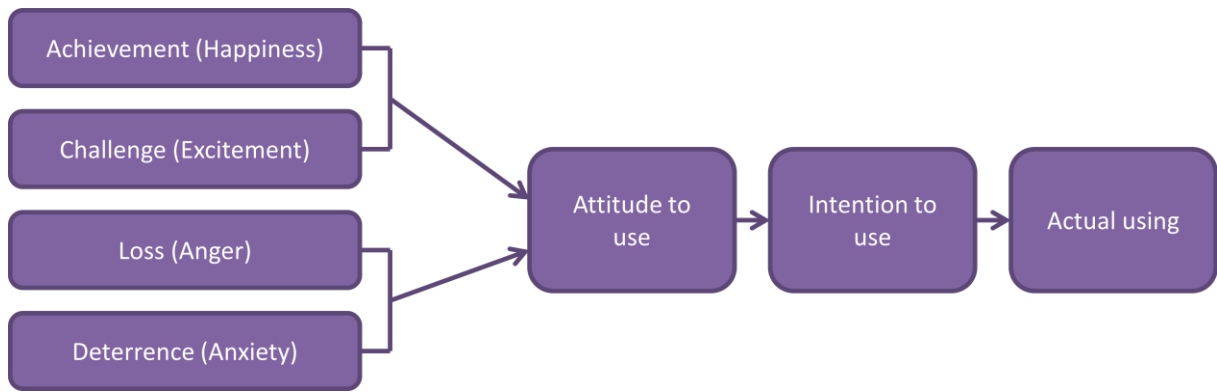
Figure 9: Emotive framework

Having reviewed the adoption theory and added emotions and Theory of Trying to the theoretical background the contribution of each theory is presented in Figure 10.
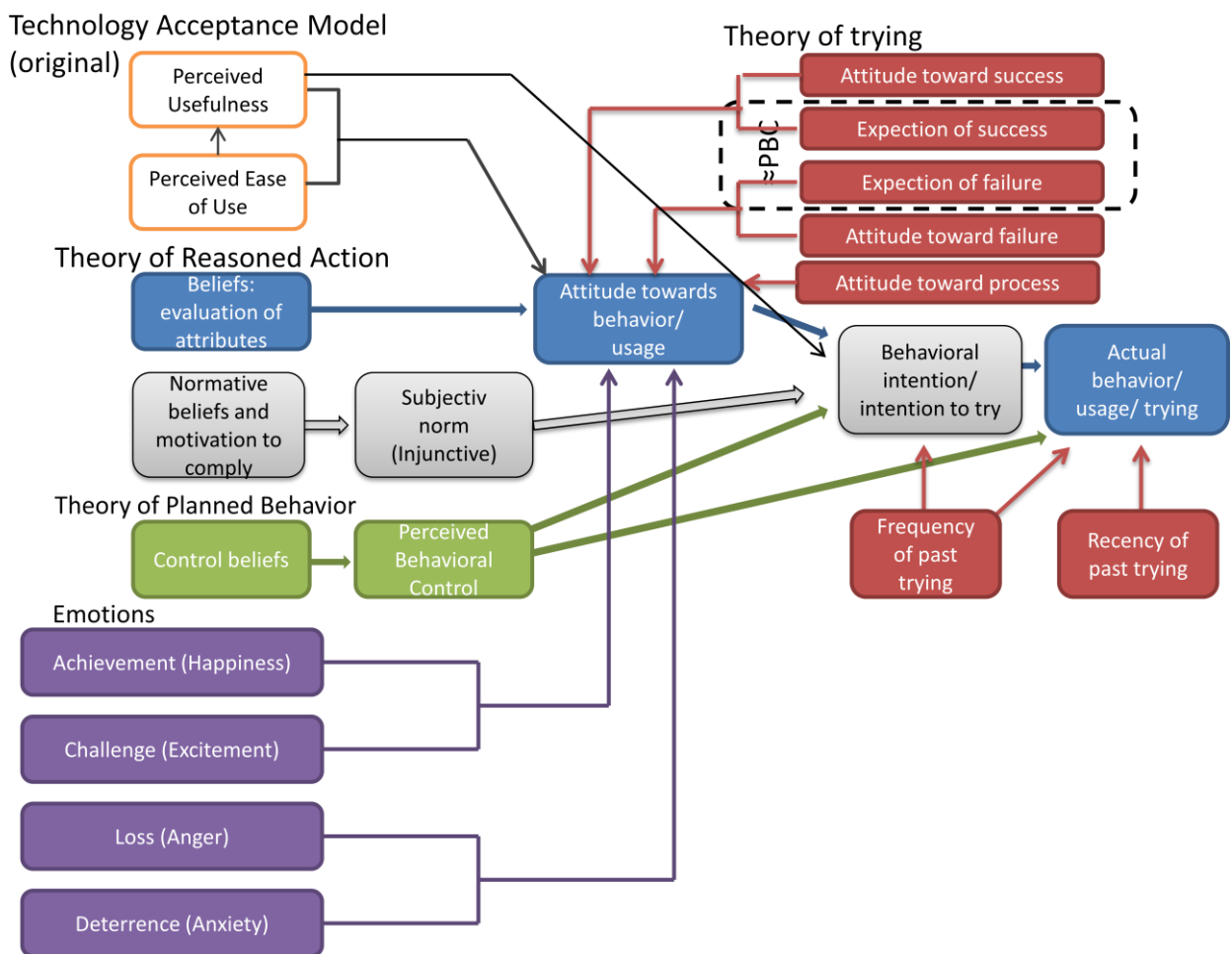
Figure 10: Summarizing the effect of the reviewed models

Figure 10 thus displays how the various models interact and build upon each other and how each model provides an additional aspect to the technology-adoption literature.

4.0 RFID adoption studies

Developed in the mid-forties, RFID technology has been around for over 50 years. Being promoted as a transformative innovation, able to revolutionize the supply chain and potentially change the way business is conducted, implementation and adoption of the technology has in fact been slow (Kim & Garrison, 2010).

With RFID becoming more mainstream and emerging closer to the consumer, there have been modest contributions to the research on how consumers perceive and adopt RFID-enabled service systems. While e-services potentially create a more convenient and efficient environment for their users *"little is understood about how consumers evaluate them for adoption"* (Featherman & Pavlou 2003, p. 452) As this is a topic receiving more and more attention, there are some that have taken on the task of gaining more insight into the view of the consumer.

4.1 Consumer attitudes towards RFID-enabled services

Pramatari and Theotokis (2009) address this topic and have developed and empirically tested a model focusing on consumers attitudes towards RFID technology-based services. As more and more RFID based technology finds its way into the commercial world, consumers face *"a myriad of technology-based service delivery options where they do not directly interact with service firm employees"* (Pramatari & Theotokis, 2009 p. 2). In their model they include three consumer attitudes, namely attitude towards; (1) the general service concept, (2) the general technology-based service application, and (3) the RFID enabled service. In addition system characteristics and personality traits are included.

Collecting data from 600 questionnaires from Greece and Ireland targeting consumers of supermarket stores concerning dynamic pricing, their results showed that consumers' attitude towards RFID-enabled services in retailing can be modeled as a convergence of multiple attitudes. Performance expectancy and effort expectancy (system related factors) were found to have a significant effect on consumers' attitude towards the technology-

based service. Individual traits (such as technology anxiety and information privacy concerns) affected consumer attitude, but in varying degree between the two countries. The authors propose the familiarity with dynamic pricing systems and cultural differences as possible explanations for the diverging results, but in need of additional research. Providing an extension to the litterateur their research proposes that *"consumers' opinion about a system is affected by their opinion about the general service concept that the system is designed to support"* (Pramatari & Theotokis, 2009 p. 12).

4.1.1 Emotions influencing attitude

In their research Boslau and Lietke (2006) seek to investigate how *"consumers' attitudes towards RFID technology relate to their actual behavior"* (Slettemeås 2009, p.233). By looking at attitude-behavior relations Boslau and Lietke (2006) focus on the importance of understanding general customer attitudes ICT, and what they are, to guide the marketing mix to improve consumer attitudes towards RFID. In their study, their assumption that attitude towards the RFID technology directly influences behavioral intentions and indirectly influence behavior were found to positively correlate. This indicates that a general positive attitude to RFID positively correlates with a positive attitude towards products with a RFID tag, behavior of RFID technology and behavior towards products with a RFID tag. As RFID is a novel and rather diffuse technology, yet inhabiting extremely complex qualities, Slettemeås' (2009) criticizes the authors for oversimplifying their assumptions and their lack of practical applications as reference. Still, the contribution of acknowledging the importance of emotions is raised: *"The new insight the authors claim to generate is that attitudes towards RFID are driven by emotions and not cognitions, possibly explained by the novelty of the technology"* (Slettemeås, 2009, p. 233).

4.2 Customer acceptance towards RFID technology

As a contribution to B2C settings and the customers' point of view, Müller-Seitz et al. (2009) investigate customer acceptance of introduced RFID technology at a German electronic retail corporation. The study concentrates on customer acceptance of RFID technology

exemplified through RFID-enabled check-outs, intelligent rack systems and customer complaint handling. By using a modified version of TAM they seek to predict and explain individuals' reaction to new technology, and the models validity in reference to RFID.

"Despite the overall appropriateness of TAM, refinements to the model seem to be needed" (Müller-Seitz et al. 2009, p. 31). This modification is provided by integrating the factor *"security concerns"* to TAM *"[…] based on the assumption that protection of data privacy plays a crucial role with reference to RFID"* (Müller-Seitz et al. 2009, p. 32). According to the authors, the most important driver for acceptance of the novel technology is PU, as it has *"the biggest impact on acceptance of the RFID technology in the present model"* (Müller-Seitz et al. 2009, p.37). Their results showed that reduced waiting time, cost reduction, improved customer service, and improved product quality correlated positively with PU. In addition, ease of handling, complexity, and stress correlated significantly with ease of use. Attitude towards protection of data privacy is the second most important acceptance predictor closely followed by the general attitude towards the novel technology. Positive attitude towards novel technologies will enhance acceptance. On the other hand, customers considering new technology as intimidating rather than appealing are suggested persuaded through *"offering as much EOU as possible"*(p. 37). Further, Müller-Seitz et al. (2009) presume that experience with the technology will positively affect usage, based on the assumption that *"perceived risk of using novel technologies might dissipate over time"* (p. 37). Findings that the authors found counterintuitive were the only moderately influencing security concerns regarding protection of data privacy and the minor influence of PEOU on customer acceptance. *"Nevertheless we have to note, the higher the perceived EOU of RFID technology, the higher the consumer acceptance"* (Müller-Seitz et al. 2009, p. 37).

4.3 Customer intention to adopt residual RFID technology

Cazier et al. (2008) expand the TAM into the RFID field examining consumers' intention to adopt residual RFID technology (RFID tags remaining active after purchase vs. disabled tags) by looking at *"passive technology adoptions with both positive and negative utility"* (p. 250). The authors claim that leaving the consumer out of the supply chain no longer is possible

with *" mass adoption of residual RFID technologies imminent"* (p. 250). This novel technology poses a new type of risk to the consumer's individual privacy such as unauthorized assessment of one's belongings by others and tracking individuals through their objects. Rather than limiting privacy risk RFID developers have primarily focused on improving perceived value of RFID by offering better prices, services, and experiences (Caizer et al., 2008). The authors warn against this approach as perceiving a particular privacy or security risk as a result of residual RFID may profoundly affect consumer purchase intention or engagement. Addressing consumers' perception of risk, functioning as strong and important deterrents to consumer acceptance, is therefore vital for both consumers and businesses to be able to truly benefit from residual RFID technology. According to the authors businesses will experience greater harm than benefit regardless of any gain in the supply chain management if products with residual RFID technology are not accepted and adopted by the consumers. Disabling RFID tags may prevent the amount of negative reactions, but also entails sacrificing *"the benefits that this technology can bring to businesses as well as to consumers"* (Caizer et al. 2008, p. 251)

4.3.1 Perceived Risk
Both positive and negative utility were found important to consumers considering adoption and acceptance of residual RFID-tags. The authors break down risk into two independent constructs; privacy risk likelihood and privacy risk harm. Both were found to have a significant negative impact on consumers' willingness to adopt products including such technology. Supporting the original TAM constructs, both PEOU and PU revealed positive effects on intention to adopt residual RFID technology. Caizer et al. (2008) also found support for their modified version as both privacy risk likelihood and privacy risk harm had a significantly impact on BI. The results showed that *"consumers' perceptions of privacy risk associated with RFID technology, as well as their perceptions of its usefulness and ease of use, directly influence their intention to adopt and accept this technology"* (Caizer et al. 2008, p. 250). In conclusion, their study emphasizes the importance of reducing perceived risk among consumers to stimulate adoption of products containing residual RFID technology.

4.4 Pre-adoption criteria

According to Lu et al. (2005) most research on end-user beliefs and attitudes are conducted post adoption of the system. *"Consequently, the beliefs and external stimuli identified are most suitable for studying continued-use behavior"* (Lu et al. 2005, p. 246). Factors affecting usage, such as decision-making, may not necessarily be the same as for initial adoption. Identifying the pre-adoption criteria therefore remains a critical issue for IS research and one especially important for technologies at the initial stage of implementation. In their paper, Lu et al. (2005) study initial and early adoption of a new information system abbreviated as WIMT (wireless internet services via mobile technology). Their outlook is that though web services seem to have the right success factors such as right price, quick and easy to use, expected adoption is not optimistic. Consumer behavior research has mainly focused on instrumental beliefs as drivers of usage intention (i.e. PU and PEOU), however behavioral science and psychology suggests that *"holistic experiences with technology as captured in constructs such as enjoyment, flow, and social image are potentially important explanatory variables in technology acceptance"* (Lu et al. 2005, p. 246).

4.4.1 Technology in Social Settings

In social settings and networks social image is important to many individuals. Technological developments may in cases function as status symbols, fashion statements or indication of wealth. As more and more technology is directly related to services, adopting these services is often a result of information passed through individual's social networks influencing their perception of the target technology. In some cases, such as social networks, the more people using the service the more value the service generates for each individual user.

Lu et al. (2005) argue that all social relations affect an individual's opinions, decisions and behaviors through interactions and communications. *"Such social influences can be explained by subjective norm and image which can affect an individual's evaluation of WIMT in terms of usefulness"* (p. 250). Considered in both TAM2 and UTAUT, social influence is viewed in the form of normative forces in compliance with organizational goals. Lu et al. (2005) therefore stress the difference in such influence when the adoption choice is

voluntary and individual consumer experience of social influence goes through social pressure.

New technology applications create uncertainty about the expected consequences. As individuals tend to address uncertainty with discomfort, support form influential others have an important impact on adoption decisions that potential users choose to take. Since individuals adapt their attitudes, behaviors and beliefs to their social context, they tend to *"interact with the social network to consult on their adoption decisions by informational and normative influences"* (Lu et al. 2005, p. 249). Informational influence is argued as integrating information from expert sources into one's own cognitive beliefs (internalization) and normative influence as working through identification such as image and compliance with social influences. Image is defined by Moore and Benbasat (1991) as *"the extent to which the use of an innovation is perceived as enhancement of one's status in a social system"* (Lu et al. 2005, p. 249). Information passed through an individual's social network such as through interaction and communication will therefore influence perceptions of the target technology, which in turn affects an individual's opinions, decisions and behaviors (Lu et al., 2005). As WIMT is expected to create convenience and efficiency, social influence may help shape an individual's estimation of his or her confidence in and ability to use a system well. Perceived EOU before any direct experience will inevitably have an effect through social influence. *"If WIMT is socially believed hard to learn and hard to use, unavoidably it will more or less affect a member's intention toward adopting"* (Lu et al. 2005, p. 250).

4.6 Personal Innovativeness in Information Technology

Lu et al. (2005) present the Personal Innovativeness in Information Technology (PIIT) trait proposed by Agarwal and Prasad (1998). PIIT is defined as the willingness of an individual to try out any new technology, and is described as symbolizing the risk-taking propensity that exists in certain individuals and not in others. *"For the same exposure to different types of media individuals with higher personal innovativeness are expected to develop more positive beliefs about the target technology"* (Lu et al. 2005, p. 251). By adding PIIT to Davis' original TAM model Agarwal and Prasad (1998) hypothesized that individuals with higher levels of PIIT are expected to develop more positive perceptions about the innovation in terms of a

advantage, PEOU, compatibility, etc., and have more positive intentions toward use of a new IS and/or IT (Lu et al., 2005). As in the case of RFID-based services, most consumers have little or no knowledge and experience about WIMT on which they can base their perceptions or beliefs. Curiosity and an innovative disposition may in such cases serve *"as the primary and direct determinant for adoption decision, without much consideration to perceptions at all"* (Lu et al. 2005, p. 252).

