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The importance of trust and cognitive ability measures in hedonic and utilitarian technology acceptance models: the development of the LTAM

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The importance of trust and cognitive ability measures in hedonic and utilitarian technology acceptance models: The development of the LTAM

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1 Abstract:

A series of studies was conducted to systematically assess the impact of additions to the UTAUT model in the form of trust, social and cognitive ability variables. The overall aim was to establish a model usable for all types of technologies, including devices, services or interfaces. Starting with the well-known measures of TA and current lifestyle technology, multiple studies were carried out with participants mainly from the UK.

The first study focused on E-Reader technology, and included classic TA measures as well as measures of technology trust and social aspects. These were, in parts, shown to be significant predictors of technology acceptance operationalized as Intention to Use (ITU). Based on the results from this study, TabletPC technology was examined in Study 2, confirming the established model using confirmatory factor analysis (CFA) and structural equation modelling (SEM). The focus was then shifted to cognitive aspects, which have so far been rather underrepresented in classic TA research. The new approach introduced in this research showed comparable benefits to significantly longer measures used in existing literature.

The trust and social related variables did not add significantly to the model in the third study, focussing on the use of computers. The cognitive ability variables however significantly improved the model.

In order to confirm initial findings regarding 'trust' related variables, a fourth study was carried out focusing on online social networks and the role that trust plays in the user interaction. This confirmed the structure of the constructs for the technology that they were initially designed for.

The fifth and final study was a confirmatory study testing the established model on workplace technology. This was designed to finalize the confirmatory approach this research has been guided by: starting with workplace technology and a seemingly universal model, introducing new variables to enhance the model and allow it to predict non-workplace technology use, and finally testing it on workplace technology for its universality.

The results showed that the inclusion of social variables added significantly to the amount of variance accounted for by the model. Furthermore, the structure of the resulting LTAM model showed links with previous hypotheses regarding latent links between Perceived Ease of Use and Perceived Usefulness.

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6 Preface

“Any sufficiently advanced technology

is indistinguishable from magic.”

— Arthur C. Clarke, Profiles of the Future: An Inquiry Into the Limits of the Possible

The role of technology in everyday life has become increasingly prominent in recent years. This becomes clear when looking at sales figures of modern communication and entertainment technology. In 2010, 1.9 million e-Reader devices, such as Kindle, Nook and Kobo, were sold in the EMEA region (Europe, Middle East and Africa) alone (ComputerWeekly, 2011). On a larger scale, over 49 million Tablet-PCs, such as iPads, were sold worldwide in the first quarter of 2013. This represents an annual growth in sales of over 140% (BBC, 2013). Online services have also expanded massively in recent years; the online social network Facebook recently reported over 1 billion active users per month (BBC, 2013).

The growth of technology and online interaction raises several fundamental questions as to why people use technology in the first instance and what actually facilitates their interactions with it. Exploring these different underlying aspects of technology use is at the core of technology acceptance research.

6.1.1 Origins of Technology Acceptance

The effectiveness or the efficiency of a technology in dealing with a problem is not necessarily the key factor of success. Interaction patterns of the user and how the user relates to the technology are essential in the prediction of technology uptake; a connection that has been labelled ‘technology acceptance’ (Davis, 1989).

Over time, research has provided several different technology acceptance models. Differences in the models are also, but not only, based on advances in related fields of research. The differences in the nature of the setting in which technology acceptance has been measured are mirrored in the models themselves, in terms of focus on work-related technology or non-work-related technology. This leads to a differentiation between technology that serves a clear instrumental purpose, and technology designed for use in a less task-oriented and more enjoyment-oriented way.

The resulting differentiations between hedonic and utilitarian systems have been summarized very well by Hong, Thong and Tam (2006). This included the related potential usefulness and applicability of technology acceptance models. Sun and Zhang (2006) provide a good definition of the difference between utilitarian and hedonic systems. While utilitarian systems are centred on an ‘instrumental value to the user’ (p.621), hedonic systems are based on the idea of a ‘self fulfilling value’ (Sun & Zhang, 2006) which is provided to the users in the form of entertainment of general enjoyment (van der Heijden, 2004).

6.1.2 The meaning of technology: knowledge, tools and transformation

In technology acceptance research, it is first necessary to establish what is meant by ‘technology’. Opinions and definitions of what classifies as technology differ drastically, and it is important to clarify what will be considered ’technology’ in the scope of this research.

The online version of the Oxford Dictionary (www.oxforddictionairies.com, 2014) gives one overall and two sub-definitions for the term technology. Technology is defined as “The application of scientific knowledge for practical purposes, especially in industry” (www.oxforddictionaries.com, 2014). Sub-definitions are “Machinery and devices developed from scientific knowledge”, and “The branch of knowledge dealing with engineering or applied sciences.” (www.oxforddictionaries.com, 2014).

These definitions indicate why pinpointing the meaning of technology is quite difficult, as it encompasses many different things. Starting from the highest level of abstraction, technology stands for the knowledge necessary to perform scientific and engineering related tasks. Based on this knowledge, machines and devices are created, which encompass the particular aspects of this knowledge. Even the transmission or transformation of the knowledge into physical and applicable form can be referred to as technology (Heidegger, 1977).

One could add to the previous definitions by giving the application of technology in terms of knowledge a distinct purpose. It then becomes clear that the application and transfer of knowledge alone is not the core point of technology, but that the overall meaning of this application lies within the reason for such action. The enhancement of a given situation or the solving of a problem posed by the current situation is at the core of technology.

The transformation of the environment to better fit the requirements of living is the important aspect of this application of knowledge, as it is otherwise indistinguishable from general works of art and other, less function based operations. Art is also an enhancement of human living conditions. However, it can be argued that the difference between art and technology is that art may be a positive addition, but is not a goal directed method of solving of an existing problem. Nevertheless, both aspects can be found in the Greek origins of the word technology. The word technology itself stems from the Greek words ‘tekhnē’, meaning a type of craft or an art, and ‘logia’, denoting it as an area of interest or a field of study (Heidegger, 1977).

Overall, it can be concluded that technology is the goal-oriented application of specialist knowledge in order to create direct (tool use) and indirect (tool creation) environmental changes that solve existing problems and enhance the living/working conditions in a given setting. Whilst technology as pure scientific or craft related knowledge is rarely part of TA research, the access to technology and the use of different routes in order to make use of this knowledge is more central. These routes do not only apply to actual technology in terms of devices, but also to services and systems that can be accessed in different ways.

6.1.3 Differentiation between routes of access

Considering the definitions introduced above, and the focus of technology acceptance (TA) research on information technology, another question arises: does technology have to be classified in terms of routes of access? Routes of access to information technology are different for individual users and can be categorized based on the levels of interaction.

Firstly, technology in terms of applied knowledge, i.e. achieving a goal or changing a situation for the better, can be accessed via a specific device or gadget. These devices, whether designed for the exclusive use of this technology or merely a facilitator of the technology would then be seen as the route to accessing the technology.

Exclusive use devices could for example be an E-Reader, which is only designed to provide electronic document reading capabilities. In this case, the E-Reader itself encompasses the technology, and the route to interaction is via the interface provided on the device. Another option would be a non-exclusive, or multi-function device, such as a TabletPC. Designed to perform many different tasks and provide access to many different technologies, both bound on the device as well as externally linked, the device also offers e-reading facilities, if not as sophisticated as dedicated E-Readers.

Secondly, an online social network could exemplify an external technology link. Currently, no devices are exclusive to online social networking; most IT multifunction devices can perform this role. Furthermore, no device encapsulates an online social network as a technology in itself; online social networks are server-based by definition. At this point lies the first split between technology access routes: device versus remote technology. A second layer of classification of technology access routes, could then delineate single- from multi-function devices, and distinguish remote technology from services. For example, online social networks are run as businesses and can therefore be considered services.

A remote technology that is not a service could constitute remote access to personal cloud storage at the user's home (not hosted by a company). Or, in the most basic form, a TV remote control. The remote control cannot provide the technology itself, but it allows you to access it, without making use of a particular service or service provider.

In the case of online social networks, it is debatable whether the actual 'technology' is the link between people and the messaging services, or whether the interface that people use to access these services. In line with the all-encapsulating definition of technology introduced earlier, the answer might be that both aspects, and more, are the technology that is commonly referred to as Facebook.

Whilst differentiation between technology by levels of complexity or access routes is debatable, the current research employs a broad definition of technology. Interfaces, services, gadgets and devices are referred to as technology. When generally referring to technology, the entire perceived makeup of a non-human interaction partner, including devices, services and interfaces, will be included, unless stated otherwise.

The differences between the technologies introduced in terms of encapsulating technology and providing access to the quintessence of it are of importance for this research. As the delivery of technology access varies between them, it is reasonable to assume that there might be differences in the way that people both interact with and perceive these technologies. E-Readers and TabletPCs, as well as online social networks, were therefore studied.

Given that the number of different technologies and access routes is increasing drastically, as is the difficulty of differentiation, addressing the issue of technology acceptance requires the testing of new models and model enhancements on as many different technologies as possible. The current research focused on five common information technologies: E-Readers, TabletPCs, Computers, online social networks, and Virtual Learning Environments.

6.1.4 Outline:

This thesis is divided into five parts. These cover multiple studies or research chapters each, and are outlined in the following.

Part 1: Literature Review and Methodology

In the first chapter of this thesis, the background to utilitarian technology acceptance models will be discussed. Following from this, the second chapter will introduce models that have previously been used to address issues of hedonic technology use. The third chapter will define the methodologies used for the five studies that were carried out for this research.

Part 2: E-Reader and TabletPC Technology Acceptance

After the introduction of general concepts used in TA research to date, the first two studies will follow. The first study focused on the prediction of intention to use (ITU) for E-Reader technology. Findings from this first exploratory study were then confirmed in the second study, applying the same model to TabletPC devices. These two studies built the foundation for the further research that will be introduced in later chapters.

Part 3: Cognitive Ability and Trust variables in younger and older populations

In Chapter 4 the importance of age, cognitive ability and cognitive decline for technology acceptance modelling is introduced. This includes measures that are hypothesized to be as effective as measures previously used in this field. The applicability and performance of these cognitive ability related measures was tested in Study 3, focusing on computer use.

Part 4: Confirmatory study of trust in online systems and bridging to utilitarian use

Following Study 3, a study related to online social networking is introduced, which tested the effects of the inclusion of trust related variables in a similar setting to the one that they were originally designed for. The final study to be introduced is Study 5, which completed the research in applying the new model extension confirmed for lifestyle technology use in the previous studies to a workplace related setting.

Part 5: Model Discussion and Conclusion

The final chapter includes a model discussion and definition as well as general findings and future research recommendation.

7 Acknowledgements:

I would like to thank my supervisory team, Professor Tom Buchanan and Dr Catherine Loveday for their tireless support and guidance during this research. They took countless hours to make sure that my research was on the right track, that my approaches were sound, and that my terminology was correct. I could not have done this without them and am most grateful for their help.

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Finally, I would like to thank my wonderful wife Evelyn (and our dog Spoo). They were most supportive and kept me going when I was entirely convinced that things were not going anywhere. They put up with my moodiness and my Angst, and gave invaluable advice when it came to writing in a way that is more accessible to people – and doesn't feature mile-long sentences. Thank you!

I dedicate this work to my yet unborn son, whom I can't wait to meet.

In terms of corporate support, I would like to thank HD Motorcycles, Nikon Imaging, and Aperture Laboratories for their wonderful products that kept me motivated during this research. Without them, this research might have been completed in less time, but also with less perceived enjoyment.

8 Author's Declaration

"I declare that, except where explicit reference is made to the contribution of others, this dissertation is the result of my own work and has not been submitted for any other degree at the University of Westminster or any other institution."

Boris A. Altemeyer, November 2014

9 Definitions of commonly used abbreviations

ATT:	Attitudes Towards Technology
CA:	Cronbach's Alpha
CFA:	Confirmatory Factor Analysis
FAC:	Facilitating Conditions
ITU:	Intention to Use
NE:	Network Externalities
PCA:	Principal Component Analysis
PEnj:	Perceived Enjoyment
PEOU:	Perceived Ease of Use
PLS:	Partial Least Squares (Modelling technique)
PU:	Perceived Usefulness
SEM:	Structural Equation Modelling
Sig.:	Significance
TA:	Technology Acceptance
TAM:	Technology Acceptance Model (Davis, 1989)
Tol.:	Tolerance
TRA:	Theory of Reasoned Action
TPB:	Theory of Planned Behaviour
UTAUT:	Unified Theory of Acceptance and Use of Technology (Venkatesh et al. 2003)

10 **Part 1:** Literature Review and Methodology

Introduction

This part consists of the two theoretical background chapters regarding technology acceptance. The first chapter is dedicated to existing technology acceptance models that were developed and are used for workplace technology. This technology, also referred to as utilitarian technology, is task or goal oriented.

In the second chapter, technology with a more hedonic use will be discussed. These technologies are more based on human interaction and enjoyment, and have only recently been introduced into the field of TA (technology acceptance) modelling. The existing models for this sort of technology, as well as the theories and ideas behind these models, are mostly specific to the technology or interaction.

Cross-over between these two areas of research will be investigated, leading to a starting point for a new addition to one of the core models of TA: the UTAUT (Unified Theory of Acceptance and Use of Technology; Venkatesh, Morris, Davis & Davis, 2003).

10.1 Chapter 1: Technology Acceptance: From streamlined performance to the perception of needs

The acceptance of technology by users has become an increasingly important part of product development and research (Baptista & Oliveira, 2015; Venkatesh & Bala, 2008; Venkatesh, Thong, Chan, Hu, & Brown, 2011; Venkatesh, Thong, & Xu, 2012). Especially in the information technology sector, companies are becoming more and more aware of the importance of how people relate to technology. Google (2010, www.google.com/design) postulated their ten principles that are aimed at guiding software and service development in multiple areas. The ten principles of how a design should be created are as follows: a design should be useful, fast, simple, engaging, innovative, universal, profitable, beautiful, trustworthy, and personable (Google, 2010, www.google.com/design). Many of these factors can be found in similar form in the technology acceptance literature.

Technology acceptance has become more prominent with regard to everyday use of technology and the problems of the users. It is no longer simply a strategic exercise for large-scale systems building (Baptista & Oliveira, 2015; Chuan-Fong Shih & Venkatesh, 2004; Escobar-Rodríguez & Carvajal-Trujillo, 2014). The plethora of different IT platforms and gadgets to choose from, and the clear shift in the IT sector from a Business to Business to a consumer market, has highlighted the importance of understanding user needs and perceptions (Corbitt, Thanasankit, & Yi, 2003; Gefen, Karahanna, & Straub, 2003; Gefen & Straub, 2004).

Davis (1989) first introduced technology acceptance as a stand-alone concept in 1989. The concept itself can be approached from multiple different directions and has developed in parallel in different disciplines and fields of research (Marangunić & Granić, 2015; Tang & Chen, 2011b). Depending on the main goal set as a measure of technology acceptance, the models and approaches differ. However, two key aspects hold true for all models. Firstly, all models are effectively trying to predict actual behaviour (Turner, Kitchenham, Brereton, Charters, & Budgen, 2010). Secondly, wherever measurement of behaviour is either not possible or methodologically too complex or inconvenient, the models rely on what is referred to as 'behavioural intention' (see Williams, Rana, & Dwivedi, 2015)

Behavioural intention was introduced by Ajzen (2002; Sheppard, Hartwick, & Warshaw, 1988) and is assumed to be a reliable predictor of actual behaviour. The difficulties that are linked with this proposed relationship will be discussed at a later stage of this chapter. A good overview of the most commonly used and impactful technology acceptance models, regardless of the disciplines they originated from or what they were initially meant to predict, can be found in Venkatesh et al. (2003). The models introduced here have been chosen based on their profound impact on the study of technology acceptance in the sense of information technology systems.

10.1.1Concepts of current technology acceptance modelling

Technology acceptance has been well established as a research concept and has been represented in multiple models. These models have been conglomerated into one overarching model by Venkatesh et al. (2003), creating the UTAUT (Unified Theory of Acceptance and Use of Technology); now one of the best known models of technology acceptance (Williams et al., 2015). This approach has been very successful, as can be seen by the numerous papers referring to and using the UTAUT (Venkatesh et al., 2003; Williams et al., 2015) and the amount of variance explained with regard to the behavioural intention to use technology, which was reported with up to 70% (Venkatesh et al., 2003; Williams et al., 2015).

This model is still considered to be state of the art and can be found in many current technology acceptance studies (Al-Qeisi, Dennis, Alamanos, & Jayawardhena, 2014; Escobar-Rodríguez & Carvajal-Trujillo, 2014; Martins, Oliveira, & Popovič, 2014) for computer use, enterprise platform use, and with extensions even electronic agent technology (e.g. Heerink, Kröse, Evers, & Wielinga, 2010). The UTAUT is based on an underlying concept of technology acceptance modelling, as were previous models (Figure 1).

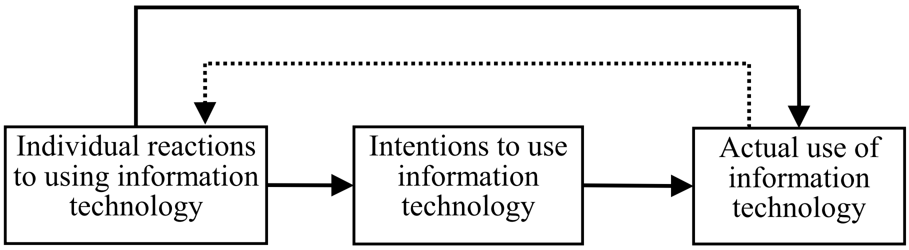

Figure 1: Underlying concept of use modelling according to Venkatesh et al. (2003) (Tang & Chen , 2011, p.588)

The UTAUT itself was developed from multiple different previous models, which were tested side-by-side to determine which aspect had the most predictive power regarding the self-reported intention to use a particular piece of technology (Venkatesh et al., 2003). This methodology was a new approach to technology acceptance modelling at the time of research, as most other models originated from theories of motivation and interaction, which were in turn developed into predictive models aimed at technology acceptance. Comparing the key existing models to determine the most useful aspects and combining their inherent strengths can be regarded as a milestone in the development of a truly universal approach to technology acceptance modelling.

The core of the UTAUT is represented by the same key factors that are postulated by the TAM (Technology Acceptance Model; Davis, Bagozzi & Warshaw 1989) and its predecessor, the TRA (Theory of Reasoned Action). The TAM was, like the UTAUT, developed to find a less situational approach to modelling that would allow a higher degree of generalization of the findings. These core factors are 'Perceived Ease of Use', 'Perceived Usefulness', and 'Behavioural Intention' (Figure 2; Davis et al., 1989). The TAM factors 'Perceived Ease of Use', 'Perceived Usefulness', and 'Behavioural Intention' dominated model development from early on, and they still play an important role in the most recent models such as the UTAUT (Venkatesh et al., 2003), the TAM3 (Venkatesh & Bala, 2008) and the ALMERE model (named after the community where it was first used; Heerink, Kröse, Evers, & Wielinga, 2010).