Lu et al. (2005) argue for "*strong causal relationships between the social influences, personal innovativeness and the perceptual beliefs – usefulness and ease of use, which in turn impact adoption intentions."* (Lu et al. 2005, p. 245). Though the study is related to intention to adopt a specific information system, namely WIMT, the following conclusions seem to be of relevance for general adoption of new information systems in a non-work related environment. Their main findings reveal the importance of recognizing social influences and system-specific personality traits to have an impact on PEOU for non-work related individual adoption. *"Successful implementation and promotion of WIMT to a certain degree relies on utilization of informal social networks and image impact"* (Lu et al. 2005, p. 261). Further, the findings reveal that social influence in the form of subjective norm and image has a direct positive impact on PU. Influence from friends and important social connections were found to be a critical determinant at least for potential individual adopters of WIMT. Confirming the findings in UTAUT in a voluntary usage setting *"subjective norm and sense of image seem to work through perceptions rather than intention"* (Lu et al. 2005, p. 260). Social influence has therefore no direct impact on intention, rather potential and early adopters seem to base their adoption intention on perceptions integrating their sense of image and opinion from their informal social networks (Lu et al., 2005).

According to Lu et al. (2005) individual perceptions of usefulness and ease of use were significantly attributed to social influences and internal motivation to try (PIIT). Though PIIT influences both PU and PEOU, influence on PEOU was found to be stronger. This differed from the findings of Lewis et al. (2003) where PIIT had a stronger effect on PU and was in contrast to the study of Agarwal and Karahanna (2000) where PIIT had no significant effect on either PU or PEOU. Further, in a non-work oriented and purely voluntary setting, neither social influence nor PIIT had a direct impact on intention to adopt, but worked through the perceptions of U and EOU (Lu et al., 2005). Given these diverging results the author's state

that *"It seems that the findings on PIIT so far are still sample and context specific"* (Lu et al. 2005, p. 260). As the sample in this study was made up of well-educated potential users the results would indicate that when evaluating WIMT for adoption such consumers put more emphasis on usefulness considerations than ease of use.

Though the study showed that in this context neither social influences nor PIIT exerted any important direct impact on intention, but rather works through perceptions of U and EOU, 58 percent of the variance was explained by the specified explanatory constructs. This should imply that *"the four selected antecedents on intention to adopt in this study are considered very important by potential and early adopters of WIMT"* (Lu et al. 2005, p. 261).

4.7 Customer perceptions and trust

Sill et al. (2008) address the question of what retailer and supply chain partners can do to make customers more comfortable with RFID at the consumer level as consumers may fall victim for one-sided often worst-case scenarios concerning novel technology such as RFID. The notion that some tags can actively transmit information (i.e. post-sales monitoring with residual tags (see: Cazier et al., 2008)) and be read from long distances tend to create great privacy concerns and doubts in the minds of the consumers. As firms have to overcome technical and economic hurdles such as initial investment costs and interoperability, the most challenging hurdle might just be negative consumer perceptions. Previous research has shown that trust is related to intention to purchase. In e-commerce this trust is related to *"the reputation of the retailer, satisfaction with past transactions, and perceptions of risk, usefulness, and ease of use of the technology"* (Sill et al. 2008, p. 79). The purpose of their study is to examine the role of information and individual differences in a potential consumer's intentions to purchase products that are tagged with RFID technology. The findings indicate that trust of RFID is a significant predictor of intentions to purchase RFID tagged products, thus, developing consumer trust is found to be of significant importance in moving the technology forward.

Personal innovativeness was not found to be a significant factor in the prediction of trust. This may be explained by the more passive qualities of RFID, as it is not a technology that

consumers can experiment with. The results supported that information on intrusiveness would affect an individual's trust of RFID. On the other hand, providing customers with information about benefits with RFID technology had little effect on their attitudes toward the technology. *"These results suggest that retail firms using RFID need to clearly define how the use of RFID translates into benefits about which consumers care"* (Sill et al. 2008, p. 91). Alternatively, minimizing the information on the intrusiveness, or finding ways to counter information on intrusiveness found in mass media could be a way to educate consumers as to how RFID technology is applied in the best interests for the consumer (Sill et al., 2008).

4.8 Perception of Risk

Featherman and Pavlou (2003) studied the end-user's cognitive and affective reaction to the potential risks often perceived inherent in using computerized services. The authors claim that perceived risk is a prominent barrier to consumer acceptance of e-services. By adding measures of negative utility (perceived usage risks) to the already existing positive utility oriented adoption model, Featherman and Pavlou (2003) seek to gain increased understanding of consumer perception helping practitioners in developing risk-reducing strategies to encourage service adoption.

Perceived risk may create different emotional and cognitive reactions caused by the evaluation of costs and benefits, or risks and utility, creating dissonance (Featherman & Pavlou 2003). Viewing utility gains as task performance efficiencies, and risks as task related problems and the uncertainty of the Internet as an unsecured communication medium, the authors propose perceived risk as comprised of the theorized facets of performance risk, financial risk, risk associated with time, psychological risk, social risk, and privacy risk, including overall risk.

Their results showed that perceived risk was found to strongly influence TAM criterion variables. In their sample, made up of undergraduate business students, performance-related risk facets identified as performance, financial, private and time risk facets where proven the most salient cause for concern *"leading to reduced system evaluation and adoption"* (p. 470). In addition, performance risk concerns were found to lay the foundation

for all the other risk facets. Featherman and Pavlou (2003) therefore claim to have found evidence for the appropriateness of applying a risk facet hierarchy rather than speaking of risk in general terms, and having identified many of the important risk facets for the e-service context. According to the authors, attributing these risk concerns to either the medium (the Internet) or to the e-service provider is something that calls for further research. In the pursuit of understanding and managing user experiences of e-services, the authors strongly suggest *"the inclusion of a performance-based perceived risk variable in human-computer interface focused adoption research"* (Featherman & Pavlou 2003, p. 469).

4.9 Perceived intrusion

As with most high tech innovations such as self-service technologies and RFID, consumer acceptance and ultimately customer adoption is essential to ensure proper implementation and return on investment of an RFID-marketing initiative (Boeck et al., 2011). *"Its incorrect use could potentially signify loss of sales and a wasted investment in the short term but more importantly its impact could hinder the company's brand and thereby affect the market value of the firm in a longer perspective"* (Boek et al. 2011, p. 843) (e.g. Metro group, Gillette, Benetton, Wal-Mart).

Finding support for consumers being only moderately privacy aware when RFID is involved (Rothensee & Spiekermann, 2008 in Boek et al., 2011), Boeck et al. (2011) find indications for consumer willingness to accept the use of RFID technology in marketing. In their article they argue for introducing perceived intrusiveness of RFID as a central construct as opposed to first evaluating customer attitude towards privacy risk and then evaluating their propensity to accept RFID. This is substantiated by the assumption that *"privacy cannot be completely protected when RFID technology is involved, but rather it is intruded upon at various levels"* (Boeck et al. 2011, p. 843). Intrusion is defined as *"the consumer's perception that the company abusively penetrates into his/her private life"* (Boeck et al. 2001, p. 843) and will therefore be based on individual perception. Perceived intrusion as a construct is then intended to reflect privacy concerns established on a continuum in regard to previous experience and culture (Boeck et al., 2011).

The general goal of their research was to evaluate customer readiness to adopt RFID in everyday settings, and their willingness to interact with the technology during their shopping experience. Four scenarios were generated; one representing a traditional loyalty program based on barcode technology and registration through manually swiping a magnetic card at point of sales, and the remaining three based on RFID technology with various incremental intrusion factors such as automatically identification upon entry, path tracking in the store, and time spent in the store. Their findings indicate that perceived privacy intrusion will negatively affect attitudes towards using the loyalty program. *"However, the study also indicates that a basic RFID loyalty program will not generate more perceived intrusion than a regular barcode loyalty program"* (Boeck et al. 2011, p. 846). In addition, the authors found evidence for an intrusion threshold affecting consumer willingness to participate to the RFID loyalty program in comparison to a traditional loyalty program, located as beyond the point of automatic identification of customers upon store entry. Though, as pointed out by the authors, such extreme scenarios have already been implemented (Barcelona club, New Delhi Branch) in the pursuit to form personalized service and increase satisfaction of selected clients.

4.10 Technology-adoption models and technology-adoption studies

The reviewed empirical research regarding adoption of RFID technology and the testing of the established models such as UTAUT and TAM indicate that though most of the theory is supported there are still aspects that remain uncertain and therefore call for extensions (e.g. Caizer et al., 2008) or modifications (e.g. Müller-Seitz et al., 2009; Boeck et al., 2011) of the existing models.

As this master thesis looks at RFID technology in the context of a voluntary setting, UTAUT and TAM primarily directed towards a mandatory and organizational setting may lack the ability to capture the diverse drivers affecting intention. Shown in the articles reviewed above, aspects such as trust (Sill et al., 2008), intrusion (Boeck et al., 2011) and technology as part of a social setting and social image (Lu et al., 2005) may affect the perception of the target technology (RFID) and the intention to adopt it. Further, the assessment of risk associated with RFID technology such as protection of data privacy (Müller-Seitz et al., 2009;

Featherman & Pavlou, 2003) pose significant impacts on acceptance. Following the development of RFID technology where residual tags may be the new norm, perceived risk harm and likelihood (Cazier et al., 2008) are shown to affect the behavioral intention of using RFID enhanced products and services.

Generally the perception of risk, anxiety and attitudes towards protection of data privacy, or alternatively trust and intrusiveness, seem to pose great concern amongst RFID-adoption researchers. Also, considering more emotional aspects (Beaudry & Pinsonneault, 2010), such as enjoyment and flow (Lu et al., 2005), and consumer opinion of the system concept in itself (Pramatri & Theotokis, 2009) is found to be relevant when laying the foundation of a more holistic understanding of the adoption process.

Though there are factors and variables not included in UTAUT or TAM, research has shown that TAM is a robust and applicable model to many contexts and UTAUT, successful in increasing predictive efficiency to 70 percent, presumed to be the most accurate technology-acceptance model to date. Common to most of the technology-adoption theory and shared by UTAUT, TAM and the adoptions studies is the effect of performance expectancy (PU) significantly influencing attitude (Pramatri & Theotokis, 2009) and serving as a strong predictor of technology acceptance (Müller-Seitz et al., 2009; Cazier et al., 2008; Lu et al., 2005). With less consistent results, effort expectancy (PEOU) was found to influence attitude significantly (Pramatri & Tehotokis, 2009), only pose a minor influence on acceptance (Müller-Seitz et al., 2009), but have a significant positive effect on adoption intention directly and through PU (Cazier et al., 2008).

5.0 Moderating Variables

Most of the technology-adoption theories reviewed are developed and tested within the organizational context, though with some exceptions (e.g. TAM). RFID-enabled consumer services, though primarily found facilitating public use, will increasingly be developed for private consumption. As such the context in which the usage of such services will occur is therefore an area of interest and one that could moderate the main effects postulated in UTAUT. Further, and as expressed in many of the adoption studies in chapter 4, issues related to privacy and risk are expressed to be of great importance related to RFID-based services and customer adoption. Exploring the effect of level of perceived customer control over security related aspects of the service could therefore influence the direct determinants in UTAUT. Having established the theoretical background and reviewed some of the current studies on technology adoption the chosen moderators of intention are therefore situational context (social vs. individual) and perceived control. By first investigating the relevance of the moderator, the proposed effect is suggested.

5.1 Social vs. individual context

Technological innovations have become a more integrated part of modern life. Constantly evolving, novel technology comes with a degree of uncertainty about its expected consequences, risks and benefits for potential adopters. As uncertainty may cause distress, consulting with others through social networks or gaining support from influential others has an important impact on what action a potential individual adopter might choose. As individuals adapt their attitudes, behaviors and beliefs to their social context, adoption decisions are often based on informational and normative social influences. Adoption decisions are therefore not only influenced by personal attitude, but also by *"socialization forces due to the desire to align one's behavior with referent group norms"* (Kulviwat et al. 2009, p. 706). Studies have shown that the influence of family and peer-based reference groups positively relates to consumer decisions (e.g. Childers & Rao, 1992). The term reference group is used to describe *"groups which serve as a source of reference for an individual and thus capable of having an influence on the person's attitudes and behaviors"*

(Leigh 1989, p. 65). Reference-group pressure and status achieved by using an innovation have also been found to be positive determinants of the adoption decision.

5.1.1 Individual versus Social technology

By distinguishing between individual and group technology Sun and Zhang (2006) propose, and find support for, that social norm has more influence on BI and PU for group technologies than for individual technologies. Different from individual technology, aiming to improve individual productivity, group technology aims to facilitate group coordination and to support cooperation and collaboration among a group of users (Sun & Zhang, 2006). Due to its unique features, user acceptance of groupware therefore differs from that of individual technology This is supported by the argument that users that have adopted group technologies have the incentive to "*enlist more users for the technology, and may be eager to promote the technology by sharing their experience with and offering help to potential adopters*" (Sun & Zhang 2006, p. 67). Potential users may consequently by convinced that learning the groupware will take a minimum of time and effort, which then promotes the intention to use it (see also: Lu et al., 2005). Transferring this to the context of RFID-enabled services would indicate that services intended for a social context will positively moderate the influence from social norm, while exerting less effect in individual contexts.

5.1.2. Public versus private consumption

Further, incorporated in the concept of contextual situation the way a service is consumed is suggested to moderate the antecedents of intention. Francis Bourne receives much of the credit of the work on purchase-related influences of reference groups (Leigh, 1989). The Bourne (1957) four-category typology is based on the belief that the more conspicuous, the more socially visible the product or brand is the stronger will the reference group influence be. Bearden and Etzel (1982) advanced the typology by adding the public-private consumption and the luxury-necessity dimension. Adding refinement and strengthening Bourne's view Bearden and Etzel (1982) support that the level of social visibility seem to be "*the dominant product-related factor promoting strong reference group relevance and possible influence attempts*" (Leigh 1989, p. 68.)

In their study Kulviwat et al. (2009) examine the role of social influence and the moderating effect of a product's public/private status on consumers' intended adoption of high-tech innovations. Applying Bourne's (1957) typology and Bearden and Etzel's (1982) division between publicly consumed and privately consumed product types, Kulviwat et al. (2009) argue that the relationship between subjective norms and adoption intention is affected by the level of conspicuousness or social visibility of a product's consumption. *"Specifically, the public/private character of a product is expected to interact with social influence such that a product's perceived social visibility moderates the relationship"* (Kulviwat et al. 2009, p. 707).

Their main findings show that social influence and adoption attitude has positive effects on consumer intention to adopt an innovation, and that the effect of social influence on adoption is fully mediated by consumer attitude. Attitude toward adoption was confirmed as having a strong impact on adoption intentions. In addition, the relationship between social influence and adoption intention is stronger when an innovation is publicly consumed rather than privately consumed. A product's social visibility (public or private product characteristics regarding consumption) will therefore moderate the relationship between social influence and adoption (Kulviwat, 2009). If the product is meant for public consumption *"adoption decisions regarding technological innovations are more susceptible to social influence"* (Kulviwat 2009, p. 710). Social influence should therefore be factored into the promotion decisions. Research findings indicate that adoption of certain high tech innovations may lead to increased status, power, or knowledge for the adopter (e.g. Pedersen, 2003). Alternatively, products meant for private consumption should focus on shaping product related cognitions and affect (Kulviwat et al., 2009).

5.2 Privacy concerns – level of control

Information privacy concerns refer to *"the claim of individuals, groups or institutions to determine for themselves when, how and to what extent information about them is communicated to others"* (Westin 1967, p.7). In a similar vein, Campell (1997) refers to such concerns as an individual's subjective view of fairness within the context of information privacy, such as privacy risks in relation to unauthorized access use, and sharing of personal information (Malhotra et al., 2004 in Cho et al, 2010, p. 988).