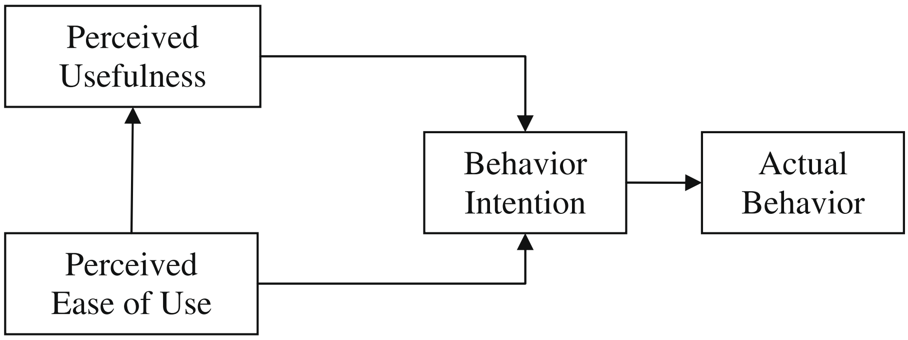

Figure 2: The Technology Acceptance Model (TAM) by Davis et al. (1989) (Yen, Wu, Chen & Huang, 2010, p.907)

In addition to these factors, which remained viable in the overall model comparison undertaken by Venkatesh et al. in 2003, further factors were added to the initial core factors. These aimed to explain the variance in the core factors themselves and in their relationships with other factors. This became the overall UTAUT model (Venkatesh et al., 2003).

Models such as the UTAUT and the TAM, on which it is based, have been very influential in the area of technology acceptance research, especially with regard to workplace technology. Due to the UTAUT's widespread use in technology acceptance research and its favourable reputation in the literature with regard to the amount of variance explained, it will be used in this research as a basis for the development of a technology acceptance model that can be applied to predict the use of lifestyle technology.

10.1.2Development of technology acceptance models

Different key models have been used in the history of technology acceptance modelling. Models focussed on technology at work have been developed from early beginnings, with the Theory of Reasoned Action by Fishbein and Ajzen (Ajzen, 1991), lending to the abovementioned UTAUT by Venkatesh et al. (2003). Technology acceptance modelling approaches developed for non-work-related technology were subsequently developed, but remain fewer in number than those applied to workplace technology. Table 1 gives an overview of technology acceptance models in the utilitarian and hedonic settings.

Table 1: Technology Acceptance Models Overview

Workplace related models (utilitarian)	Lifestyle related models (hedonic)
Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975)	**Model of Technology Adoption in Households** (MATH) (Brown & Venkatesh, 2005)
The Motivational Model (MM) (Davis, Bagozzi, & Warshaw, 1992)	**The ALMERE model** (Heerink et al., 2010)
Theory of Planned Behaviour (TPB) (Ajzen, 1991)	**Technology Trust** (Lankton & McKnight, 2011)
Technology Acceptance Model (TAM) (Davis, Bagozzi, & Warshaw, 1989)	**Technology Abandonment** (Correia de Barros, Duarte, & Cruz, 2009)
Task Technology Fit (TTF) (Goodhue & Thompson, 1995)	
Model of PC Utilization (MPCU) (Thompson, Higgins, & Howell, 1991) based on (Triandis, 1977)	
Technology Acceptance Model 2 (TAM2) (Venkatesh & Davis, 2000)	
Technology Acceptance Model 3 (TAM3) (Brown, Venkatesh, & Bala, 2006; Venkatesh & Bala, 2008)	
Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003)	

10.1.3 Theory of Reasoned Action

One of the first models to be used in the context of technology acceptance research is the Theory of Reasoned Action by Fishbein and Ajzen (1975). This theory is based in the field of social psychology and is comprised of the predictive factors 'subjective norm' and 'attitude toward behaviour'. In this context, social norms describe the impression and mental representation a person has of the opinion that others hold of his potential actions. These others could be described as opinion leaders for this person, i.e. people who are regarded as being important. This can be summarized in the perceived approval or disapproval of the person's actions by a group the person normally refers to as opinion leaders. The factor 'attitude toward behaviour' represents a person's own emotional response, positive or negative, toward acting in a certain way or displaying certain behaviour. These feelings have been labelled 'evaluative affect' by Fishbein and Ajzen (1975).

The Theory of Reasoned Action can be seen as mainly outwardly oriented. The behaviour of an individual is regarded as being predictable, based on the rules that have been set by the surrounding society, and the approval anticipated by the individual results from an action that is observable by the society. This model therefore has certain limitations when used in the context of technology acceptance and prediction of future use of technology.

Firstly, the individual's interactions with technology might not be directly observable by society, as information technology does not require the physical presence of interaction partners who could approve or disapprove of the interaction of a person with a technology. Secondly, the use of a system based on the predictive factors in this model would solely be comprised of social attributes, entirely disregarding the practical issues of technology use and possible limitations in functionality based on different platforms and operating systems.

Nevertheless, the social aspect of technology acceptance is likely to play a larger role with regard to lifestyle technology, as lifestyle is partially modelled on the values and expectations of society and the individual's inclination to comply with these.

In their 1988 paper, Sheppard, Hartwick and Warshaw published two meta-analyses of studies using the theory of reasoned action. They highlighted the general interest in the prediction of behaviour in situations that exceed the limitations of the TRA. The key limitations of the TRA - in terms of applicability to different situations - are the conscious control of the behaviour by the person, an informed choice made possible by fully availability of information to the person, and, finally, the role of choice in a given situation (Sheppard, Hartwick & Warshaw, 1988).

The high amount of variance found in the correlation-analysis of this meta-analysis results was taken as an indicator for the existence of mediating or moderating factors outside of the predictive model; this especially applied to the correlations between Intention and Behaviour and between Social Norms and Attitudes and Intention (Sheppard et al., 1988). Overall, the study found that the predictive power of behavioural intention for actual behaviour is high, but that the predictive power for achievement of goals does not reach the same level; the same held true for the predictive power of the Social Norms and Attitudes and Intention correlation (Sheppard et al., 1988).

10.1.4 Advancements of the TRA

Fishbein and Ajzen (1980) proposed solutions for this inherent problem of accurately predicting goal attainment using the TRA. Unfortunately, the key suggestions made led to an avoidance of the initial problem, as researchers were urged to operationalize goal achievement through specific behaviours that are expected to lead to the fulfilment of the goal requirements. As was pointed out, this suggestion is "both conceptually and practically problematic" (Sheppard, Hartwick & Warshaw, 1998, p. 338). A key problematic factor is the anticipation and subsequently the measurement of the path to achieve a specific goal as theorized by the researchers. This is highly unlikely to correspond with and fully cover all possible real-life iterations of options for achieving the goal. This problem was partially solved by making modifications to TRA to incorporate positive and negative outcome options regarding goal achievement in terms of a success or achievement rating (Sheppard et al., 1988).

It was hypothesized that the importance of a decision had an impact on the predictive power of the TRA. This was shown in studies relating to voting in elections or regarding the choice of birth control methods (Ajzen, Timko, & White, 1982; Davidson & Jaccard, 1979).

Sheppard, Hartwick and Warshaw (1988) highlight that even Fishbein and Ajzen have “explicitly acknowledged” (Sheppard et al., p.326) the limitations of the TRA in terms of clearly separating a person’s goal intention from a person’s behavioural intention. In addition, the key reason for the development of the model was to predict behaviour in terms of conscious choices, instead of focusing on specific events that may be out of direct control. Regardless of the abilities of a person or the support granted by the environment, the conditions that are set by the TRA are therefore impossible to meet under real-life conditions (Sheppard et al., 1988). This highlights the importance at the time of a paradigm shift in the assessment of people’s acceptance of technology.

Davis (1989) used the TRA as a basis for his first modelling of the concept ‘technology acceptance’, in what became the Motivational Model, and confirmed the good predictive power of the approach. The Motivational Model is based on psychological research into different factors affecting actions to predict the interaction with and acceptance of systems. A distinction between ‘extrinsic’ and ‘intrinsic’ motivation differentiates between a perceived external usefulness and reinforcement of the performed behaviour, and an inner urge to perform a certain action without any external feedback as a motivational trigger.

These external reinforcements are more likely to be found in an organizational context than a private setting. In organizational settings, social pressure is likely to be more consistent than in private, although regulated through a general code of conduct and formalized expectations (see Rousseau, 2001). However, internal and external motivations can take different forms depending on the underlying motivational structure of a person (Davis, 1989; Davis, Bagozzi & Warshaw, 1992).

The Theory of Reasoned Action, as developed by Fishbein and Ajzen (1975), has been successfully used in many studies to predict people's behaviour with regard to definite behavioural goals. The meta-analysis by Sheppard et al. (1988) clearly showed the predictive power of the TRA under such circumstances. Nevertheless, the TRA does not lend itself to predictions of actions that include any form of skill-level, knowledge, or resources. For this reason, new forms of modelling and predicting user behaviour were necessary. One of these new forms is the Theory of Planned Behaviour (TPB), which was introduced by Ajzen in 1991.

10.1.5 Theory of Planned Behaviour

Like the TRA, the TPB assumes that an individual's intention to perform certain behaviour is a good indicator of actual behaviour (Ajzen, 1991). It was necessary to review and extend the TRA model, as certain limitations emerged, which were based on difficulties of predicting behaviour that was not entirely voluntary (Doll & Ajzen, 1992). The initial TPB, formulated by Ajzen (1985), did not evaluate the actual performance of behaviour, but the attempt to perform certain behaviour.

This represents a limitation to the TPB. The possibility of executing certain behaviour, i.e. the option of the performance of an action being perceived as impossible, can impact the predictive power of the behavioural intention. In cases where such a barrier to execution does not exist, behavioural intention is assumed to have a near perfect predictive relationship with actual behaviour (see Ajzen, 2011).

Although hypothesized in the original version of the TPB, no interaction effects between Perceived Behavioural Control and Behavioural Intention have been confirmed in research to date, something that has been attributed to skewness of the results in terms of a general lack of highly negative responses to experimental conditions (Ajzen, 2011). Ajzen (1991) extended the TRA by adding the new core construct 'Perceived Behavioural Control'. This new core construct describes the "perceived ease or difficulty of performing the behaviour' (Ajzen, 1991, p.188).

A belief of achievability of a goal and thereby control over a situation and the related behaviour is hypothesized to lead to higher levels of behavioural intention, thereby increasing the likelihood of actual performance (Baker & White, 2010).

The TPB is the resulting model from these three factors. Perceived Behavioural Control is one of the factors that would, at a later stage of the development of TA models, differentiate the more specific models from the models with more general applicability.

This adaptation is the first implementation of any ‘usability’ or performance related factor in any model related to technology acceptance. While this theory was designed from the perspective of social psychologists, it does not focus on ‘usability’ as such, but offers the broader concept of behaviour. A different version of this model, which breaks down the different core modules into sub-factors including belief systems applicable in the relevant context, is the Decomposed Theory of Planned Behaviour (see also Venkatesh, Morris, Davis & Davis, 2003). This decomposed version will be used in the following in order to highlight theoretical underpinnings of the model.

In terms of the assessment of behaviours, Ajzen (2011) pointed out that attitudes toward behaviours are formed based on the outcomes that are associated with the behaviour, thereby qualifying the behaviour through the way in which the outcome is perceived by the individual. This raises the question whether this ‘learning’ of associations is true for behaviour that has time-delayed feedback in terms of outcomes.

Meta analyses have nevertheless shown good predictive power with regard to behaviour with possible long-term consequences such as the use of condoms and driving under the influence of alcohol (Webb & Sheeran, 2006). Recently, TPB has been used to predict use of instant messaging services (Lu, Zhou, & Wang, 2009) and interaction with online social networks (Baker & White, 2010).

Meta-studies of the TPB show that, while a respectable amount of variance in both intention to use and actual behaviour was explained (see O'Connor & Armitage, 2003), a lot of variance still remains unaccounted for (Baker & White, 2010).

In general, approximately 39% of the variance in the variable ‘behavioural intention’ and around 27% of variance in the actual behaviour were explained when using the TPB (O'Connor & Armitage, 2003), which also puts the relationship postulated between the two in question (Ajzen, 1991; Doll & Ajzen, 1992; Webb & Sheeran, 2006).

From a research perspective, it is a reasonable step to consider the introduction of a variable that captures the variance introduced into the model by non-volitional conditions for the users. For instance, studies of workplace related technology, such as new developments in information technology, are unlikely to be a fully optional interaction in most circumstances. This is simply because organization-wide IT and management systems are unlikely to allow for individual preferences in terms of data handling and interaction, e.g. the parallel existence of paper and electronic databases.

A further critique for the TPB was raised based on the specificity of the assessment method underlying the TPB, which makes every assessment very group specific and less generalizable (Mathieson, 1991; Terry, Hogg & White, 1999).

While this is not necessarily a weakness of the model, it does, as observed by Mathieson (1991), make the assessment procedure more complex and reduces the generalizability of results that many researchers seek. This argument was taken further by Terry et al. (1999), who indicated that the specificity of the social norms that are assessed, and the impact of this construct in its proposed from on the assessment, are limiting factors of the model. Based on identity theory and the notion that a perception of a role in a social context is predicated to include a form of action, the subjective norm construct (Ajzen, 1991) was regarded as an inadequate representation of social interactions and influences (Terry et al., 1999).

In line with this argument, different measures of social norms and social group identification have been added to the TPB for research purposes (Baker & White, 2010). These additions have been reported as leading to positive results in terms of predictive power of the model in the field of health-behaviour related studies.

The core models that have formed the basis for the understanding and the modelling of behaviour and behavioural intention have limitations, and are subject to further developments and expansion of their areas of application. Other models that were specifically designed to model and measure technology acceptance extended these. This included the original model of technology acceptance: TAM (Davis, Bagozzi & Warshaw, 1989).

10.1.6 Technology Acceptance Model: TAM

The decision to make use of information technology by individual is based on different factors that are related to inner-psychic processes, pressures of the (social) environment or affordances and implications of the technology itself. The importance of technology adoption decisions and related research is mirrored in the pressure put on the IT industry to develop systems, which can give organizations a competitive advantage (Brown, Dennis, & Venkatesh, 2010; Chuan-Fong Shih & Venkatesh, 2004; Harrison, Mykytyn Jr, & Riemenschneider, 1997; Sabherwal & King, 1992; Sykes, Venkatesh, & Johnson, 2014; Tang & Chen, 2011a).

The first model of the use of information technology systems directly aimed at the organizational or professional context was the 'Technology Acceptance Model' (TAM) as introduced by Davis, Bagozzi and Warshaw (1989). The TAM has been used in many studies and has been validated in meta-studies (Mathieson, 1991; Šumak, Heričko, & Pušnik, 2011; Tang & Chen, 2011a; Taylor & Todd, 1995; Turner et al., 2010). Adaptations of the TAM for technologies different from purely utilitarian applications have been made in recent years, especially with regard to Internet or network based applications (Bruner II & Kumar, 2005; Farahat, 2012; Gefen et al., 2003; Heerink et al., 2010; Hossain & de Silva, 2009; Kwon & Wen, 2010; Marangunić & Granić, 2015; Oum & Han, 2011; Read, Robertson, & McQuilken, 2011; Straub & Karahanna, 1998; Tang & Chen, 2011b; Tarhini, Hone, & Liu, 2013; Yen et al., 2010).

In contrast to other models derived from or extending the TRA, the TAM does not feature factors that cover any emotional loading (compare Read et al., 2011; Venkatesh et al., 2003). This measure is taken in order to generate feedback that is more clearly focused on the inter- rather than intra-individual differences of technology acceptance. Only the factor ‘subjective norm’ has been adapted directly from the TRA model, which nevertheless was not included in the original version of the TAM but in the revised TAM2, developed by Venkatesh and Davis (2000).

The original TAM consisted of the two factors ‘perceived usefulness’ and ‘perceived ease of use’ (Davis, 1989). The first factor is aimed at assessing the potential for increased performance that a prospective user predicts for the use of a certain technology or a certain system. The latter is defined as being “the degree to which a person believes that using a particular system would be free of effort” (Davis, 1989, p. 320). As all following models will build on this core structure, the constructs used in the TAM will be outlined in more detail, before comparing the TAM with its predecessors.

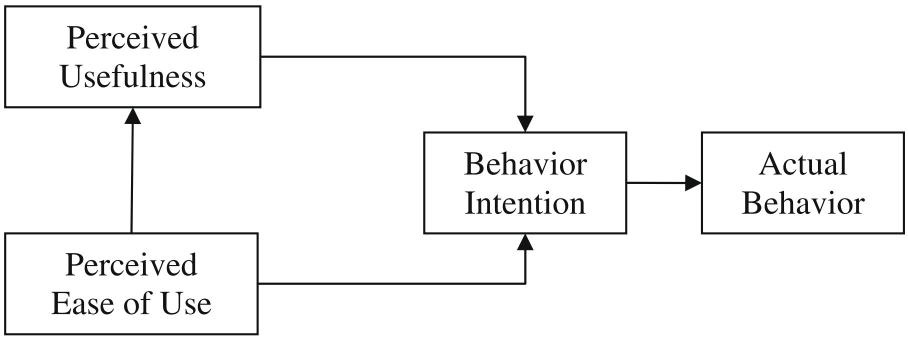

Figure 3: The Technology Acceptance Model (TAM) by Davis et al. (1989) (Yen, Wu, Chen & Huang, 2010, p.907)

10.1.7 Perceived Ease of Use

According to Davis et al. (1989) perceived ease of use is a key determinant in technology adoption, as it forms a first step toward technology acceptance from the potential user's perspective. Venkatesh (2000) combined this with the statistical evidence presented in studies of the TAM, as perceived ease of use showed two distinct effects on the behavioural intention to adopt a technology, one a direct effect and one mediated by the perceived usefulness of a technology (Venkatesh, 2000). In their literature review regarding the TAM, Marangunić and Granić (2015) found this effect to be a core part of all TAM modelling. Venkatesh (2000) differentiated between three core components that influence Perceived Ease of Use: 'anchors', 'adjustments' and 'experience' (p.345). Anchors, which can be seen as reflecting more generalized concepts about a certain technology, are broken down further into four sub-aspects. The first sub-aspect is the user's own perceived ability to interact successfully with information technology, labelled computer self-efficacy. The second sub-aspect is the amount of perceived external control from the user's perspective. As a third aspect, the emotional aspect of technology or computer anxiety was included. Finally, the perceived level of computer playfulness was included, indicating the level to which a user feels content about less structured and exploratory computer interactions.

The component 'adjustments' covers the more immediate beliefs of a person with regard to a specific technology, in contrast to general beliefs that are covered in the sub-aspects introduced above (Venkatesh, 2000). These adjustments are split into 'perceived enjoyment' and 'objective usability'. Both are part of a feedback sequence that updates these adjustments based on the users' actual experiences with the technology (Venkatesh, 2000). Regarding experience, the question remains how to best measure this factor and how best to include it in the model from a statistical perspective. Experience normally relates to the time spent using a system. However, the experience itself may be perceived as being of a generally positive or negative nature. This also depends on the way that the system has been introduced to the users, as well as the system complexity.

10.1.8 Perceived Usefulness

According to Davis et al. (1989) the definition for Perceived Usefulness (PU) is "the degree to which a person believes that using a particular system would enhance his or her job performance." (p.320). While the relationship with job performance is a relatively utilitarian approach to the use of technology, this instrumental aspect of use is the core of the 'usefulness' concept. Nevertheless, the original definition of useful used by Davis et al. (1989) does not refer to the type of task it is linked with, as it is defined as something being "capable of being used advantageously" (Davis et al., 1989, p.320). Usefulness was furthermore seen as related to monetary or other bonuses for the users of the technology in a work environment (Davis et al., 1989).

The utilitarian aspect can also be found in earlier technology acceptance models (e.g. Ajzen, 1991). However, when introducing the TAM Davis et al. (1989) followed the theoretical background of the construct perceived usefulness back to a factor analysis performed by Schultz and Slevin (1975). This dimension reduction, based on over 60 questionnaire items regarding decision-making models and data collected in an organizational setting, fed into the establishment of the factor labelled 'performance'.