With the constant price decline which makes the use of RFID economically viable in ever more areas of application, *"the most frequently voiced fear refer to the misuse of data generated by RFID resulting in an undesirable intrusion into the privacy of individuals"* (Thiesse 2007, p. 215). This threat is primarily concerned with the *"globally unique identity of each good and the possible linkage with the owner"* (Thiesse 2007, p. 216). With RFID and similar technologies, the possibilities of acquiring new data types through real-time monitoring, the ability to permanently save and link information about individuals, the decreasing transparency of reasons for acquiring data and the uncontrolled data access caused by extreme interconnectedness (Thiesse, 2007) foster potential privacy threats.

In his paper Thiesse (2007) looks at the perception of RFID technology as a risk to privacy. RFID-based services have the potential of increasing technology acceptance through enhancing shopping experiences, reducing checkouts, easier returns and winning customer loyalty by inventing innovative ways of satisfying new customer needs. Though many may view this as improvements and increasing customer benefits, there is also the assessment of risk associated with this technology. The increasing numbers of applications that are likely to become economically viable entailing activated transponders in individual products which will remain activated beyond purchase, pose new consequences of relevance (Thiesse, 2007).

5.2.1 The Privacy Paradox

Cho et al (2010) examined the ways in which Internet users construct their risk judgments about online privacy. The authors focus on two moderators, namely perceived controllability and prior experience, and examine the extent to which these factors selectively affect the risk estimates for one self and others. Specifically, they try to specify the moderating processes involved in optimistic bias in potentially affecting people's judgments of themselves, others or both. Studies have shown that optimistic bias also is applicable in an online context.

A similar phenomenon is labeled the "privacy paradox". This contradictory problem is exemplified through Internet users *"displaying high levels of societal concern about online privacy, but seldom or never engaging in precautionary behavior at the personal level"* (Cho

et al. 2010, p. 988). Cho et al.'s (2010) findings indicate that users cognitively distinguish between risk judgment on the personal level and that on the societal level. Personal judgments about online privacy risks were distinctively colored by a strong optimistic bias judging oneself to be *"significantly less vulnerable than others to these risks"* (p. 987). *"Consistent with previous literature about the optimistic bias, Internet users appear to engage in motivated reasoning and to harbor unrealistic optimism about online privacy risks because a feeling of personal invulnerability to privacy risks may lead to reduced anxiety, self-esteem, a sense of control, and subjective well-being in virtual environments"* (Cho et al 2010, p. 992).

5.2.2 Perceived controllability

Various studies have also shown that biased judgments (i.e. unrealistic optimism) are one of the most robust findings in risk perception research affecting both perceptions and behaviors pertaining to a variety of risks (Cho et al., 2010). *"Numerous studies have reported a positive relationship between perceptions of control and optimistic bias"* (p. 988). Perceived controllability is a powerful and robust psychological variable predicting behavior, emotion, motivation and performance (Harris, 1996 in Cho et al., 2010). With a self-reinforcing power, perceived controllability may lead to the illusion of personal invulnerability and comparative superiority of control, which results in a greater optimistic bias toward online privacy, which in turn supports the perception of control and so on (Cho et al., 2010).

The authors claim that prior experience positively affects personal risk estimates and thus functions as a moderator influencing personal-level risk judgments stronger than societal-level judgments. Finding support in the literature, they suggest that Internet user's prior or direct negative experiences may lead to decreased unrealistic optimism about online privacy risk reducing optimistic bias.

Cho et al.'s (2010) paper highlights the complex nature of risk judgments about online privacy risks. Internet users tend to display strong optimism, until proven wrong, making it difficult to promote precautious behavior through protective tools or guidelines. Though optimistic bias is a robust phenomenon, the authors contribute theoretically to the literature

by exposing the propensity for change and disregarding optimistic bias as a constant or stable phenomenon, but rather a conditional one. More specifically, their results reveal that *"optimistic bias about online privacy risk varies across individuals to the extent that internal beliefs (i.e. perceived controllability) and individual differences (i.e. prior experience) significantly moderate the degree to which people display unrealistic optimism"* (p. 992).

6.0 Theoretical model and Hypothesis

Based on the literature presented, a model is proposed to explain intention to use product related services facilitated through RFID technology. The antecedents and moderators included will build on general perspectives of RFID-adoption theory and specific models proposed to explain intention to use RFID products. The model derived is based on the same foundations as UTAUT, a model which is both comprehensive and holds great validity explaining up to 70 percent of the intention to use (Venkatesh et al. 2003). In addition, many of the antecedents in UTAUT mirror the antecedents in the previously reviewed models. Though UTAUT is of a more general character it is reasonable to presume that it is applicable in the RFID context. Still, certain elements will be added to give the proposed model more accuracy. Alongside the continuous development of information technology, the technology acceptance theory calls for periodic examinations of the determining factors as new technologies often involve factors that have rarely been considered before (Sun & Zhang, 2006). Therefore, the model founds its theoretical foundation and basic structure on UTAUT and from there building on with firstly risk harm, then emotions and lastly experience.

6.1 Building the Research Model

6.1.1 Limitations of existing research

What drives the adoption of RFID enabled products and services? The usage of RFID technology as an enabler for consumer services is at its infancy. Mainly focusing on supply chain management and logistics, research on consumer acceptance of RFID technology has been limited leaving the knowledge about the general drivers of adoption of RFID-enabled services in great uncertainty. In general, previous studies have looked into system perceptions and personality traits as antecedents of RFID acceptance (Müller-Seitz et al., 2009; Cazier et al., 2008; Pramatari et al., 2009; Sill et al., 2008). Amongst these studies, system characteristics that have been emphasized are security (Müller-Seitz et al., 2009), benefits (Sill et al., 2008), and perceived ease of use and perceived usefulness (Cazier et al., 2008; Müller-Seitz et al., 2009) derived from TAM (Davis, 1989). Regarding personality traits,

technology anxiety (Pramtari et al., 2009), personal innovativeness (Lewis et al., 2003; Lu et al., 2005; Sill et al., 2008), and propensity to trust (Sill et al., 2008) have been researched in technology adoption studies. Pramatari and Theotokis (2009) also suggest the effects of cultural differences affecting the intention to interact with RFID-based technology. In addition, even less is known about the individual and/or situational moderators influencing these general determinants of intention. Though all of these studies investigate the effects of potential antecedents influencing consumers' acceptance, adoption and intention to use RFID technology, none of them study the potential influences of moderating variables such as situational or personal characteristics.

6.1.2. Purpose of the study

With few studies actually addressing this topic and previous research based on rather one-dimensional models a need for a more comprehensive model including a broader specter of antecedents seem to be in place. Based on the reviewed adoption models and adoption studies, the purpose of this section in the thesis is to build and test a model intended to explain the adoption of RFID-enabled services and to look into potential effects of relevant moderators.

6.2 Theoretical model

Previous models have mainly included variables primarily centered on purely cognitive variables. Extending these models by incorporating emotional antecedents, experience and risk perceptions are suggested to increase the predictive nature of the model and thus improve the understanding of what drives the intention to adopt RFID-enabled services. Reviewing the adoption literature established models such as the Theory of Reasoned Action (Fishbein & Ajzen, 1975), the Theory of Planned Behavior (Ajzen, 1991), and the Technology Acceptance Model (Davis, 1989) are all reflected to a certain degree in the Unified theory of Acceptance and Use of Technology (Venkatesh et al., 2003). By selecting UTAUT as the general framework one achieves to include many of the same antecedents proposed in the aforementioned models, as UTAUT incorporates much of the essence of these appropriate

models, and at the same time improve the predictability of the research model as UTAUT is found to significantly outperform these models. In addition, both self-efficacy and anxiety are reviewed in UTAUT and are personality traits expressed to be of importance in existing RFID adoption research.

As mentioned, using UTAUT as a starting point the research model will build on the following determinants of intention. Extracted from UTAUT are the four direct antecedents of intention, namely performance expectancy (PEOU from TAM), effort expectancy (PU from TAM), social influence (social norm in TRA), and facilitating conditions (PBC from TPB). Two personality characteristics included, reviewed in UTAUT and supported by existing research, are self-efficacy and anxiety. Regarding the importance of risk assessment, a general concern in the adoption research (e.g. unauthorized assessment of one's belongings by others, Cazier et al., 2007; security related issues, Yui et al., 2007), perceived privacy risk harm (Cazier et al., 2003) a measurement of the potential harm or damage of relevant risks has been incorporated in the model as a proposed antecedent of adoption. Representing the emotional aspects of adoption the inclusion of the four emotive antecedents proposed by Beaudry and Pinsonneault (2010) have been suggested. These are achievement emotions conceptualized as satisfaction, challenge emotions conceptualized as expectation, loss emotions conceptualized as frustration, and deterrence emotions conceptualized as concern. As these emotions have been found to influence IT adoption at the early stages of implementation (Beaudry and Pinsonneault, 2010), inclusion of these emotions seem particularly relevant given the novelty of RFID-enabled services. Addressing the comment in chapter 6.1.1, concerning the lack of research on the potential influence of moderating variables in prior RFID acceptance literature, the research model includes two moderating variables. Thus, situational context and perceived control are proposed to moderate the effect of the direct antecedents of intention. The graphic presentation of the research model (Figure 11) depicts each of the main categories of antecedents of intention with related sub-categories enclosed in the same section.
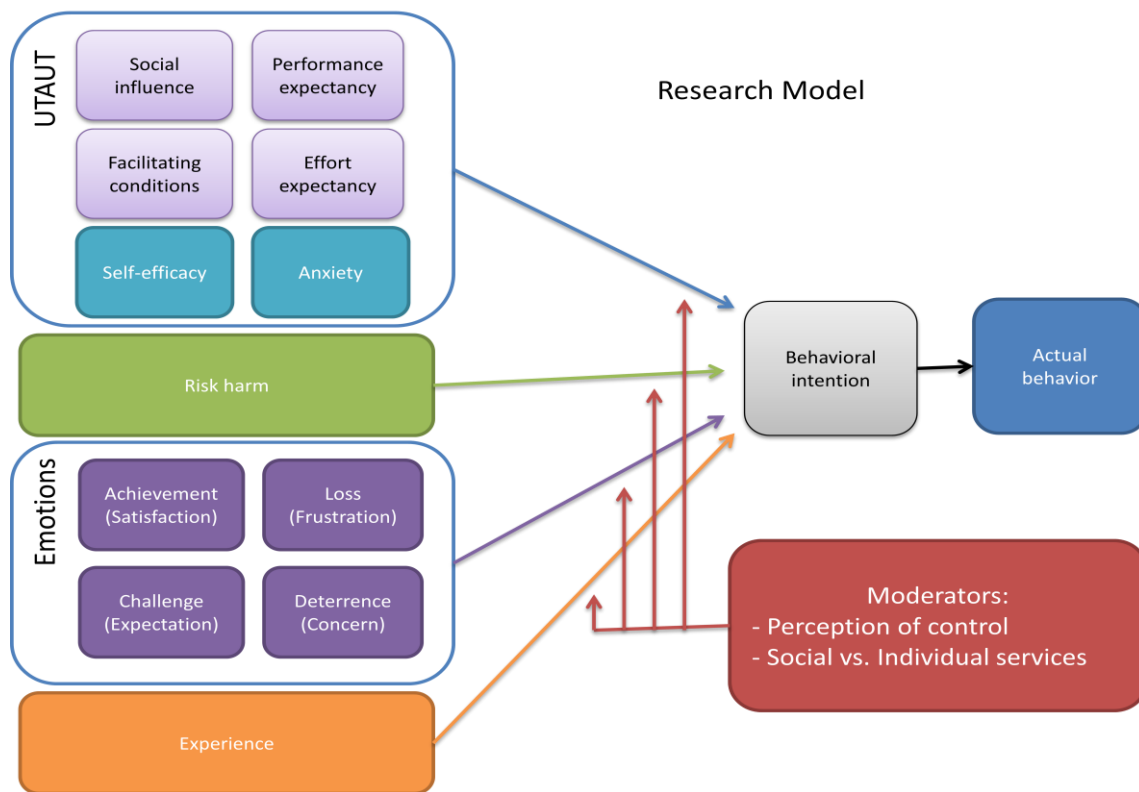
Figure 11: Research model

6.3 Hypotheses

Having introduced the research model, the following hypotheses have been formulated based on theory and prior empirical studies.

6.3.1 System-related factors/System response

According to TRA (Fishbein & Ajzen, 1975) beliefs about an object are predicted to be a central antecedent for usage of an object. With TAM, Davis (1989) points to two such beliefs which have also been found to be of significance in RFID specific studies (Müller-Seitz et al., 2009; Caizer et al., 2008) also known as the previously defined PEOU and PU. These constructs are reflected in the UTAUT model as performance expectancy (reflecting PU) and effort expectancy (reflecting PEOU). In addition both performance expectancy and effort expectancy were found to have significant effect on consumers' attitude towards technology-based services (Pramatari & Theotokis, 2009)

6.3.1.1 Performance expectancy

Derived from five existing models, the performance expectancy construct found in UTAUT reflects the similar constructs of perceived usefulness (TAM and C-TAM-TPB), extrinsic motivation (MM), job-fit (MPCU), relative advantage (IDT) and outcome expectations (SCT). Found to be significant in both mandatory and voluntary settings, performance expectancy has been considered the strongest predictor of intention (Venktaesh et al., 2003) and confirmed as the most important factor influencing technology acceptance (Sun & Zhang, 2006). The significance of this determinant on intention has received empirical support through consistent results in previous model tests (e.g. Compeau & Higgins, 1995; Thompson et al., 1991, Szajna, 1996; King & He, 2006). Further, more and more surveys indicate a readiness by consumers to accept RFID caused by performance benefits such as improved product security, faster checkouts or easier returns (Gartner, 2003; CGEY, 2004 in Thiesse, 2007). The potential increase of usefulness or performance expectancy facilitated by RFID-enabled services and the increase in customer acceptance of new technologies should therefore have a positive effect on intention.

Based on the theoretical review and the empirical support, performance expectancy is expected to influence behavioral intention. Thus, the proposed hypothesis is as follows:

H1: Performance expectancy has a positive effect on behavioral intention

6.3.1.2 Effort expectancy

Defined as the "*degree of ease associated with the use of the system*" (Venkatesh et al. 2003, p. 450) the theoretical foundation from which the concept of effort expectancy is based is found in the three constructs of perceived ease of use (TAM), complexity (MPCU), and ease of use (IDT). In contrast to PU (performance expectancy), PEOU (effort expectancy) has been reported with some inconsistent effects on attitude, intention and usage. Cazier et al. (2008) reported that both PEOU and PU had positive effects on intention to adopt residual RFID technology. Igbaria et al. (1997) found, in contrast to the research of Davis et al. (1989), that the *"total effect of perceived ease of use is greater than the total effect of perceived usefulness on usage"* (p. 294). Szajna (1996), on the other hand, reports a consistent and direct relationship of PEOU to PU, but where the relationship between PEOU and intentions is non-existing. Nonetheless, effort expectancy is included in the model as an antecedent of intention where a high degree of ease of use is positively associated with intention to use.