This construct was highlighted as describing the impact of the intervention on the job-performance of a manager, and was highly correlated with reported behavioural intention to use in the model (Davis et al., 1989). It was theorized by other researchers from the behavioural and motivational domain that changes that are not perceived as being productive in the terms outlined above are unlikely to be accepted; this would be regardless of other favourable conditions and interventions that might be put in place to enhance acceptance and use (Davis et al., 1989).

While the connections between behavioural intention and perceived usefulness as outlined above provide a sound argument for the adoption of this construct in technology acceptance models, methodological drawbacks in the initial study were identified by Davis et al. (1989). The operationalization of the construct in terms of choice of items was not performed in a way that excluded any emotional aspects of technology use, which could possibly have affected the results.

Other research had indicated similar connections between Perceived Ease of Use (PEOU) and Intention to Use (ITU) (see DeSanctis & Courtney, 1983), while no research at the time sufficiently identified a clear connection with a concise construct of perceived usefulness. In order to address this, Davis et al. (1989) devised several studies to identify the core components behind perceived usefulness, among other constructs. A core finding of these validation studies of the construct perceived usefulness was the strong relationship between this construct and the construct 'usage' (Davis et al., 1989; Marangunić & Granić, 2015; Turner et al., 2010; compare Williams et al., 2015). This relationship was reportedly much stronger in both validation studies than the relationship between usage and perceived ease of use (Davis et al., 1989).

Davis et al. (1989) hypothesized that perceived ease of use and perceived usefulness might not be independent predictors of intention to use a technology, but might rely on each other in terms of perceived ease of use being a preliminary stage to the assessment of perceived usefulness. This connection was even stated as a "chain of causality" (Davis et al., 1989, p.334), resulting in a PEOU to PU to Behavioural Intention connection. Based on the original notion of performance, this construct was named 'performance expectancy' in later studies (see Venkatesh et al., 2003)(Williams et al., 2015). Venkatesh et al. (2003) furthermore show overlap between different technology acceptance models with regard to their operationalization of this construct and the theoretical underpinning of it. In subsequent research, this link has been kept as a core part of the modelling process for TA (Bruner II & Kumar, 2005; Farahat, 2012; Gefen et al., 2003; Tang & Chen, 2011b).

10.1.9 Behavioural Intention

Most technology acceptance models and related models rely heavily, if not exclusively, on the accuracy of the relationship between behavioural intention and actual behavioural performance. The basic assumption behind this relationship can be found in work by Ajzen (1991; Ajzen, 2011), which states that there should be a very reliable connection between behavioural intention and actual behaviour, assuming that there are no barriers to completing the behaviour. This notion led to the introduction of the construct Perceived Behavioural Control and the TPB. Multiple studies have assessed the relationship between intention and actual behaviour, many of which have used correlational designs (Oum & Han, 2011; Tang & Chen, 2011a, 2011b; Webb & Sheeran, 2006; Yang & Yoo, 2004).

Correlational studies have been conducted for different predictive models in the past. For the TPB, O'Connor and Armitage (2003) conducted a meta-analysis including over 180 studies. The correlation found between the variables 'behavioural intention' and 'actual behaviour' was reported to be .47. Similar values were found in meta-studies regarding exercise behaviour or health related behaviour (Rivis & Sheeran, 2003; Sheeran, Norman, & Orbell, 1999; Sheeran & Orbell, 1999).

In a meta-analysis conducted by Webb and Sheeran (2006) a non-correlational design was chosen in order to allow the direct comparison of effect sizes. In a meta-study of several meta-studies regarding correlational effects between behavioural intention and behaviour Sheeran (2002) reported an overall correlation of over .50, with behavioural intention explaining 28% of the variance in actual behaviour displayed.

In their meta-study using effect size rather than correlational indicators, Webb and Sheeran (2006) found that a medium-to-large effect size change in behavioural intention is required for a small-to-medium sized effect in actually displayed behaviour to occur. Mediating effects were also apparent, such as the effects assumed between the constructs behavioural intention and actual behaviour as mediated by the variable Perceived Behavioural Control in the TPB model (Webb & Sheeran, 2006; Ajzen, 2011).

Although correlational relationships between Perceived Behavioural Control and Actual Behaviour, as well as Perceived Behavioural Control and Behavioural Intention were found, the changes in PBC did not account for the changes observed in the measure of actual behaviour (Webb & Sheeran, 2006).

In line with Thompson, Higgins, and Howell (1994) , Venkatesh et al. (2000) found that direct user experience allows for better behaviour predictions. This was also backed up by other studies using the UTAUT (Williams et al., 2015). The user can form far better attitudes with regard to the interaction than it would be possible based on any other form of information acquisition. This is a very interesting point with regard to the assessment of technology acceptance of non-users or before the first exposure to the new technology has taken place.

This could imply that a measure of technology acceptance is only going to be accurate once a person has experienced the possible benefits and drawbacks of a particular technology. While this is a reasonable assumption to make, this does not cover the full nature of human decision-making with regard to the use of technologies. The assumptions made with regard to the possible benefits of a technology, as well as user friendliness and social factors, are likely to influence the decision of a person to even try a particular technology for the first time. They may also simply to decide that this technology does either not provide any benefits for them – either in terms of lifestyle of performance – or that the negative aspects outweigh the positive.

10.1.10 Advancements of the TAM

In several meta studies and literature reviews regarding the TAM, it has been found to be a well fitting model that needs to be adapted with care in order to be usable for areas for which is was not originally designed (Chuttur, 2009; Hsiao & Yang, 2011; Marangunić & Granić, 2015; Turner et al., 2010).

Several core advancements of the TAM have been identified in meta-analyses (Chuttur, 2009; Marangunić & Granić, 2015). These include ‘external predictors’, ‘factors from other theories’, ‘contextual factors’, and usage measurements’ (King & He, 2006).

Within these categories, the research into aspects such as trust (Gefen et al., 2003; Grabner-Kräuter & Bitter, 2013; Li, Pieńkowski, van Moorsel, & Smith, 2012; Morgan-Thomas & Veloutsou, 2013; Wang, Ngamsiriudom, & Hsieh, 2015; Wu, Huang, & Hsu, 2014), social variables (Farahat, 2012; Kwon & Wen, 2010; Tarhini et al., 2013; Venkatesh & Davis, 2000) and different moderators have been very common.

The impact that social norms have on the behaviour of a user would be expected to be larger when that behaviour has been learned or adopted more recently (Thompson, Higgins & Howell, 1994). For users with less experience of a certain technology or behaviour in general, the user's affect toward the behaviour will also have a stronger impact on the user's use of the technology that it would have with more experienced users: "the influence of the affective component will decrease as the user's experience increases." (Thompson et al., 1994, p.173).

The term 'innovative dissonance' denotes the effect of the affect of a user toward a technology and the resulting use, and was introduced by Rogers and Shoemaker (1971). Innovative dissonance describes the negative correlation between the affect a user experiences with regard to the technology and the opposing frequency of use, i.e. disliking a technology but using it very frequently, or vice versa. This could explain why new users have stronger affect driven reactions than more experienced users, in the sense that experienced users have had a sufficient amount of exposure to the technology to have unlinked the effects of personal affect and use of a technology or patterns of use (Thompson, 1991; Thompson et al., 1994). Yen et al. (2010) followed the direction of previous research in excluding the attitude construct from the original TAM, in order to simplify the model, which in previous studies was shown to be a viable option (Adams, Nelson & Todd, 1992; Venkatesh & Davis, 2000).

10.1.11 Perceived Enjoyment

The perceived enjoyment characteristic is representative of the change from the original work-focused approach of the early TAM models and their predecessors to a more social interaction and fun-based relationship with technology.

Perceived enjoyment broadens the scope of technology acceptance. None of the original factors in any TA prediction model covered the socializing and leisure aspect of technology use in great detail. While perceived ease of use and perceived usefulness could theoretically, taking into account minor amendments, also be used to assess technology aimed at entertaining the user, there would be clear drawbacks from such a transition. Firstly, the interaction with the technology can generally be hypothesized to have a goal or aim. The user will have a certain motive to interact with the technology in terms of reaching a goal (concrete or abstract) completing a task. These reasons will motivate the user to interact with the technology. Although the fact that the interaction with the technology is pleasant can act as a motivator, this would turn the technology, in the widest sense, into a toy; a category which, for research purposes, is not covered in the definition of technology.

Secondly, the perceived ease of use of a device does not necessarily make it enjoyable to interact with. In order for this to be the case, the user would have to perceive ease of use and enjoyment as the same construct, indicating that the task itself is included in this category to a certain extent. Again, the interaction could be reduced to play and the device or technology consequently to being a toy.

10.1.12 Crossover-Effects between PEOU and PEnj

Potential cross-over effects between PEOU and PEnj in the modelling of the TAM and its extensions represented a research challenge. Using statistical methods that allow different approaches from the more commonly used covariance based methods, Sun and Zhang (2006) showed effects that allowed a clearer inference of possible causal links between the constructs PEnj and PEOU.

This clarification was seen as necessary, as PEnj had been conceptualized as both the possible cause (Venkatesh, 1999; Venkatesh, 2000; Venkatesh et al., 2003; Yi and Hwang, 2003) and result (Davis, Bagozzi & Warshaw, 1992; Igbaria & Davis, 1995; van der Heijden, 2004) of PEOU.

This difference in effect direction is of practical importance with regard to possible interventions, and might also impact statistical analyses of research data and the way in which technology acceptance is modelled (Sun & Zhang, 2006). Nevertheless, previous research focused on technology that was work-oriented or 'utilitarian' (Marangunić & Granić, 2015; Williams et al., 2015). These findings might not apply in the same way to the field of lifestyle technology, or 'hedonic' systems.

The TAM (Davis, 1989) supports the theory that the effect between PEnj and PEOU originates from PEnj, while the Motivational Model of technology Acceptance (Davis et al., 1992) indicates the reverse. This is in line with the assumptions underlying the motivational theory (Deci, 1975). Venkatesh supported the PEnj to PEOU effect direction in his 2002 paper, in which he highlighted the potential problem of attributing different directions to this effect in the modelling of technology acceptance. Two construct-related aspects are likely to be of importance in attributing a direction to the effect between perceived enjoyment and perceived ease.

Firstly, the two constructs are very close on a conceptual level, as both are based on motivational aspects that can be categorized as being of an intrinsic nature. Secondly, these two constructs were shown as being highly correlated in several studies, which is possibly a result of their similarity on a conceptual level (see Sun and Zhang, 2006). Bi-directional effects in models of user behaviour appear to be widespread, and can change direction based on circumstantial effects (Marangunić & Granić, 2015; Read et al., 2011; Sun & Zhang, 2006; Tang & Chen, 2011b; Turner et al., 2010; Williams et al., 2015).

Based on arguments by Venkatesh (2000), Agarwal and Karahanna (2000) and Deci (1975), Sun and Zhang (2006) argued that a reduced estimation of difficulty to use a technology might be based on the simultaneous experience of joy, which would support the hypothesis that the main direction of the effect is from PEnj to PEOU.

The effect of PEOU on Intention to Use is much larger than any direct effect of PEnj, which suggests that the direction of the effect should be assumed as going from PEnj toward PEOU (Igbaria, Parasuraman, & Baroudi, 1996). Agarwal and Karahanna (2000) introduced the notion that 'cognitive absorption', a state of mind in which the users is fully absorbed in the interaction with the technology or device, may have an impact on this relationship, as this state of mind is co-defined by a certain level of PEnj. The complexity of the environment might also affect the performance or interaction behaviour of the users in general (Legris, Ingham, & Collerette, 2003).

The overall conclusion of Sun and Zhang (2006) was that the effect direction PEnj to PEOU takes precedence over the reversed effect direction, based on their statistical analysis. This can nevertheless only be regarded as a valid finding for utilitarian systems.

While the TAM benefits from its relative simplicity, this simplicity did also raise questions with regard to the underlying theories of the individual core constructs, as has been highlighted. The TAM and its composition of Perceived Ease of Use, Perceived Usefulness and Behavioural Intention is nevertheless the fundamental model of technology acceptance, upon which more recent approaches are built.

10.1.13 Task Technology Fit (TTF)

Task Technology Fit describes the interaction between the user and the technology as seen from a task performance point of view (Goodhue, 1995; Goodhue & Thompson, 1995). This can be regarded as an assessment as to whether using a particular technology increases the performance of a user on a given task, which is similar to the original concept behind the development of the TAM (Davis et al., 1989). An underlying concept of the TTF is that the user is only seen to be likely to accept a certain technology if the use of this technology allows him or her to achieve higher levels of performance on the given task. This assumption links the TTF to the use of utilitarian systems, as this assumption is unlikely to apply to hedonic systems.

There are multiple versions and developments of the TTF (Dishaw, Strong, & Bandy, 1999). These developments include the addition of self-efficacy scales and a linkage with the construct perceived usefulness, which forms the core of many technology acceptance models, including the TAM and the UTAUT. However, initial studies did not support the link between task-technology fit and perceived usefulness (Yen, Wu Cheng & Huang, 2010).

Yen et al. (2010) in their attempt to link the TTF and the TAM state that the purpose of technology acceptance models is to identify why an individual would choose a certain technology over another. This is not entirely accurate, as none of the most common technology acceptance models, including the different versions of the TAM, the UTAUT or predecessors of these models, were designed for technology comparison. On the contrary, the models only assess the acceptance of one particular technology and thereby allow insights into the mental processes that lead to an acceptance of technology. Earlier technology acceptance models such as the TRA or TPB are very situation-specific and rely on circumstantial information. This makes direct comparisons between two types of technology very difficult.

By linking the two technology acceptance models TAM and TTF, Yen et al. (2010) were hoping to compensate for the drawbacks of only using one of the models, which would either mean not collecting information regarding user preferences in terms of attitudes toward technology, or missing detailed information regarding the fit between the requirements of the task and the capabilities of the technology.

The combination of the TAM and the TTF led to a model that explained 69% of the variance with regard to the users' intention to use a technology (Yen et al. 2010). While the effects of TTF on perceived ease of use and perceived usefulness have been reported in previous studies (Dishaw & Strong, 1999; Keil, Beranek & Konsynski, 1995), these effects were not replicated in the study by Yen et al. (2010).

10.1.14 Model of PC Utilization

The Model of PC Utilization (MPCU) was developed by Thompson, Higgins and Howell (1991) and is based on a theory introduced by Triandis (1977). The MPCU seems to be suited to assess an individual's inclination to accept a certain technology as being useful and show positive responses in terms of actual interaction (Venkatesh, Morris, Davis & Davis, 2003). Core factors in this model spread over different streams of research and it could therefore be placed in a different context. For instance, the factor 'job-fit', a measure of perceived performance increase in a professional setting, ties into the increased fit between task and technology in later models.

'Long-term consequences' is a factor of the MPCU closely related to the motivational approach of Ajzen (1991). This factor is clearly defined as assessing the perceived likelihood of the use of technology resulting in something that is regarded as a benefit in the future. From a motivational perspective, this would be comparable to a delayed positive reinforcement of behaviour. Depending on the structure of the perceived individual goal-hierarchy this delayed gratification might as well be perceived as a goal itself, raising the question whether the motivation to perform certain interaction behaviour (accept the technology and use it) is in this context automatically set as extrinsic or if the motivation can also be turned into an intrinsic factor (compare Thompson et al., 1991; Venkatesh et al., 2003; Vohs, Baumeister, & Schmeichel, 2012; Wilson, Lengua, Tininenko, Taylor, & Trancik, 2009). A factor aimed at assessing a dimension more closely related to intrinsic motivation is the 'affect towards use', focusing on emotional feedback as perceived by the user from using the technology, such as experience of positive feelings.

In general, internal responses towards performed behaviour and external feedback in the form of reinforcements (positive and negative) of behaviour, are based in the social setting in which an individual has been raised and is currently performing. This might, especially in a strongly established organizational culture, lead to a mix of different social values determining the motivational framework of a prospective user of technology.

The factor that is used to cover these influences in the MPCU is labelled ‘social factors’, which is defined as representing “the individual’s internalization of the reference group’s subjective culture, and specific interpersonal agreements that the individual has made with others, in specific social situations” (Thompson et al., 1991; p.126).

As all models presented in this comparison are mainly aimed at the professional and organizational work context it can be assumed that the context assessed in this model is work related. Nevertheless, work related context is not necessarily the context in which the individual perceives his or her own external ‘anchor points’ for the behaviour at work to reside. The problem of latent variables which might be influential on the uptake of a certain technology, but which are not represented reasonably well in any larger construct has been approached with the dimension of ‘Facilitating Conditions’. These conditions have been defined as being factors present in the environment that the user or observer is able to recognize as potentially having a positive impact on the use of technology. As stated by Thompson et al., 1991, p.129) the “provision of support for users of PCs may be one type of facilitating condition that can influence system utilization”.

In the context of quantitative data analysis, factors such as facilitating conditions need to be critically reviewed, as they potentially cover more than just one construct. Analysing multiple constructs as an amalgamation represented by one factor could potentially lead to the factor representing ‘residual variance’ and thereby skewing the results. For this reason the impact of this factor on the overall model has to be viewed with caution.

10.1.15 TAM 2

The original TAM was extended based on previous research and four longitudinal studies (Venkatesh & Davis, 2000). The longitudinal studies addressed the combination of voluntary and mandatory use, thereby tackling the potential issues that the TPB had raised with the inclusion of PBC. While this aspect of choice or behavioural control was not included in the original TAM (Davis et al, 1989), it exceeded the amount of variance explained by the TPB (Venkatesh, 1999; Venkatesh & Davis, 2000).

The step from the TAM to the TAM2 added more complexity to the original model, while bringing it closer to other existing models, such as the TPB or the TRA, on which the TAM was partially built (Davis, Morris & Venkatesh, 1989). Additions made to the original TAM can be separated into two distinct groups: social influence processes based on social interactions and group behaviour, and cognitive instrumental processes related to the performance of the technology and its impact on work.

Within the context of social interactions, Venkatesh and Davis (2000) added the construct 'voluntariness' to the TAM to address PBC. This construct was set up as a moderating factor in the new model between subjective norms and the behavioural intention to use a technology (Hartwick & Barki, 1992). Subjective Norms, which originates from the TRA and was also included in the TPB, was also a new addition to the model. This factor was put in close relation to image, another factor aimed at social interaction, identity and group norming (Venkatesh & Davis, 2000). Both factors were set up in the new model to be influential to 'Perceived Usefulness', while 'Subjective Norm' was also hypothesized to impact on behavioural intention (Venkatesh & Davis, 2000).

This impact was also evident in the comparison of the four longitudinal studies. Finally, the construct 'experience', which was added to the model in this review process by Venkatesh and Davis (2000), was placed as a moderating factor between subjective norm and both, 'perceived usefulness' and ' intention to use'.

These moderating effects are hypothesized based on the differences between immediate and second-hand information acquisition with regard to the belief structure underpinning interaction intentions (Doll & Ajzen, 1992; Ajzen, 2011).

With regard to the cognitive instrumental processes, three constructs were added to the original TAM model. These additions were made based on research in motivational theory, decision-making theory and social psychology (Venkatesh & Davis, 2000). All three new constructs in this group were hypothesized to impact on the TAM core construct ‘perceived usefulness’. The construct ‘job relevance’ was included in the model in order to gather information with regard to the matching between the technology and the requirements of the tasks to be performed by the users (Venkatesh & Davis, 2000).