Thus, the proposed hypothesis reads as follows:

H2: Effort expectancy has a positive effect on behavioral intention

6.3.1.3 Facilitating conditions

Facilitating conditions, mirroring perceived behavioral control from TPB and C-TAM-TPB, facilitating conditions from MPCU, and compatibility found in IDT, constitutes the perceived level of existing organizational and technical infrastructure able to support system usage (Venkatesh et al., 2003). Shown to be a significant predictor of intention in TPB, facilitating conditions was not found to influence intention in MPCU and IDT. Based on research by Venkatesh (2000), Venkatesh et al. (2003) explain these diverging results with the models inclusion, or exclusion, of performance expectancy and effort expectancy

Facilitating conditions in UTAUT is partially derived from PBC in TPB. The theoretical support for predicting facilitating conditions as a determinant of intention will therefore be based on the assumption that PBC has a direct influence on intention and therefore a relevant driver to include. Though not found to be significant in predicting intention in UTAUT, but influencing usage *"beyond that explained by behavioral intentions"* (Venkatesh et al. 2003, p. 454) facilitating conditions as a direct antecedent on intention will be postulated in the research model where high perceived levels of support will positively influence intention. Stating this relationship, the proposed hypothesis is as follows:

H3: Facilitating conditions has a positive effect on behavioral intention

6.3.1.4 Social Influence

Though given different labels in various models, the construct of social influence captures the *"explicit or implicit notion that the individual's behavior is influenced by the way in which they believe that others will view them as a result of having used the technology"* (Venkatesh et al. 2003, p. 451). Social influence therefore reflects subjective norm (TRA, TPB and C-TAM-TPB), social factors (MPCU) and image (IDT). Though not found to exert any direct influence on intention in a voluntary context (Venkatesh et al., 2003, Lu et al., 2005), social influence poses its effect through influencing perceptions about the technology (Venkatesh et al., 2003; Lu et al., 2003). This is exercised through the mechanisms of internalization (integrating referent's information and beliefs into one's own (Lewis et al. (2003)), identification (altering a belief structure or acting in response to potential social status gains

(Lewis et al. (2005)) or in compliance to social pressure. However, in contrast to these findings Karahanna and Straub (1999) found that *"subjective norm is a significant determinant of intention to adopt"* (Lu et al. 2003, p. 260).

Though the effect of social influence in the early stages of adoption is reported to be stronger in a mandatory setting (Venkatesh et al., 2003; Sun & Zhang, 2006), the effect of social influence in voluntary settings has been reported in the work of Sun and Zhang (2006). Thus, the effect of social influences in a mandatory setting will *"differ from the social pressures on an individual consumer facing a free adoption choice"* (Lu et al. 2005, p. 248). As individuals are part of, and exposed to, various informal social networks, these relationships will affect one's opinions and decisions (Lu et al., 2005) which in turn will affect an individual's evaluation of a new technology.

While excluded from the original TAM both TRA, TPB and the extended version of TAM, TAM2, posit the effect of social influence on usage intentions indicating the salience of this construct. The influence of social influence on intention in UTAUT is complex and subject to a wide range of moderating factors. Still, the construct is an important and influential one and therefore valid for inclusion. Therefore, following in the footsteps of the theoretical framework based on UTAUT, social influence is included as one of the direct determinants of intention where high levels of social influence will positively affect intention to use the RFID-enabled services. Given this background the following hypothesis has been authored:

H4: Social influence has a positive effect on behavioral intention

6.3.2 Personality traits

Today users of technology are not a confined group of people, rather *"women, older consumers, the less educated, and the less affluent all have access to some level of familiarity with using simple technologies"* (Dabholkar & Bagozzi 2002, p. 186). Variation in consumer differences caused by personality traits, as opposed to demographic or psychographic factors, are therefore of greater interest as personality traits are essential in consumer attitude formation and behavioral intentions (Dabholkar & Baggozi, 2002). As such, personality traits have been included in the model. Personally traits discussed in UTAUT (though not considered direct determinants of intention) and emphasized to be of

importance in existing research on RFID adoption are anxiety (e.g. Pramatari & Theotokis, 2009) and self-efficacy (Compeau et al. 2006; Compeau & Higgins 1995).

6.3.2.1 Anxiety

Anxiety, defined as an individual's apprehension, or even fear, when faced with the possibility of using computers (Venkatesh, 2000), is considered to have a *"significant impact on computer use"* (Compeau & Higgens 1995, p. 203) in SCT. Pramatari and Tehotokis (2009) found that anxiety affected consumer attitude towards technology-based and RFID-enabled services. Reports from previous studies have shown that anxiety can have a significant impact on computer-related activities such as attitudes toward computers (Compeau & Higgins, 1995) and intentions to use computers or software applications (Elasmer & Carter, 1996). Anxiety is therefore considered to increase resistance towards accepting a new technology and acting as an obstacle for an individual's intention to interact with it by arousing negative affective reactions towards usage (Venkatesh, 2000). Supporting the theoretical resurrection of anxiety as a direct determinant of intention is the research conducted by Compeau and Higgins (1995). Here anxiety, alongside self-efficacy, was shown *"to explain unique variance in key dependent variables such as behavior"* (Venkatesh 2000, p. 350).

Since individuals tend to avoid activities that evoke anxiety, anxiety is expected to influence intention to use (Compeau & Higgins, 1995). Thus, anxiety is predicted to be a direct determinant posing a negative influence on intention represented by the following hypothesis:

H5: Anxiety has a negative effect on behavioral intention

6.3.2.2 Self-efficacy

Self-efficacy defined as *"beliefs about one's ability to perform a specific behavior"* (Compeau et al. 1999, p. 146) is given prominence in SCT. As such, the theory recognizes that an expectation of a positive outcome, given a specific behavior, is related to the individual perception of one's capabilities to successfully execute the behavior in the first place. Further, given the existence of a continuous reciprocal interaction between environment, cognitive perceptions, and behavior (Bandura, 1986) successful interactions with the technology, affect, and anxiety will influence self-efficacy judgments while at the same time

be influenced by the same construct (Compeau et al., 1999). Thus, anxiety and self-efficacy are reciprocal determinants (Venkatesh, 2000), where stimulating one of the two variables will cause an effect in the other.

Research in the IS field have previously demonstrated a strong link between self-efficacy and reactions to new technology (e.g. adoption and use of computers, Compeau & Higgens, 1995). Results have consistently shown the relationship between self-efficacy and other cognitive and emotional responses that influence behavioral intention (Compeau et al., 2006). Self-efficacy is therefore seen as affecting behavioral intention and exerting an *"influence on individuals' choice behavior with respect to information technology"* (Compeau et al. 2006, p. 231). Compeau and Higgins (1995) research results indicated that *"[…] self-efficacy adds to our understanding of why people use computers, over and above the concepts like outcome expectations, anxiety, and affect"* (p. 207). Though excluded from UTAUT based on the argument that self-efficacy will be mediated by effort expectancy (PEOU), to be able to *"understand how and why a behavior develops and to exert an influence on future behavior"* (Compeau et al. 2006, p. 233) including self-efficacy as a determinant of intention remains important. In addition, research done by Compeau et al. (1999) reported that *"self-efficacy explains a total of 18% of the variance in individual's usage (total effect = .43)"* (p. 153), and was found to be a significant predictor of use one year later. As such, research on self-efficacy supports the predictive capabilities of this construct in relationship to performance related outcome expectations (Compeau et al., 1999).

High levels of self-efficacy is therefore expected to positively influence behavioral intention and is therefore included as an antecedent with the following hypotheses:

H6: Self-efficacy has a positive effect on behavioral intention

6.3.3 Privacy concerns
Much of the research done on consumer related responses to RFID technology seem to be concerned with risk, or a perception of risk, often related to privacy and/or security risks. Intuitively this makes sense as users are unlikely to accept a system if they have doubts when using it (Yui et al., 2007). Privacy has therefore been identified as a major practical

implementation challenge and the most significant cost to consumers (Boeck et al., 2011), and one of the key determinants for the widespread adoption of a new system. Threats such as unauthorized assessments of one's belongings (Spiekermann & Ziekow, 2005), tracking individuals through their objects (Spiekermann & Ziekow, 2005), and real-time monitoring (Thiesse, 2007) will result in consumers performing risk-benefit evaluations when deciding when and when not to engage in such services or disclose private information (Cazier et al., 2008). Attitudes regarding the safeguard of privacy should therefore influence the propensity to buy tagged items, accept products with residual RFID or engage in RFID-enabled services. Interpreting risk as the consumer's subjective expectations of suffering a loss in pursuit of a desired outcome, perceived risk may impair customers' perception of the consequences of adoption, and negatively influence the adoption of RFID-based services (Yui et al., 2007). Further, Caizer et al. (2008) found support for their modified version, adding perception of privacy risk associated with RFID technology to the original TAM. Privacy risk harm, in addition to PEOU and PU, was reported to directly influence consumers' intention to accept and adopt RFID technology, and therefore further emphasizing the importance of incorporating perception of risk in to the model. Supporting these findings Yiu et al. (2007) reported that, though preceded by PU and PEOU respectively in regards to strength of correlation, perceived risk was found to have direct relationship to adoption.

In the pursuit of capturing privacy concerns in the research model the construct of perceived risk harm derived from the research by Caizer et al. (2008) will be the theoretical foundation for the empirical investigation. Considering its proposed influential powers both intuitively, practically and reported, risk harm has been included as a direct and negative determinant of intention with the corresponding hypothesis formulated as:

H7: Perceived risk harm has a negative effect on behavioral intention

6.3.4 Emotional system responses

Emotions are demonstrated as powerful influences in research done in the field of brand attitude and advertising (Agarwal & Malhorta, 2005). Still, traditionally system responses have generally only included cognitive responses as antecedents for adoption. Expanding this repertoire, Beaudry and Pinsonneault (2010) have tested and found support for four

emotional category responses influencing IT usage directly or indirectly. These four emotions were also found to influence adoption of IT in the early stages of implementation (Beaudry & Pinsonneault, 2010). Further, Allen et al. (2005) found the emotive variables of joy and fear offering incremental prediction above the cognitive variables (accounting for 30 percent of the variance in attitude) further supports the *"unique role for emotive information as an antecedent of attitude"* (p. 498). Based on the framework presented by Beaudry and Pinsonneault (2010) reflecting both positive and negative emotions potentially present in the process the following argumentation and hypotheses have been put forward.

6.3.4.1 Negative emotions

As the introduction of novel technologies (e.g. RFID enabled services) come with a certain degree of uncertainty and risk, it is eligible to assume that such insecurity may be translated into anxiety and/or anger categorized as deterrence and loss emotions. Posing a negative influence on intention the following hypothesis is formulated as:

H8: Deterrence and loss emotions have a negative effect on behavioral intention

6.3.4.2 Positive emotions

On the other hand, consumers may also have or expect positive experiences with RFID-based through potential advantages such as consumer convenience (Eckfeldt, 2005), better shopping experience (Slettemeås, 2009), post-sale services (Slettemeås, 2009), improved services (Eckfelct, 2005) etc. Therefore, categorized as achievement and challenge emotions, emotions such as happiness and excitement are also included in the model as potential positive antecedents of acceptance of RFID-based services. The hypothesis reads as follows:

H9: Challenge and achievement emotions have a positive effect on behavioral intention

6.3.5 Experience

The constructs of frequency and recency of trying derived from TT (Bagozzi & Warshaw, 1990) make up the theoretical foundation for the variable labeled experience. The effect of prior attempts or encounters may influence the intention to engage with the RFID-enabled service (Fishbein & Ajzen, 1975). Research has shown that greater use is related to greater discloser and that *"people with more computer experience tend to have fewer negative feelings toward computers"* (Frye & Dornisch 2010, p. 1121). Müller-Seitz et al. (2009) make

a similar statement linking the effect of experience positively to usage as *"perceived risk of using novel technologies might dissipate over time"* (p. 37). Further, Frye and Dornisch (2010) point to the fact that with experience, frequent users acknowledge the possibility of privacy concerns, but do not let these concerns alter their disclosure patterns , *"since they do not expect their communications would, in fact, be intercepted"* (p.1124). This follows in line with the "privacy paradox" (Cho et al., 2010) where users' online privacy risk judgments are distinctively colored by a strong optimistic bias much based on previous positive encounters.

In the model experience will function as a proxy for frequency, as it is assumed that the frequency of trying will be reflected in accumulated experience. Adding experience as a component enabling a higher understanding of the belief-intention-acceptance relationship is supported by Szajna (1996). As users gain more experience they may employ this knowledge to form intentions (Fishbein & Ajzen, 1975). Prior experience with similar technology will elicit more sources to draw upon when engaging with new technology. As prior experience is utilized when forming intentions to use a RFID-based service BI will have a more significant influence on actual usage for experienced users as opposed to inexperienced users (Sun & Zhang, 2006).

Experience is therefore viewed as a direct determinant of intention. Based on this reasoning that higher levels of experience may positively influence behavioral intention the following hypothesis has been constructed:

H10: Experience has a positive effect on behavioral intention

6.4 Weighing of effects

Introducing UTAUT as a theoretical framework the choice of highlighting the effect of anxiety and self-efficacy and adding risk harm, emotions and experience as additional antecedents for adoption the model is predicted to paint a more holistic picture of the intention to use RFID services which in turn helps predict actual adoption.

Summing up the effects of the abovementioned antecedents are Figure 12, emphasizing the negative effects on intention, and, Figure 13 emphasizing the positive effects on intention.
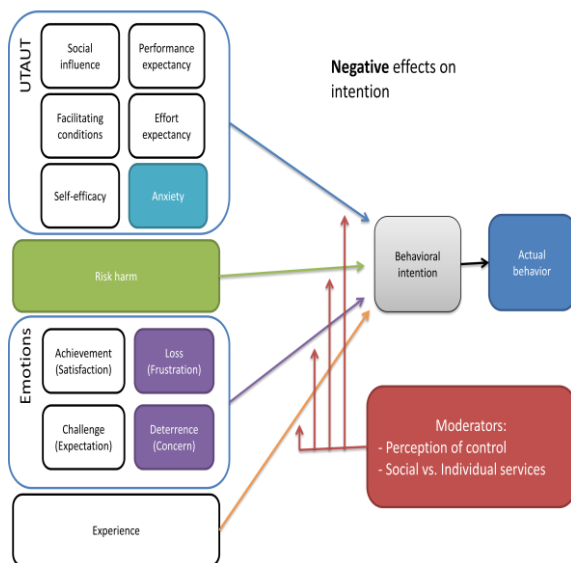
Figure 12: Negative effects on intention
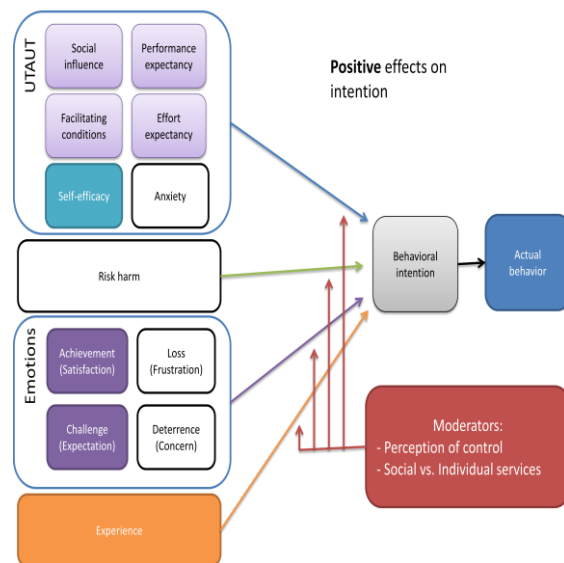
Figure 13: Positive effects on intention

6.5 Propositions for moderators

Sun and Zhang (2006) posit that moderating factors have profound effects on user technology acceptance. Including moderators will therefore lead to enhancing the predictive validity of a model, making the investigation of such effects worthwhile. The moderators proposed in the model are individual versus social context, and perceived control.

6.5.1 Situational Context

Sun & Zhang (2006) state that as existing models simply provide a basis for understanding user acceptance, that *"to predict user acceptance of a specific system, individual and contextual factors should be taken into account"* (p. 73). Service context is thought of as moderating the determinants of intention. By differentiating between services designed for a social versus an individual context, it is suggested that the effect of the contextual frame will influence the determinants of intention. Predicted to moderate all antecedents, the service context is especially assumed to moderate the strength of effect of social influence on intention. As individuals may resort to the opinion of others or regard the technology as

an image enhancer (Lu et al., 2005) the influential power of social influence is presumed to be stronger in a social context than in an individual context. Thus, a social context will moderate the effect of social influence on intention. The moderating effect of contextual situation can be exemplified through the following proposition:

Proposition 1: The effect of social influence will be moderated by the contextual situation either social or individual

6.5.2 Perceived control

The potentially problematic issues attributed to RFID are considered to be one of the key determinants of intention to adopt such technology. As such, the main concerns seem to revolve around the potentially misuse of sensitive or personal data collected by such systems, and the ability to track and monitor individuals through belongings (Roberts, 2006). Perception of control in relation to the information that is gathered or control over how, when or if the information is used should therefore moderate the determinants of intention (e.g. authorized personnel, encryption of data, security measures, consent forms etc.). Primarily the effect of high levels of perceived control is presumed to moderate the influence of risk harm on intention. Therefore, the moderating effect of perceived control can be exemplified through the following proposition:

Proposition 2: Perceived risk harm will be moderated by perception of control

6.7 Case Description

The pilot case study for which the testing of the research model and the hypotheses was to be explored was done as a first step towards developing RFID-enabled services for a Norwegian ski manufacturer in cooperation with Forskningsrådet, Sintef and Center for Service Innovation (CSI). The Nordic ski marked is an industry deeply rooted in the traditional and conventional product-innovation process mentality. Here, all value captured by the manufacturer occurs in the transfer of product between customer and retailer. The customer is purely a receiver of value creation and not a contributor. Applying a more service-dominant logic, one focuses on co-creating value with the customer. As defined by

Olivia and Kallenberg (2003) *"A Product-Service System is an integrated product and service offering that delivers value in use"*. Everything is essentially services; products are value propositions and function as platforms for customers' value creation. In this view the role of the customer calls for a new definition and a change in customer behavior, which is part of the innovation process. By adding services to the products, creating alternative and/or new ways of capturing value through the usage of products, and through experiences with the products, manufacturers are able to capture more of the value creation throughout the product life cycle.