The second construct added was ‘output quality’, which refers to the ability of the technology to create output that is within the expectations that the users have for output of their work in general (Venkatesh & Davis, 2000). ‘Result demonstrability’ was added to cover the aspect of the technology making a notable difference to the job performance of the user, instead of merely being a different way of doing things. All hypothesized interactions and effects introduced above were supported by the findings of Venkatesh and Davis (2000), including results of four longitudinal studies spanning voluntary as well as mandatory usage settings.

It is striking that while six new constructs were added to the original TAM, none of them was hypothesized to impact on the core construct ‘perceived ease of use’. It is unclear whether this was because the construct has no more detailed underlying constructs, or whether the amount of variance that could possibly be explained by using such sub-constructs was not expected to be of relevant proportions.

10.1.16 TAM3

More specialized developments in the search for better predictive models of technology acceptance have taken the form of modelling for specific technologies (Venkatesh & Bala, 2008), including electronic commerce systems (Koufaris, 2002), email (Karahanna & Straub, 1998), and other systems (see Bajwa & Arun, 1994; Heerink et al., 2010; Hong et al., 2006; Lankton & McKnight, 2011; Rai & Bajwa, 1997).

The declared aim behind the development of TAM3 was neither the specific nor general applicability of predictive factors or confirmation thereof, but the review of the TAM (Davis et al., 1989) and the identification of areas for future research (Venkatesh & Bala, 2008). Developments for the different aspects underlying the original TAM as core constructs that had not been assessed before with regard to possible interactions were also explored (comp. Venkatesh & Davis, 2000; Venkatesh, 2000). The research-generated evidence for the TAM and necessary amendments in terms of psychometric qualities of the measures, the theoretical background of the constructs used, and the addition of new constructs were reviewed. In summary, the TAM3 is a combination of the TAM2 and the findings of Venkatesh (2000) with regard to the underlying constructs of 'perceived ease of use' (Venkatesh & Bala, 2008).

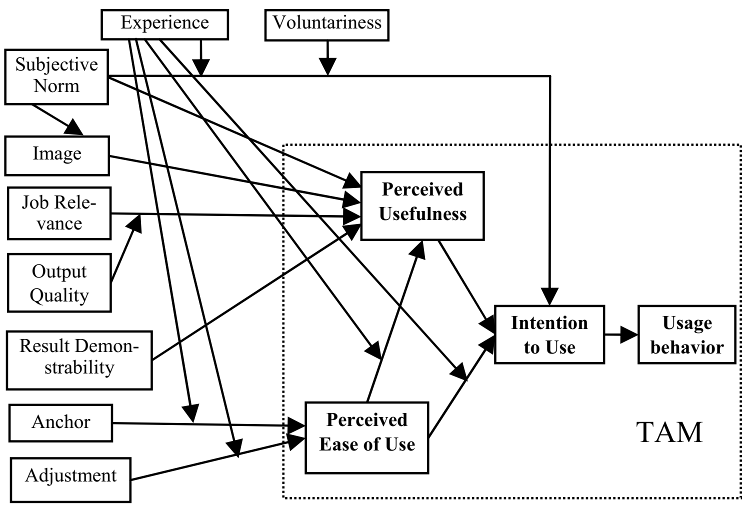

Figure 4: Technology acceptance model 3 (Venkatesh & Bala, 2008) (Tang & Cheng, 2011, p.590)

Four overarching constructs were defined as determinants for the core constructs perceived ease of use and perceived usefulness: ‘individual differences’, ‘system characteristics’, ‘social influence’, and ‘facilitating conditions’ (Venkatesh & Bala, 2008). The TAM3 was effectively the first model to introduce individual differences into the field of technology acceptance. This is however not equivalent to an introduction of ‘personality’ as a factor, as the individual differences that Venkatesh & Bala (2008) refer to in terms of the TAM3 modelling only cover motivational aspects and attitudes toward technology of the users, not their personality profile.

Table 2: Underlying Constructs of TAM core constructs as proposed by Venkatesh and Bala (2008; see pp.277, 279)

Underlying Constructs of Perceived Usefulness	Underlying Constructs of Perceived Ease of Use
Perceived Ease of Use	Computer Self-Efficacy
Subjective Norm	Perception of External Control
Image	Computer Anxiety
Job Relevance	Computer Playfulness
Output Quality	Perceived Enjoyment
Result Demonstrability	Objective Usability

While the impact of the construct ‘experience’ has been widened in the model, as shown in Table 3, no crossover-effects were included in the model, due to lack of theoretical or empirical evidence (Venkatesh & Bala, 2008).

Table 3: Relationships mediated by 'experience', as hypothesized by Venkatesh and Bala (2008).

Effect Origin	Affected Construct
Subjective Norm	Behavioral Intention
Subjective Norm	Perceived Usefulness
Perceived Ease of Use	**Perceived Usefulness**
Perceived Ease of Use	**Behavioral Intention**
Computer Anxiety	**Perceived Ease of Use**
Computer Playfulness	Perceived Ease of Use
Perceived Enjoyment	Perceived Ease of Use
Objective Usability	Perceived Ease of Use

Note: Bold typeface indicates relationships that were newly added in the development of TAM3 (Venkatesh & Bala, 2008).

For all studies compared in the paper by Venkatesh and Bala (2008) significant predictive relationships were found for actual use based on the behavioural intention to use technology (p<.001). While the amount of variance explained for the behavioural intention ranged from 40 to 53%, the amount of variance explained for actual use ranged from 31 to 35% (Venkatesh & Bala, 2008).

A key finding of the TAM3 model is the absence of overlap between the underlying factors of the core constructs 'perceived ease of use' and 'perceived usefulness' (Venkatesh & Bala, 2008). This finding strengthened the argument of Venkatesh (2000) regarding the non-significance of direct effects of underlying constructs on both core constructs of the TAM, as these effects have been found to either diminish in the presence of other, more substantial effects, or to be entirely mediated by other factors (Venkatesh & Bala, 2008).

The inclusion of experience as a key moderating component in the model at least partially closes the theoretical gap between initial technology acceptance and long-term technology use, which is "a key measure of ultimate success of a system" (Venkatesh & Bala, 2008, p.302).

A large part of the development and definition of the TAM3 (Venkatesh & Bala, 2008) was aimed at the identification of interventions and training sequences that would enhance the level of technology acceptance exhibited by the users. These interventions are certainly very useful in organizational settings and for work-related technology, especially with regard to long-term use. However, it cannot be assumed that such interventions would either appeal to the users of lifestyle technology, or whether such training could actually be provide in the form of actual training or tutorials. It seems reasonable to assume that, especially with lifestyle technology, the immediate ease of use and user satisfaction are paramount for any level of sufficient technology acceptance.

10.1.17 UTAUT

The previous technology acceptance models have had a major impact on the research in this area. However, after the TAM was superseded, the UTAUT has been most successful model in many areas of technology acceptance research (Im, Hong, & Kang, 2011; Taiwo & Downe, 2013; Ward, 2013; Williams et al., 2015). The UTAUT is an amalgamation of well-predicting models in the TA research field. Based on a meta-analysis of previous research and different applications of different TA models, Venkatesh et al. (2003) established the most important and most reliable factors for general TA in the workplace.

In their research paper Venkatesh et al. (2003) assessed and tested eight different technology acceptance models that have been used commonly in information technology research and literature. These eight models were compared for differences and similarities in order to compose a new technology acceptance model that should combine the strengths of the individual models while still being a usable research tool. The models included in the research were the TAM (1 and 2), the TRA, the TPB, the C-TAM-TPB (a combination of the TAM and the TPB), the MPCU, the IDT, the MM, and the SCT.

In a longitudinal study surveying a voluntary use setting, no model reached levels of explained variance in intention to use of 40% or higher, with the highest scores reaching 39% (Venkatesh et al., 2003). Comparable findings were reported for the prediction of actual usage behaviour (Venkatesh et al., 2003). This is important to note, as actual use assessments have been the ‘gold-standard’ in TA research, but are rarely implemented due to the complexity of the settings and the additional requirements for such measurements. The drawbacks of the use of behavioural intention instead of objective measures of actual sue will be discussed at a later stage.

In the resulting UTAUT model, three constructs were hypothesized to predict behavioural intention, namely ‘performance expectancy’, ‘effort expectancy’, and ‘social influence’. All three were furthermore hypothesized to be moderated by age and gender, while ‘effort expectancy’ and ‘social influence’ were also hypothesized to be moderated by ‘experience’. ‘Social influence’ was also expected to be moderated by ‘voluntariness of use’ (Venkatesh et al., 2003). The construct ‘facilitating conditions’ was included in the model, linking it directly with the actual behaviour, while links indicated that moderating interactions from the constructs ‘age’ and ‘experience’ were expected to occur (Venkatesh et al., 2003). With as much as 70% of variance explained (Venkatesh et al., 2003) it could be possible that the predictive power of the UTAUT model, within the organisational context, had reached its zenith, regardless of which other factors are added to the model – at least within limits of usability of the resulting model.

While this may be true in the organizational context of IT use, technology acceptance modelling for lifestyle technology and other, non-work related technologies, especially outside of an organizational context, has not reached these levels of accuracy (Lankton & McKnight, 2011; Heerink et al., 2010).