The context of the case was therefore to design and test 8 different scenarios intended to exemplify potential service offerings in relation to the purchase of cross-country skis and the future usage of these. As this is a traditional product marked the effect of developing and implementing services intended to interact with and enhance the product itself would be pioneering in this industry. But success, as mentioned throughout the theoretical and empirical research, depends on customer intention to use and actual adoption of the service, if the service is to generate any value for both customer and business.

The following chapters will now take the reader through the layout of the data collection and the subsequent data analyzes before presenting the results from the research in chapter eight.

7.0 Method

An online survey was conducted facilitated through one of the leading data collectors in Europe, NORSTAT. The NORSTAT online-panel is made up of a sample representing national diversity amongst online users in the age groups of 15 and above. The histograms below show how the average respondent (aged 49) completing the survey is representative in comparison to the general Norwegian population. The purpose was to test the research model presented in Figure 11. Out of the 2606 respondents e-mailed and invited to click on a link to the survey, a total of n = 560 respondents met the quality criteria and contributed to the data set. Following the acceptation of this request, each respondent was exposed to one out of eight service descriptions. Each service description was manipulated with either of two moderator's; (1) customer perception of control with the personal information used in the service, and (2) whether RFID was used in an individual or social service. In addition, for the purpose of generalizability of the results, each of the four manipulations was developed for both an affective and cognitive usage context (see Appendix B for an example of service description: individual service/high control in a *cognitive* usage context). This gave a total of eight unique service descriptions with accompanying manipulation.
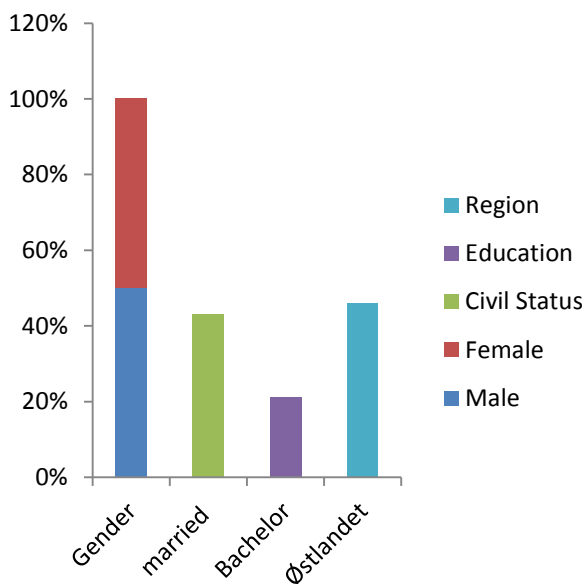
Figure 14: SSB numbers – average age 42
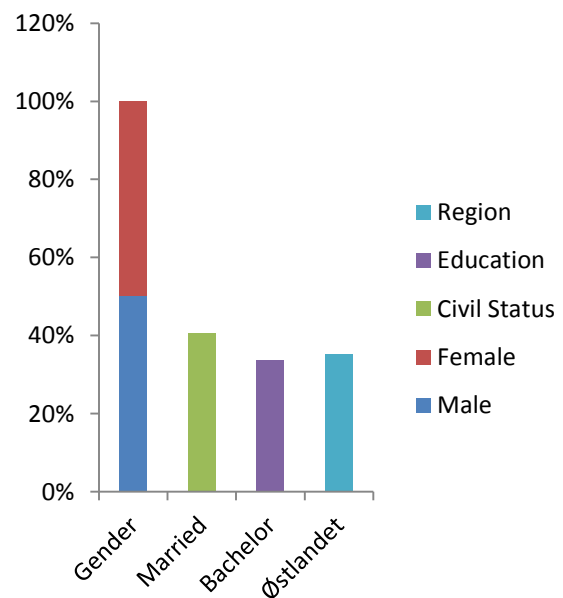
Figure 15: NORSTAT sample – average age 49

Note: NORSTAT sample differentiated between married with children and married without children. The numbers in the histogram are those representing married without children.

Comparing Figure 15 with the SSB numbers graphically displayed in Figure 14, the sample is said to be rather representative. The main diverging results are that the NORSTAT sample generally has a higher educational degree and are more dispersed across the country.

7.1 Quality measurements

To secure quality of the data gathered through the online-panel a number of security measures were included in the survey. To encourage the respondents to in fact read the manipulation carefully, a minimum time elapse of 45 seconds was required before the respondent could proceed to answering the questions. In addition, a question requiring the respondent to mark a specific answer was incorporated. This was done to ensure that the respondents also read the questions carefully.

7.2 Principle Component analysis

As the purpose of this analysis is to reduce the data by extracting a smaller number of artificial variables, PC presents principle components that are accountable for most of the variance in the observed variables, without much loss of information. In further analysis, these principal components are used as predictors or criterion variables.

Using Principal Component as extraction method and Oblimin with Kaiser Normalization as rotation method resulted in 4 categories with eigenvalue above one. Oblimin is an oblique factor rotation which identifies *"the extent to which each of the factors is correlated"* (Hair et al. 2010 p. 93) as opposed to an orthogonal solution where the components remain uncorrelated. The purpose of rotating the factors is to get the variables to load either very high or very low on each factor (UCLA, 2012). Further, suppressing coefficients under the value of .35 was selected.

Deciding on the number of factors to extract from the reduced data basically depends on when one considers there to be very little random variability left, leaving the decision arbitrary. One approach is by following the Kaiser Criterion (Kaiser, 1960) suggesting to only retain factors, or principal components, that extract as much as the equivalent of one of the original variables. In other words, one should only retain and interpret principal components with eigenvalues above one and therefore accounting for a meaningful amount of the variance. As the purpose of PC analysis is to reduce the number of observed variables, those components with eigenvalue less than one arguably account for less variance than has been contributed by individual variables. These components are therefore considered trivial and not retained.

As UTAUT is founded on six underlying factors (performance expectancy, effort expectancy, social norm, anxiety, facilitating conditions, and self-efficacy) it was found to be relevant to specify a fixed number of factors to extract; namely six. With low, but acceptable, loadings on the sixth factor (.567), the pattern matrix showed that some of the variables overlapped more than one construct (i.e., effort expectancy and facilitating conditions) indicating correlation and the possibility that they measure the same construct. Thus, the results were not found to be satisfactory.

7.3 Factor analysis

To investigate the data further a factor analysis was conducted where Maximum likelihood (ML) was chosen as extraction method and with the same rotation method (Oblimin with Kaiser Normalization). Further, the specification of numbers of factors to extract where maintained. This is a dependent technique and one where the attempt is to "to discover the nature of constructs influencing a set of responses" (DeCoster 1998, p. 1). As such, the primary objection is therefore to determine (1) the number of common factors influencing a set of measurers, and (2) the strength of the relationship between each factor and each observed measure (DeCoster, 1998). The results are shown in Table 1.

Total Variance Explained

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings[a]
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	7.450	41.389	41.389	5.033	27.959	27.959	4.658
2	2.849	15.828	57.217	3.659	20.326	48.285	3.571
3	1.845	10.248	67.465	1.562	8.677	56.962	4.369
4	1.310	7.276	74.741	1.156	6.424	63.386	5.875
5	.862	4.789	79.530	1.289	7.162	70.548	1.899
6	.567	3.149	82.679	.774	4.299	74.847	5.301
7	.539	2.995	85.673				
8	.472	2.620	88.293				
9	.384	2.131	90.424				
10	.286	1.589	92.013				
11	.260	1.445	93.458				
12	.228	1.264	94.722				
13	.204	1.135	95.858				
14	.188	1.046	96.904				
15	.167	.925	97.829				
16	.163	.904	98.733				
17	.128	.710	99.443				
18	.100	.557	100.000				

Extraction Method: Maximum Likelihood.

When factors are correlated, sums of squared loadings cannot be added to obtain a total variance.

Table 2: Total variance explained factor 1-6

As seen in Table 2, factor number six (.567) has a lower value than the former five. As the total value is rounded up to .6, the factor is accepted (Hair et al., 2010). Empirically this may be boarder-lining what is found to be satisfactory (i.e., Kaiser criterion), but given our theoretical foundation, the inclusion of factor six is maintained. In addition, when suppression coefficients under .35 the presented values are predicted to hold high discriminant validity.

7.4 Pattern Matrix results

The pattern matrix in Table 3 represents the linear combinations of the variables where the loadings represent the unique contribution of each variable to the factor (Hair et al., 2010). As a rule of thumb, factor loading values greater than ±.50 are considered necessary for practical significance, though a smaller loading is needed given larger sample sizes (Hair et al., 2010). As this is a research with an exploratory design based on existing and well-established constructs loadings down to .6 are considered low but accepted. Following this guideline facilitating condition Q1, self-efficacy Q3 and anxiety Q1 are all accepted, though acknowledging the fact that these variables have a lower convergent validity than the rest.

Pattern Matrix[a]

	Factor					
	1	2	3	4	5	6
	Facilitating conditions	Social Influence	Self-efficacy	Effort expectancy	Anxiety	Performance expectancy
Social Influence						
Q1		.700				
Q2		.922				
Q3		.889				
Effort expectancy						
Q1				.754		
Q2				.941		
Q3				.883		
Facilitating conditions						
Q1	.598					
Q2	.970					
Q3						.613
Self-efficacy						
Q1			.907			
Q2			1.007			
Q3			.635			
Anxiety						
Q1					.621	
Q2					.835	
Q3					.708	
Performance expectancy						
Q1						.891
Q2						.820
Q3						.893
Cronbach's Alpha	.907	.896	.923	.919	.760	.907

Extraction method: Maximum likelihood, Rotation method: Oblimin with Kaizer Normalisation. a. Rotation converged in 8 iterations

Table 3: Pattern Matrix (Maximum Likelihood)

Viewing the results, a problematic issue of cross-loading was detected with one of the questions concerning facilitating conditions. As shown in Table 2, in addition to the low convergent validity (.613), the result also indicates that the item loads on a different factor than intended. As this would threaten the construct vaility of the concept of facilitating conditions, facilitating conditions Q3 was excluded from the dataset and the analysis repeated. The recomputed results are shown in Table 4

By excluding this question from further data processing the construct reliability should remain intact. To assign some meaning to the pattern of factor loadings, a review of the questions in the survey was helpful. As each construct investigated in the survey was accompanied by three questions the loading on specific constructs indicated the renaming of the given factor.

7.5 Summated scale

A summated scale is formed by *"combining several individual variables into a single composite measure"* (Hair et al. 2010, p. 124). The benefit of this is twofold. First, by using multiple variables, the summated scale reduces measurement error by relying on more than a single response. Secondly, by combining multiple variables, one is able to represent a common ground, or multiple aspects, in a single measure. As the concepts tested in the survey are theoretical definitions based on prior theoretical and empirical research, they are guided by the conceptual definition specifying the type and character of the items (Hair et al., 2010). This also assures the content validity, or face validity, ensuring that the *"selection of scale items extends past just empirical issues to also include theoretical and practical considerations"* (Hair et al. 2010, p. 125).

To create a summated scale, the association between the items must be strong in representing a single concept. As illustrated by performing the factor analysis, the items in question load highly on individual factors. This assures the undimensionality, an essential requirement for such a scale.

To measure the reliability, or the consistency among the variables in the summated scale, one can look at the internal consistency. This to assure that the variables loading on the same factor in fact measure the same construct and as a consequence should be highly intercorrelated (Hair et al., 2010). A diagnostic measure to assess internal consistency of the entire scale is the computing of the reliability coefficient, Cronbach's Alpha.

7.5.1 Cronbach's Alpha

To measure the internal consistency of a construct, or how closely related the questions are as a group, one looks at the value of Cronbach's Alpha. Thus, the Cronbach Alpha value should indicate how well the survey questions capture the variance in each construct. This is not a statistical test, but a coefficient of reliability or consistency measuring how well the sum score on the selected items capture the expected score in the entire domain. The pattern matrix below (Table 3) is extended with the Cronbach's Alpha of each construct. As a reliability coefficient above about .9 is considered "excellent", above .8 considered "good", and .7 or higher considered "acceptable" in most research (George & Mallery, 2003) (between .6 and .7 is deemed a lower limit of acceptability, sufficient primarily in exploratory research (Hair et al., 2010)), the figures indicate that the questions related to each construct have relatively high internal consistency and in fact cover the underlying (latent) constructs.

Pattern Matrix with Cronbach's Alpha

	Factor					
	1	2	3	4	5	6
	Facilitating conditions	Social Influence	Self-efficacy	Effort expectancy	Anxiety	Performance expectancy
Social Influence						
Q1		.707				
Q2		.928				
Q3		.891				
Effort expectancy						
Q1				.764		
Q2				.947		
Q3				.886		
Facilitating conditions						
Q1	.595					
Q2	.965					
Self-efficacy						
Q1			.909			
Q2			1.007			
Q3			.638			
Anxiety						
Q1					.621	
Q2					.830	
Q3					.713	
Performance expectancy						
Q1						.797
Q2						.834
Q3						.946
Cronbach's Alpha	**.907**	**.896**	**.923**	**.919**	**.760**	**.907**

Table 4: Pattern Matrix with Crohnbach's Alpha

Note: RISK HARM, EMOTIONS and EXPERIENCE were not included in the factor analysis. As EMOTIONS and EXPERIENCE are mono-operationalized, these have no corresponding Alpha. RISK HARM had an Alpha value of .955, adding it to the list of coefficient's with excellent reliability. The questions covering RISK HARM and their corresponding loadings are seen in Table 5.

Factor Matrix[a]	Factor
	1
	Risk Harm
Risk Harm	
Q1: Det kan føre til stor skade om leverandøren av tjenesten misbruker min personlige informasjon	.894
Q2: Det kan føre til stor skade om personlig informasjon om meg misbrukes gjennom skitjenesten	.970
Q3: Det kan føre til stor skade om personlig informasjon om meg blir stålet fra skitjenesten	.944
Cronbach's Alpha	.955

Extraction Method: Maximum Likelihood. a 1 factors extracted. 4 iteratnions required

Table 5: Factor matrix RISK HARM

As the foundation for this research is based on existing theoretical constructs, also empirically supported, analyzing the reliability of the constructs has further contributed to the strengthening of these. In addition, the factor analysis provided evidence of distinct loadings of the factors indicating that the constructs are theoretically and empirically sound. Regarding the scale validity, convergent validity is confirmed as the scale is correlated to other known measures of the concept. Further, discriminate validity is shown as conceptually similar concepts are distinct, and lastly, nomological validity is demonstrated as prior theoretical supported relationships are supported by the scale (see: correlation matrix in Appendix A).

7.5.2 Exploring the dependent variables: Attitude and Intention

Continuing the explorative factor analysis, the two dependent variables attitude and intention where processed with the same extraction method (Maximum likelihood) and rotation method (Oblimin with Kaiser Normalization), but without a specified number of factors to extract. The results are shown in Table 6.

Pattern Matrix[a] with Cronbach's Alpha

	Factor	
	1	2
	Attitude	**Intention**
Attitude		
A1	.663	
A2	.643	
A3	.889	
A4	.849	
A5	.996	
A6	.963	
Intention		
I1		1.006
I2		.873
Cronbach's Alpha	.929	.949

Extraction Method: Maximum Likelihood. Rotation Method: Oblimin with Kaiser Normalization.
a. Rotation converged in 5 iterations.
Table 6: Pattern Matrix Attitude and Intention

As no extraction values where specified in advance, the result presenting two factors, each with an eigenvalue over one, correlates with the purpose of capturing the constructs of intention and attitude.

7.6 Summated scales supported

In conclusion, the factor analysis supports that six summated scales should be constructed. The six factors correspond to dimensions that can be named and related to concepts with adequate content validity. The dimensionality of each scale is supported by the clean interpretation of each factor, with high factor loadings of each variable on only one factor. The reliability of the summated scales is indicated by the computation of Cronbach's Alpha, representing levels above the recommended .70 in all scales.

Table 7 gives an overview of the various variables and their items and the survey questions covering each of the items.

Variables and corresponding survey questions

Variables and Items	Survey questions
Social Influence	**Grad av enighet 1-5**
Q1	Folk som er viktige for meg synes jeg skal bruke denne tjenesten
Q2	Det forventes at folk som meg bruker denne tjenesten
Q3	Folk jeg ser opp til forventer at jeg bruker denne tjenesten
Effort expectancy	**Grad av enighet 1-5**
Q1	Det vil være enkelt for meg å bli dyktig til å bruke denne tjenesten
Q2	Denne tjenesten vil være enkel å bruke
Q3	Det vil være enkelt for meg å lære å bruke denne tjenesten
Facilitating conditions	**Grad av enighet 1-5**
Q1	Jeg har de nødvendige ressurser til å bruke denne skitjenesten
Q2	Jeg har den nødvendige kunnksap til å bruke denne tjenesten
Self-efficacy	**Grad av enighet 1-5**
Q1	Jeg klarer å bruke denne tjenesten uten at noen trenger å fortelle meg hvordan den fungerer
Q2	Jeg tenger ikke be noen om hjelp for å bruke denne tjenesten
Q3	Jeg klarer fint å lære meg å bruke denne tjenesten
Anxiety	**Grad av enighet 1-5**
Q1	Jeg er engstelig for å bruke denne tjenesten
Q2	Det skremmer meg å tenke på at jeg kan miste personlig informasjon om jeg gjør noe feil når jeg bruker denne tjenesten
Q3	Jeg vegrer meg for å bruke denne tjenesten fordi jeg er redd for å gjøre uopprettelige feil
Performance Expectancy	**Grad av enighet 1-5**
Q1	Denne skitjenesten vil være nyttig for meg
Q2	Denne tjenesten vil raskt gi meg nyttig informasjon til skituren
Q3	Om jeg brukder denne tjenesten vil jeg få økt utbytte av å gå på ski
Risk Harm	**Grad av enighet 1-5**
Q1	Det kan føre til stor skade om leverandøren av tjenesten misbruker min personlige informasjon
Q2	Det kan føre til stor skade om personlig informasjon om meg misbrukes

	gjennom skitjenesten
Q3	Det kan føre til stor skade om personlig informasjon om meg blir stjålet fra skitjenesten
Emotions	**Følelser knyttet til bruk av skitjenesten: Svært liten grad – Svært stor grad**
Q1	Frustrasjon
Q2	Bekymring
Q3	Tilfredshet
Q4	Forventning
Experience	**Grad av enighet (Helt uenig – Helt enig)**
Q1	Jeg bruker allerede andre tjenester med identifiseringsteknologi som ligner den som er brukt i skitjenesten
Attitude	**Grad av enighet 1-5**
A1	Med tjenesten kan jeg lære mye om ski og skibruk
A2	Tjenesten gir meg nyttig informasjon
A3	Tjenesten gir informasjon som kan gjøre meg til en bedre skiløper
A4	Tjenesten gir gode følelser når jeg går på ski
A5	Tjenesten gir meg skiglede
A6	Tjenesten gir en personlig skiopplevelse
Intention	**Grad av enighet 1-5**
I1	Jeg kommer til å bruke denne skitjenesten når den kommer på markedet
I2	Jeg kan godt tenke meg å bruke denne skitjenesten når den blir tilgjengelig

Table 7: Survey questions presented

7.7 Descriptives

7.7.1 Descriptive Statistics

The descriptive statistics represented in Table 8 below determines the measurers of central tendency, labeled mean, and measurer of dispersion (minimum, maximum and standard deviation). Minimum and maximum indicate the range of the variables found in the interval, here between one and five. The mean values represent the average response to the indexed variable. This measure is an important component of the equation used to calculate a variable's standard deviation. The standard deviation measures the amount of variability in the distribution of the variable in relation to the mean of the sample. Thus, if the mean value represents the data, then most of the scores will cluster close to the mean, resulting in a small standard deviation relative to the mean.

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
EFFORT EXPECTANCY	560	1,00	5,00	3,0524	1,04882
SOCIAL INFLUENCE	560	1,00	5,00	1,8006	,91874
FACILITATING CONDITIONS	560	1,00	5,00	3,2652	1,20180
SELF-EFFICACY	560	1,00	5,00	3,1857	1,05618
PERFORMANCE EXPECTANCY	560	1,00	5,00	2,5673	1,18622
ANXIETY	560	1,00	5,00	2,4381	1,01438
Valid N (listwise)	560				

Table 8: Descriptive Statistics

7.7.2 Correlation

In addition to Cronbach's Alpha, correlation can be used as a diagnostic measure to identify internal consistency by considering the correlation amongst the concepts.

Correlation is a technique used to investigate the relationship between two quantitative continuous variables. An underlying assumption is that the data is from a normal distribution sampled randomly. Pearson's correlation coefficient (r) is a measure of the strength of, and direction of, the linear association between two variables (UWE, 2007), and is defined as the covariance of the two variables divided by the product of their standard deviations. The correlation coefficient indicates to which extent one can estimate the value of one variable given the value of another variable (i.e., 32 percent of the variance in self-efficacy is shared with effort expectancy) (see: correlation matrix Appendix A).

Interpreting the correlation coefficient depends on context and purposes. All proposed criteria are therefore in some ways arbitrary and should not be enforced too strictly. In this sample, correlations over .6 are considered to be of high association in relation to the discrimination value between the constructs. An upper limit of .9 is set to assure that the constructs are unique, in such that the variance of each variable is *"not explained or associated with the other variables in the factor analysis"* (Hair et al. 2010, p. 93). Further, the correlations between measures are all less than 1.0.

The single and double asterisks in the correlation matrix signify correlation at the .05 and .01 significance level respectively, establishing the level at which it is different from zero, and, hence, evidence of an association between two variables. As observed in Table 1 in the Appendix A, the correlations matrix indicates that the some of the constructs significantly

correlate on a high level such as; satisfaction and expectation (.822**) performance expectancy and intention (.747**), facilitating conditions and effort expectancy (.731**). In general, most of the variables have a correlation level in the moderate to high range, which should ensure the specific variance of each construct.

8.0 Results

8.1 Assumptions of multivariate analysis

As multivariate analysis is based on a number of assumptions, testing the assumptions underlying the statistical bases for multivariate analysis is necessary to validate any statistical inferences and results. In the following I will test the data set normality and independence.

8.1.1 Normality

Normality is the *"degree to which the distribution of the sample corresponds to a normal distribution"* (Hair et al. 2010, p. 36) and is the most fundamental assumption in multivariate analysis. Significantly large deviations from the normal distribution will cause all statistical tests to become invalid. As sample size increases, the samples become more and more representative of the population, and the variation in the estimated coefficients for large samples will become smaller. Thus, sample size has the effect of *"increasing statistical power by reducing sampling error"* (Hair et al. 2010, p. 72). Further, larger sample sizes (samples of 200 or more (Hair et al., 2010)) such as in this case, reduces the detrimental effects of non-normality.

Critical values for skewness are commonly cited as *"values falling outside the range of -1 to +1 indicate a substantially skewed distribution" (Hair et al., 2010, p. 36)*. Regarding the values for kurtosis a more liberal range is accepted. Exemplified using intention as the dependent variable, the calculated values of skewness and kurtosis in Table 9 show that the data is indicated to be of a normal distribution. As values between +1 and -1 are considered good, and between +2 and -2 usually acceptable the deviation from the range found in performance expectancy is accepted. In addition, looking at the graphical presentation of the histogram and the normal P-P plot (Figure 16) normality is further supported.

Skewness and Kurtosis				
	Skewness		Kurtosis	
	Statistic	Std. Error	Statistic	Std. Error
EFFORT EXPECTANCY	-.395	.103	-.349	.206
SOCIAL INFLUENCE	.823	.103	-.416	.206
FACILITATING CONDITIONS	-.425	.103	-.604	.206
SELF-EFFICACY	-.310	.103	-.304	.206
PERFORMANCE EXPECTANCY	.097	.103	-1.134	.206
ANXIETY	.307	.103	-.503	.206

Table 9: Skewness and Kurtosis

By visually examining the normal probability plot of the residuals in Figure 16, one can see that the values fall along the diagonal with no substantial or systematic departures. This would indicate that the residuals are considered to represent a normal distribution, and the regression variate is therefore found to meet the assumption of normality. Moreover, the histogram indicates a normal distribution
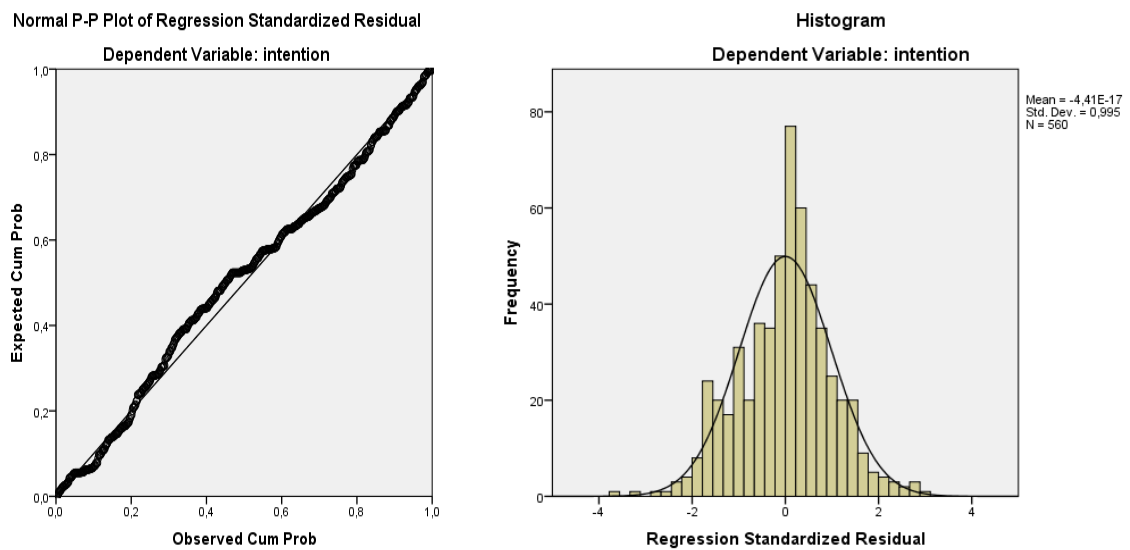
Figure 16: Normality plot and Histogram of Intention

8.1.2 Independence

A critical assumption of ANOVA is the requirement of *"dependent measures for each respondent to be totally uncorrelated with the response from other respondents in the sample"* (Hair et al. 2010, p. 347). As the respondents were recruited by individual invitations and through a professional operator (NORSTAT) the assumption of independent responses is considered to be met.

8.2 Multiple regression analysis

To fit a predictive model to the observed data, multiple regression analysis was performed on the data set. Such a statistical technique enables us to analyze the significance between a set of normally distributed predictors and a normally distributed criterion variable, by using the known values of the independent variables to predict the selected dependent value (Hair et al., 2010). By maximizing the overall predictive power of the independent variables, *"this linear combination of independent variables is formed to be the best predictor of the dependent measure"* (Hair et al. 2010, p. 159) Starting with the UTAUT and building on the model with RISK HARM, EMOTIONS and EXPERIENCE, the intention was to reveal if adding more variables increased the predictability of the initial model, namely UTAUT. In the first analysis attitude and intention separately were indicated as dependent variables. In the second round, to ensure that attitude did not capture all of the significance, attitude was included as a predictor on intention.

8.2.1 Antecedents of Attitude and Intention

ANOVA provides a statistical test for the overall model fit in the terms of F ratio. Based on these values the matrixes below include the standardized beta coefficient, denoted by the level of significance, and the adjusted coefficient of determination (adjusted R^2). Starting with a baseline model 1a, based on UTAUT, the extensions of the model will culminate in the proposed research model.

1a: Baseline model – UTUAT

This is the baseline model where UTAUT functions as a framework, though with the inclusion of ANXIETY and SELF-EFFICACY as potential antecedents on intention.

	ATTITUDE	INTENTION
	Standardized Coefficients: Beta	*Standardized Coefficients: Beta*
UTAUT		
EFFORT EXPECTANCY	.219**	.000
SOCIAL INFLUENCE	.009	.038
FACILITATING CONDITIONS	.009	.046
SELF-EFFICACY	.083*	.003
PERFORMANC EXPECTANCY	.568**	.695**
ANXIETY	.074*	.122**
ADJUSTED R ^{2}	***.488***	***.571***

**. Correlation is significant at the 0.01 level (2-tailed) *. Correlation is significant at the 0.05 level (2-tailed).

Table 10: Baseline model – UTAUT

Attitude

 The table shows that EFFORT EXPECTANCY, PERFORMANCE EXPECTANCY, SELF-EFFICACY and ANXIETY are significant antecedents of attitude with an adjusted R^2 of .488.

Intention

In comparison, only PERFORMANCE EXPECTANCY and ANXIETY pose as significant antecedents of intention in this sample. Intention has an adjusted R^2 of .571, thus, potential overfitting will be reflected if this value decreases and further give an indication of the significant contribution of additional variables in relation to the predictive accuracy of the extended model (Hair et al., 2010).

2a: UTAUT and RISK HARM

Building the research model RISK HARM was added to the analyses as the first additional antecedent.

	ATTITUDE	INTENTION
	Standardized Coefficients: Beta	*Standardized Coefficients: Beta*
UTAUT		
EFFORT EXPECTANCY	.220**	.000*
SOCIAL INFLUENCE	.012	.038
FACILITATING CONDITIONS	.011	.046
SELF-EFFICACY	.081*	.003
PERFORMANC EXPECTANCY	.567**	.695
ANXIETY	.061	.121**
RISK HARM		
RISK HARM	.036	.004
ADJUSTED R ^{2}	*.488*	*.570*

Table 11: UTAUT and RISK HARM

Attitude

When adding RISK HARM, both EFFORT EXPECTANCY and PERFORMANCE EXPECTANCY are continuously found to be significant antecedents of attitude. Whereas ANXIETY has lost its significant value, SELF-EFFICACY is reported with a significant correlation at the .05 level. Further, adjusted R^2 remains constant.

Intention

Looking at intention, adjusted R^2 has had a .001 reduction. By adding RISK HARM only ANXIETY remains significant, though with a contribution at the .05 level from EFFORT EXPECTANCY. RISK HARM therefore adds little to no predictive power to the model.

3a: UTAUT and RISK HARM and EMOTIONS

The third step in building the model is done by adding emotions, categorized as FRUSTRATION, CONCERN, SATISFACTION and EXPECTATION.

	ATTITUDE	INTENTION
	Standardized Coefficients: Beta	*Standardized Coefficients: Beta*
UTAUT		
EFFORT EXPECTANCY	.158**	.028
SOCIAL INFLUENCE	.019	.035
FACILITATING CONDITIONS	.014	.048
SELF-EFFICACY	.066	.002
PERFORMANC EXPECTANCY	.429**	.630**
ANXIETY	.026	.111**
RISK HARM		
RISK HARM	.022	.002
EMOTIONS		
FRUSTRATION	.011	.009
CONCERN	.096*	.020
SATISFACTION	.065	.009
EXPECTATION	.160**	.103*
ADJUSTED R^2	***.515***	***.575***

Table 12: UTAUT and RISK HARM and EMOTIONS

Attitude

Following the trend from the baseline model, EFFORT EXPECTANCY and PERFORMANCE EXPECTANCY are reported with significant correlation at the .01 level for attitude. RISK HARM poses no significant correlation, but by adding emotions, the positive emotion EXPECTATION (at the .01 level), and the negative emotion CONCERN (at the .05 level), significant correlations are observed. Further, adjusted R^2 has increased from .488 to .515 which should indicate a more accurate model.

Intention

When including emotions PERFORMANCE EXPECTANCY and ANXIETY are correlated at the .01 significance level. This is similar to the baseline model, but deviates from model 2a. EXPECTATION is further only significant at the .05 level for intention, as opposed to at the .01 level for attitude. Adjusted R^2 is also reported to increase from .570 to .575. As this is a very moderate increase it is assumed to be non-significant and adding emotions to the model therefore not considered improving the predictive accuracy.

4a: UTAUT and RISK HARM and EMOTIONS and EXPERIENCE

The last additional determinant of attitude and intention is EXPERIENCE.

	ATTITUDE	INTENTION
	Standardized Coefficients: Beta	*Standardized Coefficients: Beta*
UTAUT		
EFFORT EXPECTANCY	.155**	.032
SOCIAL INFLUENCE	.021	.032
FACILITATING CONDITIONS	.010	.042
SELF-EFFICACY	.068	.002
PERFORMANC EXPECTANCY	.425**	.624**
ANXIETY	.026	.111**
RISK HARM		
RISK HARM	.023	.001
EMOTIONS		
FRUSTRATION	.015	.003
CONCERN	.100*	.027
SATISFACTION	.063	.005
EXPECTATION	.163**	.108*
EXPERIENCE		
EXPERIENCE	.038	.062*
ADJUSTED R²	***.516***	***.577***

Table 13: UTAUT and RISK HARM and EMOTIONS and EXPERIENCE

Attitude

Consistent with the preceding schematics EFFORT EXPECTANCY and PERFORMANCE EXPECTANCY are reported with correlations significant at the .01 level denoted by the double asterisks. In addition and as found in 3a, EXPECTATIONS is observed as a significant determinant at the .01 level. Adjusted R^2 has experienced a marginal increase to .516 with the inclusion of experience

Intention

In all but schema 2a have PERFORMANCE EXPECTANCY and ANXIETY posed correlations significant at the .01 level, also this was the only time EFFORT EXPECTANY was significant though at the .05 level. After including emotions, EXPECTATIONS is still significant at the .05 level. The significant correlation of EXPERIENCE on intention is reported at the .05 level. Increasing by .002 from 3a, adjusted R^2 has only experienced an increase of .006 from the baseline model indicating low additional value by including more antecedents.

8.2.2. Antecedents of Intention

To investigate the effect of attitude as an antecedent of intention, attitude was included as a predictor of intention. In doing so it is also possible to determine the status of attitude either functioning as sole influencer on intention or as one of several antecedents of intention.

1b: Extended baseline model – UTAUT and ATTITUDE

	INTENTION
	Standardized Coefficients: Beta
UTAUT	
EFFORT EXPECTANCY	.034
SOCIAL INFLUENCE	.039
FACILITATING CONDITIONS	.044
SELF-EFFICACY	.010
PERFORMANC EXPECTANCY	.608**
ANXIETY	.111**
ATTITUDE	
ATTITUDE	.155**
ADJUSTED R ^{2}	***.582***

Table 14: Extended baseline model - UTAUT and ATTITUDE

Intention

The significance of ATTITUDE as an antecedent of intention is observed in 1b. Accompanied by PERFORMANCE EXPECTANCY and ANXIETY (also reported in the original baseline model 1a), ATTITUDE is reported as a significant antecedent of intention at the .01 level. Further, by adding ATTITUDE to the baseline model adjusted R^2 has increased from .571 in 1a to .582 in 1b.

2b: UTAUT and RISK HARM and ATTITUDE

Equivalent to 2a, RISK HARM is added to the extended baseline model

	INTENTION
	Standardized Coefficients: Beta
UTAUT	
EFFORT EXPECTANCY	.034
SOCIAL INFLUENCE	.040
FACILITATING CONDITIONS	.044
SELF-EFFICACY	.009
PERFORMANC EXPECTANCY	.607**
ANXIETY	.112**
RISK HARM	
RISK HARM	.002
ATTITUDE	
ATTITUDE	.155**
ADJUSTED R ^{2}	***.582***

Table 15: UTAUT and RISK HARM and ATTITUDE

Intention

Similar to results found in 2a, RISK HARM has no significant influence on intention. Though no decrease in adjusted R^2 the value remains constant. In addition, ANXIETY is significant at the .01 level. Diverging from 2a, the results found in 2b indicate that PERFORMANCE EXPECTANCY is significant at the .01 level. The effect of ATTITUDE on intention is consistent with the extended baseline model. RISK HARM is therefore not considered to strengthen the model.

3b: UTAUT and RISK HARM and EMOTIONS and ATTITUDE

The second set of additional antecedents is emotions

	INTENTION
	Standardized Coefficients: Beta
UTAUT	
EFFORT EXPECTANCY	.034
SOCIAL INFLUENCE	.040
FACILITATING CONDITIONS	.044
SELF-EFFICACY	.009
PERFORMANC EXPECTANCY	.607**
ANXIETY	.112**
RISK HARM	
RISK HARM	.002
EMOTIONS	
FRUSTRATION	.011
CONCERN	.007
SATISFACTION	.000
EXPECTATION	.081
ATTITUDE	
ATTITUDE	.155**
ADJUSTED R ^{2}	***.582***

Table 16: UTAUT and RISK HARM and EMOTIONS and ATTITUDE

Intention

ATTITUDE is still reported as a significant antecedent of intention, alongside PERFORMANCE EXPECTANCY and ANXIETY. As opposed to the results found in 3a, adding emotions has no significant impact on determining antecedents of intention.

4b: UTAUT & RISK HARM & EMOTIONS & EXPERIENCE & ATTITUDE

Lastly, EXPERIENCE is added to the model thus schematically representing the research model.

	INTENTION
	Standardized Coefficients: Beta
UTAUT	
EFFORT EXPECTANCY	.052
SOCIAL INFLUENCE	.034
FACILITATING CONDITIONS	.041
SELF-EFFICACY	.007
PERFORMANC EXPECTANCY	.569**
ANXIETY	.107**
RISK HARM	
RISK HARM	.004
EMOTIONS	
FRUSTRATION	.005
CONCERN	.014
SATISFACTION	.003
EXPECTATION	.087
EXPERIENCE	
EXPERIENCE	.057*
ATTITUDE	
ATTITUDE	.130**
ADJUSTED R ^{2}	***.585***

Table 17: UTAUT and RISK HARM and EMOTIONS and EXPERIENCE and ATTITUDE

Intention

Consistent with the preceding results PERFORMANCE EXPECTANCY, ANXIETY and ATTITUDE are significant determinants of intention. EXPERIENCE is found to be significant at the .05 level (equivalent to the level of significance found in 4a) resulting in an increase in adjusted R^2 from the extended baseline model (1b) of .003.

8.2.3 General summary

Looking at the schematic presentation of the stepwise structure of the research model the following assessments are suggested.

A general comment is that adjusted R^2 does not significantly increase the more variables that are added. Rather, the model gets more complicated and less sophisticated. Quite consistently, PERFORMANCE EXPECTANCY and ANXIETY seem to have a significantly effect on both attitude and intention. Adding attitude as a predictor of intention was found to be a

significant driver of intention in all the models, but did not alter the significance of performance expectancy and anxiety as equally important drivers on intention. Notably, RISK HARM had no effect on either attitude or intention. A possible explanation is that ANXIETY and CONCERN sufficiently cover this dimension, leaving the more extreme defined RISK HARM redundant.

Looking at the analysis's in more detail, EFFORT EXPECTANCY (1a: .219**, 2a: .220**, 3a: .158**, 4a: .155**) was reported a significant driver on attitude in all the model versions. In addition, SELF-EFFICACY (1a: .083*, 2a: .081*), CONCERN (3a: .096*, 4a: .100*) and EXPECTATION (3a: .160**, 4a: .163**) seemed to influence attitude depending on the number of variables included. Regarding intention, EXPECTATION (4a: .108*) and EXPEREINCE (4a: .062*, 4b: .057*) seemed to influence this outcome variable in relevance to the number of antecedents added. Summarized, this can indicate that regarding the antecedents added to UTAUT emotions generally have greater impacts on attitude, whereas experience will influence intention.

8.2.4 Moderating variables

The research model predicts that the six UTAUT variables, RISK HARM, EMOTIONS, and EXPERIENCE will influence intention. Affecting these antecedents are the suggested moderating effects of perception of control (high vs. low) and situational context (individual vs. social). Testing the effect of the manipulation intended by the moderators a one-way Anova analysis was conducted.

	High control	*Low control*
Mean	3.2500	2.8220
F	17.026	
Sig.	.000	

Table 18: Testing control as a moderator

From Table 18 we can read that when exposed to a manipulation designed to pose higher levels of control, perception of control was also considered to be higher. Further, the reported F-value and significance level indicate that the manipulation has functioned as intended. Thus, manipulation of control was successful.

	Social		Individual	
	Social context	Individual context	Social context	Individual context
Mean	3.0881	2.8821	3.0440	3.0226
F	5.204		.051	
Sig.	.023		.821	

Table 19: Testing context as a moderator

Context was measured by the opposing situations of social and individual context. The reported mean of experiencing social context as in fact social was deemed marginally higher than the ones exposed to the individual manipulation (see: Table 19). Likewise, experiencing an individual context when exposed to a manipulation with an individual design was reported as more or less equal to the context being perceived as social. This could indicate that the manipulations are not sufficient in capturing the intended situational context. Looking at the F-value and significance level both values strengthen the reason for concern as to how well the manipulation was able to portray a distinct situational context.

Computing a linear regression analysis on the moderators, the models were found to be statistically significant indicated by a significance value of zero to three decimal places

5a: Moderator #1: High vs. Low control

Linear regression: Perceived control

	High control	**Low control**
	Standardized Coefficients: Beta	Standardized Coefficients: Beta
UTAUT		
EFFORT EXPECTANCY	.032	.046
SOCIAL INFLEUNCE	.003	.087
FACILITATING CONDITIONS	.002	.094
SELF-EFFICACY	.001	.001
PERFORMANC EXPECTANCY	.694**	.693**
ANXIETY	.146**	.110**
ADJUSTED R ^{2}	***.553***	***.589***

** Correlation is significant at the 0.01 level (2-tailed) * Correlation is significant at the 0.05 level (2-tailed).

Table 20: Linear regression level of control

Table 20 portrays the same results for both high perception of control and low perception of control. Regardless of the level of perceived control performance expectancy and anxiety are reported as determinants of intention

5b: Moderator #2: Individual vs. Social

Linear regression: situational context

	Individual	Social
	Standardized Coefficients: Beta	*Standardized Coefficients: Beta*
UTAUT		
EFFORT EXPECTANCY	.012	.012
SOCIAL INFLUENCE	.062	.017
FACILITATING CONDITIONS	.005	.088
SELF-EFFICACY	.040	.048
PERFORMANC EXPECTANCY	.710**	.675**
ANXIETY	.119**	.127**
ADJUSTED R ^{2}	***.616***	***.513***

Table 21: Linear regression context

When manipulating the situational context, in terms of either presenting a social or individual service scenario, performance expectancy and anxiety are continuously reported as direct determinants of intention (Table 21). This falls in line with the previous results of both direct antecedents of intention and when moderating the perception of control.

Summing up the results of moderating variables

Aligned with the results from the previous regression analysis of the antecedents, both moderators consistently report performance expectancy and anxiety as main drivers regardless of situational context or degree of control. Moreover, there was no significant change in adjusted R^2. This further underscores the findings indicating that performance expectancy and anxiety are the main antecedents on attitude and intention. As these variables are found in the original UTAUT model these results, supporting its applicability, add to the predictive power of UTAUT.

9.0 Conclusion

The following chapter will sum up the research results and provide a discussion on the antecedents of intention in relation to the theoretical framework UTAUT and its determinants. The added antecedents of intention will also be discussed followed by implications and further research.

9.1 Summery and results

Summing up the results from the exploratory research the following table demonstrates the outcome of the hypotheses testing in regards to antecedents of intention (Results Intention A, Table 22) and with attitude as a constant determinant (Results Intention B, Table 22).

Hypothesis	Results Intention A	Results Intention B
H1: Performance expectancy has a positive effect on behavioral intention	*Accepted*	*Accepted*
H2: Effort expectancy has a positive effect on behavioral intention	Rejected	Rejected
H3: Facilitating conditions has a positive effect on behavioral intention	Rejected	Rejected
H4: Social influence has a positive effect on behavioral intention	Rejected	Rejected
H5: Anxiety has a negative effect on behavioral intention	*Accepted*	*Accepted*
H6: Self-efficacy has a positive effect on behavioral intention	Rejected	Rejected
H7: Perceived risk harm has a negative effect on behavioral intention	Rejected	Rejected
H8: Deterrence and loss emotions have a negative effect on behavioral intention	Rejected	Rejected
H9: Challenge and achievement emotions have a positive effect on behavioral intention	***Expectation* found significant at the .05 level (3a & 4a)**	Rejected
H10: Experience has a positive effect on behavioral intention	**Found significant at the .05 level (4a)**	**Found significant at the .05 level (4a & 4b)**

Table 22: Summary of hypotheses

When incorporating attitude as a direct determinant of intention it was shown that attitude had a significant direct influence (at the .01 level) on intention, but without altering the significant effect of performance expectancy or anxiety on intention.

Only two of the hypotheses where found to be accepted at a .01 significance level namely, H1: *performance expectancy* has a positive effect on behavioral intention, and H2: *anxiety* has a negative effect on behavioral intention. Further, *experience* was found to have a positive effect on behavioral intention on a .05 significance level. This would indicate that apart from experience, none of the added antecedents had any influence on intention when accounting for attitude.

9.1.1 Reviewing the performance of the UTAUT variables in the RFID-enabled service context

As stated, the added antecedents of intention, apart from experience, were not found to improve the predictive validity above and beyond that performed by UTAUT. I will now go through the UTAUT determinants and compare them to the study results.

Performance expectancy

In compliance with UTAUT (though hypothesized to be moderated by gender and age) performance expectancy is validated as a robust and strong indicator of intention in a voluntary setting regardless of context or perception of control. Thus, performance expectation as a significant antecedent of intention is further supported by this research.

Effort expectancy

Effort expectancy had a significant effect on attitude in all the extensions of the research model (from 1a to 4a), but was non-significant in regards to influencing intention. UTAUT, on the other hand, posits an effect of effort expectancy on intention in both a mandatory and voluntary setting with a declining effect as users accumulate experience with the technology. Since the services were not practically able to experience, the ease of using the proposed service may have been a significant contributor when forming an attitude towards the service, but when indicating intention to use the service, effort expectancy was overshadowed by performance expectancy and the emotional antecedent expectations. As

such, effort expectancy was not a consideration amongst the respondents when reporting intention to use RFID-enabled services.

Social influence

Social influence in a voluntary setting is not considered to influence intention in UTAUT or in any of the theories making up the social influence construct in UTAUT. Social influence is only thought to pose a significant effect when use is mandated (Venkatesh et al., 2003). The research results confirmed these findings as social influence had no significant effect on intention to use RFID-enabled services when the use was voluntary.

Facilitating conditions

Facilitating conditions did not influence intention which is in line with the findings in UTAUT. Though outside the scope of this thesis Venkatesh et al. (2003) did find that facilitating conditions posed an effect on usage when moderated by age and experience.

Anxiety

Supporting the notion that anxiety is *"conceptually and empirically distinct from effort expectancy"* (Venkatesh et al. 2003, p. 455) the results, as opposed to those declared in UTAUT, but supporting SCT, clearly demonstrated that anxiety is a direct determinant of intention by posing a significant influence on this construct.

Anxiety was considered a personality trait in the research model. Going back to the emotive framework of Beaudry and Pinsonneault (2010) anxiety can also be categorized as an emotional state under the label deterrence emotions. Deterrence emotions were conceptualized as concern in the research model and though rejected as an antecedent of intention, concern was significant determinant of attitude at the .05 level

Self-efficacy

As hypothesized in UTAUT, self-efficacy, on the other hand, did not influence intention. Venkatesh et al. (2003) view self-efficacy as a distinct construct found as a direct determinant of intention in SCT. But, they explain this as a misleading effect as the theory of SCT does not control for the *"effect of effort expectancy"* (Venkatesh et al. 2003, p. 455). In this study effort expectancy was controlled for and was found non-significant in regards to

operating as a direct antecedent of intention (though exercising a significant influence on attitude). As such self-efficacy as a determinant of intention or mediated through effort expectancy was not supported.

9.1.2 Reviewing the added antecedents
Moving on to the added antecedents of intention the following results are presented.

Risk Harm

Contradictory to the studies on risk perception or risk assessment (Müeller-Seitz et al., 2009; Cazier et al., 2008; Featherman & Pavlou, 2003) there was no indication that perceived risk harm would influence the attitude or intention to use a RFID-enabled service. A potential explanation to this finding could be that as the model included anxiety as a personality trait (effect on intention and attitude) and concern as an emotional antecedent (effect on attitude) this would sufficiently cover the element of risk harm. In addition, questions regarding perceived risk harm may have been understood as to extreme or highly unlikely and therefore not regarded as a situation one would actually experience. As none of the extended versions reported any significant effect on intention risk harm as a direct antecedent of behavioral intention was rejected.

Emotional antecedents

Regarding the emotions, those found to pose a significant influence on intention was expectation. Expectation was reported to influence both attitude and intention when analyzed individually, concern was only found relevant for attitude. This could suggest that the respondents were driven by the challenge emotion expectation when presented with the potential service scenarios and forming their intention to use the service. Further, a potential overlap between anxiety as a personality trait and anxiety as a deterrence emotion, though conceptualized as concern in the research model, may have caused concern to become less prominent in the results regarding intention.

Still, when adding attitude as a constant direct determinant of intention, none of the emotions were found to pose a significant influence on intention. This may imply that

expectation is captured by the attitude construct and thus only indirectly influences intention.

Experience

Experience was reported to influence intention at a .05 significance level in both intention versions but with no influence on attitude. This would imply that as customers are more and more used to interacting with technology, the more experience one has with similar technology-based services the higher the intentions to use. Drawing upon previous encounters, experience would directly determine intention to use a service.

9.1.3 Reviewing the moderators

Neither situational context nor perception of control seemed to moderate the determinants of intention tested in the research model. This was especially found counterintuitive in regards to the suggested propositions. The fact that social influence was not affected by context may be explained by the fact that the services portrayed currently do not exist leaving the respondents, apart from the scenario description, without any basis for comparison. Further, the scenario description itself may have been misunderstood or poorly exemplified as the results from testing situational context seemed to indicate. In regards to the data analysis and the current results a suggested conclusion to be drawn from this is the fact that social context is apparently irrelevant. Consumers as individualists prioritize personal gain, enhancement of own performances, or the reaching of personal goals regardless of the potential social intentions of the service provider.

Risk harm, found to be one of the key determinants of intention in the literature, was neither found to influence the intention to behave in any significant way nor moderated by the level of perceived control. This may suggest that individual consumers when forming intentions to use a service pay little attention to the levels of control over personal information, or the lack of this, provided by the service. Put another way, consumers are quite consistently optimistically biased to own risk assessments (see: privacy paradox Cho et al., 2010) as neither risk harm nor perception of control seem to influence or moderate the intention to use a service.

9.1.4   Summarizing the results

The data analysis paints a clear picture of the determinants of intention to use RFID-enabled services. Performance expectancy alongside anxiety is the predominant antecedents of intention. High performance expectancy and low anxiety will result in high behavioral intention and vice versa. In addition, experience influences intention to use at a more moderate level. This would indicate that extending UTAUT does not add to the predictive efficiency of the model, rather makes it more complicated and less sophisticated. According to the data analysis neither situational context nor level of perceived control will moderate the determinants of intention.

9.2 Discussion and implications

The main object of this thesis was do explore and detect the antecedents of intention to use RFID-enabled services. Based on existing theoretical models and with the input from empirical studies, a model was developed and tested in the context of adding RFID-enabled services to a physical product, namely cross-country skis. Following in line with service-dominant logic, all value propositions are in essence services. As such, selling cross-country skis is as much about selling the product as selling the skiing experience and facilitating good experiences (e.g., following-up the customer, customizing the buying experience, enhancing the utilization of the product) through well-designed services. As the product marked is a dynamic and ever changing marked, the need to be on top of the game, to stay in front of the competition, and to build strong customer relationships is key to a company's success and survival.

The results indicate that the two main drivers of intention are anxiety and performance expectancy. As such, this thesis validates the robustness of UTAUT further strengthening its predictive value by successfully applying it to a voluntary context with RFID-enabled services as the target technology, though suggesting a more prominent role for anxiety.

Performance expectancy is cited as the strongest predictor of intention in several of the reviewed studies on technology adoption (e.g. Thompson et al., 1991; Compeau & Higgins, 1995; Szajna 1996; King & He 2006; Müller-Seitz et al., 2009) and further supported in this

study. In UTAUT anxiety is not considered a direct determinant of intention rather its effect is fully mediated by effort expectancy (Venkatesh et al., 2003). Compeau and Higgens (1995) reported that anxiety would have a significant impact on attitude towards computer use. Attitude as a dependent structure was preliminary examined in this thesis though not included in the research model. Though studying the formation of attitude towards the service, as opposed to computer use, the findings showed no effect of anxiety as a determinant of attitude. Anxiety as a direct determinant of intention however was supported in both versions of intention. Risk harm and privacy concerns have been emphasized as important barriers of intention to adopt RFID-enabled services (Yui et al., 2007) and posing major practical implication concerns (e.g.: Boek et al., 2011; Cazier et al., 2008). The current results do not support these findings. Risk harm was consistently rejected as posing any negative influence on intention, or on attitude for that matter. The possible conclusion drawn from this is that contrary to these reviewed studies and the alleged intuitive character of the variable the average consumer is not equally concerned with risk as the theory should suggest. Anxiety, on the other hand, is a construct more aligned with the customer voice when expressing concerns preventing intention to use a RFID-enabled service, and more correctly reflects the potential concerns a consumer will evaluate. RFID-technology is an efficiency enhancer in many consumers' lives (e.g. facilitating smoother traveling experiences by the use of electronic travel cards). Whether or not the results of this technology is understood, comprehended or even something the consumer is aware of the effects of this technology is appreciated and sometimes taken for granted. Risk associated with the use of this technology is therefore not assessed as the technology in itself is a necessity. Therefore, when introducing RFID to new areas of interest the benefits that come with this technology are recognized and appreciated while the risks are overlooked, accepted or even expected as consumers' generally associate interaction with any new technology with a degree of risk. Or as expressed by Boeke et al. (2011) consumers acknowledge the fact that *"privacy cannot be completely protected when RFID technology is involved"* (p. 843).

Experience was the only added antecedent to pose any significant influence on intention. The construct was derived from the Theory of Trying (Bagozzi & Warshaw, 1990), where experience acted as a proxy for frequency of trying. Bagozzi and Warshaw (1990) did find

that frequency of trying was a significant predictor of intention to try and as such is supported by the findings in this thesis. Interesting to note is as the service scenarios portrayed in the survey do not currently exist the respondents still reported that they already were using services with similar identification technology as the ones presented. An obvious question is then what kind of experiences are they drawing upon. A potential explanation is that the respondents in some way recognize the service offerings as familiar as various applications are available in the market (e.g. running app's, training app's etc. downloaded to your cell-phone) encouraging more physical activity and offering assistance to execute these activities. Another suggested explanation, requiring an assumption that the consumer is conscious of the technology that lies behind various services, is that the experience from technology in everyday life is transferred and referred to in the new context of RFID-enabled services in a cross-country setting.

In regards to the proposed moderating effect of perceived control and reviewing the non-significance of risk harm on intention and the significance of experience on intention, the accumulated levels of technology experience could seem to lower the need for control when RFID is used in a voluntary service setting. Technology experience in general has made consumers less risk averse then what has previously been suggested. Consumers could therefore be understood as generally more tolerant when it comes to the security measurements surrounding the service and that the level of control is not what makes or breaks an intention to use a service. In retrospect, RFID-technology has been in use for several years already (e.g. toll collection, smart cards, pet-tagging etc.) without causing significant privacy or security violations. *"A greater privacy concern is, for example, the cell phone and particularly the latest feature-rich devices with cameras and location tracking. Loosely speaking your cell phone is a sophisticated active RFID tag!"* (Roberts 2006, p. 26). As this may be true, there are few indications that people will avoid using cell phones or refrain from purchasing the newest product releases with their enhanced technological applications.

Still, anxiety poses a significant negative influence on behavioral intention. According to the results apprehensiveness, hesitation and the fear of doing something that could cause loss of personal information was strong. SCT posit that anxiety has a significant impact on

computer use, and this assumption in the context of intention to use RFID-enabled services is further supported by this thesis.

The recommendations drawn from this research in regards to developing and implementing product related RFID-enabled services is therefore to focus on the usefulness of the service while lowering the cause of anxiety. Creating high expectations of performance expectancy and having the expertise, the ability and skills to meet these expectancies should have a positive outcome on intention to use a service. Further, informing and communicating to the customer about the applied safety measures preventing loss of personal information or the possibility to make unrecoverable errors in the new system should lower the levels of anxiety increasing the intention to use the RFID-enabled services. In addition, as more and more services are based on technology, the general level of experience in the target groups will increase, which in turn should predict a higher intention to use RFID-enabled services.

9.3 Further research

The results from the study show that the only two antecedents exerting any actual influence on intention are performance expectancy and anxiety. That is, when performance expectancy is high combined with low levels of anxiety, intention to act is high. Alternatively, when anxiety is high, and performance expectancy is low, intention is predicted to be low. The direct effect of performance expectancy on intention is supported by both adoption theory and empirical research and studies (e.g. Venkatesh et al., 2003; Müller-Seitz et al., 2009). Apart from in SCT, anxiety has not experienced the same amount of recognition (Venkatesh et al., 2003) though suggested in some of the reviewed studies (e.g. Pramatari & Theotokis, 2009). The result from this thesis suggests that anxiety *is* a significant determinant of intention and should therefore be a subject of further investigation. Further, experience may also play a more significant role than previously expected. The reported effect on intention, though less prominent than that of performance expectancy and anxiety, gives reason to believe that experience may affect the intention to use RFID-enabled services. Szajna (1996) argued for the inclusion of an experience component in TAM to be able to capture and understand the belief-intention-acceptance relationship of technology.

In a similar vein, looking further into the influence of experience could be an area of interest for further research.

Personal and situational characteristics moderating the adoption process have not been considered in prior research. Though the selected moderators were not found to moderate the intention to adopt RFID-enabled services (in the case of situational context scenario descriptions may have been misunderstood or poorly described as the test results may have indicated) the importance of examining the influence of potential moderators is relevant. Even though the proposed effects in this case were not met, this attempt should be understood as a call for further research on the subject of potential moderating variables.

Surprisingly enough none of the remaining direct determinants in UTAUT posed any significant effect on intention. A possible explanation is that in regards to a novel technology in a voluntary setting, a more customized model is required including other determinants or moderators. Alternatively, adopting the simple but concise design from TAM only two determinants are needed to predict intention, namely performance expectancy and anxiety, leaving additional determinants or moderators redundant.

The research on customer acceptance of RFID-technology is small and fragmented Slettemeås (2009) states. Contributing to this field the exploratory nature of this thesis is chosen in an attempt to uncover, detect or further support some of the determinants of intention. Further research on voluntary technology acceptance is encouraged as technology-enabled services will become an increasingly part of a company's value proposition and source of income.

Appendix A

Table 1: Cross-sectional correlation matrix of model constructs

Pearson Correlation

	α	EFFX	SI	FC	SE	PE	AN	RH	ATT	IN	F	C	S	EXPC	EXPR
EFFX	.919	1													
SI	.896	.348**	1												
FC	.907	.731**	.215**	1											
SE	.923	.570**	.179**	.645**	1										
PE	.907	.598**	.506**	.478**	.316**	1									
AN	.760	-.153**	.047	-.211**	-.166**	-.090*	1								
RH	.955	-.003	-.059	.004	.030	-.048	.335**	1							
ATT	n/a	.526**	.339**	.401**	.238**	.679**	-.148**	-.086*	1						
IN	n/a	.479**	.394**	.410**	.273**	.747**	-.192**	-.080	.599**	1					
F	n/a	-.346**	-.162**	-.278**	-.186**	-.383**	.291**	.168**	-.348**	-.342**	1				
C	n/a	-.375**	-.142**	-.311**	-.179**	-.387**	.400**	.217**	-.382**	-.354**	.700**	1			
S	n/a	.485**	.401**	.355**	.229**	.649**	-.140**	-.085*	.566**	.545**	-.331**	-.313**	1		
EXPC	n/a	.487**	.352**	.360**	.243**	.630**	-.087*	-.055	.569**	.542**	-.318**	-.265**	.822**	1	
EXPR	n/a	.232**	.154**	.225**	.190**	.216**	-.034	.009	.190**	.225**	-.124**	-.069	.161**	.134**	1

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

EFFX = Effort expectancy
SI = Social influence
FC = Facilitating conditions
SE = Self-efficacy
PE = Performance expectancy
AN = Anxiety
RH = Risk harm

ATT = Attitude
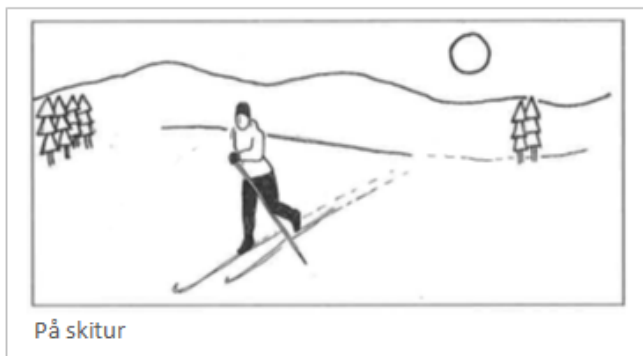IN = Intention
F = Frustration
C = Concern
S = Satisfaction
EXPC = Expectation
EXPR = Experience

Gullpar til alle!

På skitur

En kjent skiprodusent har utviklet en identifiserings-teknologi som gjør at hver enkelt ski kan følges fra fabrikken, via butikk og ut til deg når du bruker den. På den måten får du en ski som er optimalt tilpasset og som gir deg en helt ny tjeneste i både kjøps- og brukssituasjonen.

Når du kjøper skiene vil tjenesten gjøre at du får ski med lengde, spenn og bruksområde som er optimal for deg. Du vil selv finne dine unike ski i en skidatabase og alle data om dine ski og deg som skibruker blir lagt inn i en personlig applikasjon på din mobil eller på din PC.

Når du skal bruke skiene vil tjenesten blant annet anvise hvordan du skal smøre skiene og med hvilken smøring. Videre kan tjenesten følge deg gjennom skituren slik at du får individuelle forslag til løypevalg underveis og du etter turen kan se

Sikker informasjon

Skitrening
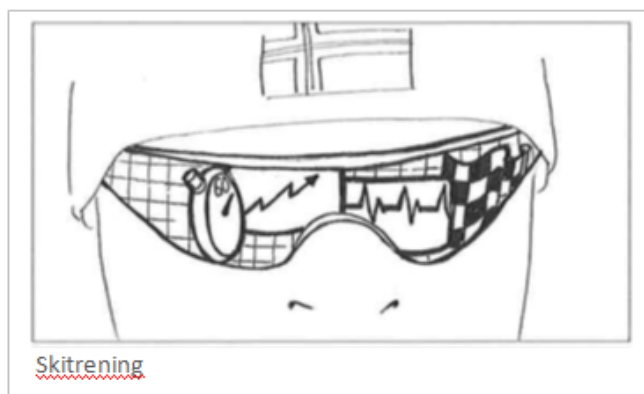
hvor og hvor langt du har gått. Underveis kan du også konkurrere med deg selv for å lære å gå best mulig på ski. Alle opplysninger om deg og dine skiturer lagres bare på din personlige mobil eller PC og du velger selv hvordan disse skal bli brukt.

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