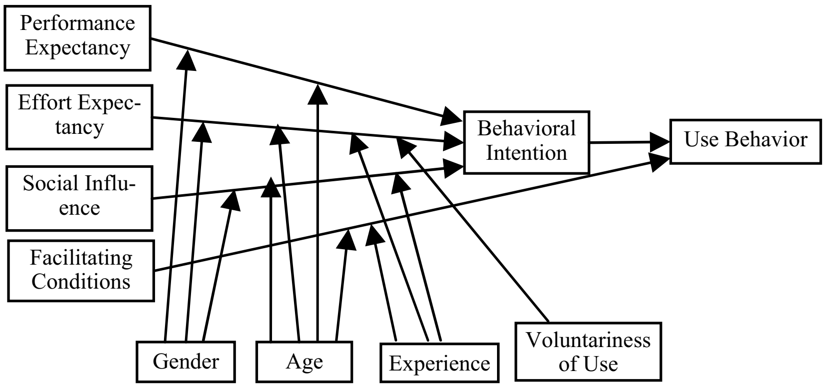

Figure 5: UTAUT model according to Venkatesh et al. (2003) (Tang & Chen, 2011, p.590)

N.B.: Arrows joining lines indicate a mediating impact in the model

In recent years, the newly developed TAM3 as well as the UTAUT have been at the core of the technology acceptance research, with other models branching out towards more specific fields of human-computer and general human-technology-interaction. However, this diversification and specialization in knowledge has not permeated back into the field of technology acceptance to the fullest extent. For example, in the original TAM, overlap between PEOU and other constructs from the models tested by Venkatesh et al. (2003) were found.

Labelled 'performance expectancy' in the UTAUT, overlap was also shown with the constructs extrinsic motivation (MM), job-fit (MPCU), relative advantage (IDT) and outcome expectation (SCT) (Venkatesh et al., 2003). These and other links remain to under-researched and in need of evidence based definition.

The definition given by Davis et al. (1992) for the construct 'extrinsic motivation' is a good example of general utilitarian approaches to this topic of technology acceptance: "The perception that users will want to perform an activity because it is perceived to be instrumental in achieving value outcomes that are distinct from the activity itself […]" (Venkatesh et al., 2003). All these constructs are highlighted in the literature as being conceptually closely related, as pointed out by Venkatesh et al. (2003). However, for all tested models, the equivalent to 'performance expectancy' had the greatest predictive power with regard to the behavioural intention to use technology (Venkatesh et al., 2003).

In their study of novice, intermediate, and expert users of lifestyle technology (high-end smartphones), Oulasvirta, Wahlström, and Anders Ericsson (2011), showed that differences in performance can be attributed mostly to previous experience with the device, but not necessarily to a better or deeper understanding of the underlying concepts or emerging problems. It was furthermore pointed out that for less experienced users, the achievement of a certain goal can hinder the user from forming a more complete understanding of the representations of the system on the display of the device (Loraas & Diaz, 2009).

In their user study regarding mobile technology Koivumäki, Ristola, and Kesti (2008) assessed differences in reactions of first time users of mobile technology, also in terms of personal links with the devices, in terms of ownership compared to demonstration devices. These tests were carried out with mobile phones and PDA devices with applications and services that were taken from the classification of mobile services by Balasubramanian, Petersen and Jarvenpaa (2002). Significant differences were found between the use ratings of personal, i.e. owned, and borrowed devices, in the UTAUT model. For the UTAUT constructs used in this study, several significant differences were found between the results for participants who were considered as being skilled in dealing with mobile devices, compared to participants who did not have that level of expertise, and were therefore considered unskilled.

All items forming the construct Effort Expectancy showed significant differences between the groups, with the skilled population scoring higher than the unskilled population. The same held true for all but one item of the construct Social influence, all items of the construct Attitude, as well as all items forming the construct Intention to Use (Venkatesh et al., 2003). With regard to the construct Performance expectancy, all but two items showed significant differences between the groups, with the skilled participants scoring highest.

For Performance Expectancy all but one item showed significant between group-differences, with the population using borrowed devices scoring higher than the owners of the devices.

10.1.18 UTAUT and different technologies

The UTAUT model has been successfully applied to many different types of technology, including but not limited to office workplace systems, healthcare software, mobile banking (Baptista & Oliveira, 2015; Shaikh & Karjaluoto, 2015; Zhou, Lu, & Wang, 2010), online services and web-pages in educational contexts (van Schaik, 2009), Tablet PCs (Moran, Hawkes, & El Gayar, 2010) and e-learning (van Raaij & Schepers, 2008; Yoo, Han, & Huang, 2012). A broader overview regarding eh different technologies that the UTAUT has been applied to can be found in Williams et al. (2015) and Taiwo and Downe (2013).

Morgan-Thomas and Veloutsou (2013) extended parts of the UTAUT focussing on the impact of brand loyalty and online brand adherence in combination with trust related variables. The trust related variables used by Morgan-Thomas and Veloutsou (2013) were, as in the studies by Gefen (2000); Gefen et al. (2003); Gefen and Straub (2004); Pavlou and Gefen (2004) strongly linked to safety and online security aspects of an interaction, as less focused on inter-human aspects of this construct. A more emotional link was intended to be represented by the online brand items, which were designed to link into the perception and identification with online brands (Morgan-Thomas & Veloutsou, 2013). Wallace and Sheetz (2014) applied technology acceptance modelling to the use of project management software in an academic setting. This research was focussed on actual use rather than the behavioural intention, and acknowledged the importance of measuring actual use of the assessed technology. Unfortunately, the study also resorted to use subjective measures of actual use in form of a single-item self-report, which potentially reduced the validity of the measure and data considerably.

A literature review (Shaikh & Karjaluoto, 2015) revealed that for the technology acceptance sub-category of mobile banking adoption, the UTAUT was only in third place (13% usage) regarding TA models used in recent studies. The most common model was the TAM, followed by the Innovation Diffusion Theory (IDT) by Rogers (1995). Whilst the UTAUT is not the most used model, it was noted that the mayor drawback of the UTAUT is the absence of cultural factors, which are also absent in the TAM and the IDT.

10.1.19 UTAUT in different cultures

Whilst many initial studies carried out with the UTAUT relied on US based, mainly male samples, the model is not considered internationally applicable (Williams et al., 2015). Current research is focussing on the introduction of culturally specific factors as moderators in order to compensate for cultural differences between samples.

Venkatesh et al. (2003) indicated that the cultural background of the users could be a moderator in the UTAUT model, even though it was not included in the model formulation at that stage. This indicated that the model structure was considered stable over cultures, even if the cultural differences would change the loadings of the individual pathways in the model. Following this research direction, Sun and Zhang (2006) added cultural background of the participants as a moderating factor in the model. Further research carried out in this area supported the initial findings by Sun and Zhang (2006) that there is a significant moderation effect in the UTAUT based on culture (Fusilier, Durlabhji, & Cucchi, 2008). For self-reported amount of Internet use across different countries Fusilier et al. (2008) found a significant effect of cultural background, operationalized as country affiliation, between the USA, India, Mauritius and French Reunion Islands. A questions that arises for studies of this kind is whether the same amount of internet access, at a comparable cost, in the different countries can be assumed, as the bandwidth and availability of consistent service can vary dramatically even within different regions of the same country (Fusilier, Durlabhji, Cucchi, & Collins, 2005).

Taking this research further, cultural dimensions as established by Hofstede (1980) were included in modelling process in order to measure actual cultural differences rather than differences merely based on country of residence, which potentially limits the generalizability (Fusilier et al., 2008; Sun & Zhang, 2006). Furthermore, this approach is more likely to streamline the number of interaction variables, as dichotomous differentiations between the countries (Fusilier et al., 2008) would no longer be necessary (Nistor, Lerche, Weinberger, Ceobanu, & Heymann, 2014). Nistor, Göğüş, and Lerche (2013) examined the performance of the UTAUT model witch regard to educational technology use across different European countries.

This comparison included the use of the cultural dimension introduced by Hofstede (1980). This work was then turned into a theoretical model extension in the work by Nistor et al. (2014).

In line with the initial proposition for this research direction made by Venkatesh et al. (2003), the previously mentioned studies found that the model layout was overall the same (or very similar), however featured significant differences in terms of the pathway loadings depending on the cultural background of he participants.

In the cultural research advancing the UTAUT no clear differentiation was made between hedonic and utilitarian use, with many studies focussing on mobile banking and e-commerce settings. Also, the component of trust has been underrepresented in this form of research. This can be regarded as a direction for future research, especially given the differences in the loadings of the regression paths that were found when trust variables were included in the model.

Baptista and Oliveira (2015) examined mobile banking and the impact on cultural aspects on the UTAUT, which introduced a potentially very impactful set of new variables that aim to incorporate cultural differences into technology acceptance modelling. This can be regarded as an advancement of the contextual argument that was presented by Venkatesh et al. (2011). The findings of Baptist and Oliviera (2015) highlighted the importance of cultural drivers and aspects as moderating factors in technology acceptance. As shown earlier by van Schaik (2009), Baptist and Oliviera (2015) used Facilitating conditions as a predictor of actual sue, not affecting self-reported behavioural intention.

10.1.20 UTAUT and Actual Use

A key drawback of many studies using the UTAUT was the absence of dactual use measures (Williams et al., 2015). This also includes the use of subjective self-report measures rather than objective measures of actual use, such as number of system log-ins. It is however not always possible to measure peoples' objective use of technology. Whilst most modern gadgets and mobile devices have tracking options built in that can be accessed, and most websites and surveys allow for the same to be performed, personal data safety might be a constraint.

Al-Qeisi et al. (2014) examined the impact of different additions in terms of aesthetic perceptions of the users on their acceptance of websites for online baking. In this case subjective measures of actual use of the service were used, as objective measures that include user tracking are not feasible. Given the data protection that is necessary for monetary online transactions and other online banking features, tracking is highly unlikely to be either supported by the financial institutions or the participants themselves. This makes the self-reported measures the most practical alternative.

Brown, Venkatesh and Goyal (2014) pointed out the importance of providing adequate information for the users of new systems in order to enhance the chance of building realistic expectations regarding the system's performance and functionality on side of the users. This point, initially highlighted by Sykes, Venkatesh and Gosain (2009), is also of particular importance when focussing on acceptance of lifestyle technology, as the peer-group support and information availability is likely to compete with, if not out-compete, the manufacturers or official providers channels of communications with the customers and users. Similar effects might be expected to occur in academic use of software and technology, with the students potentially heavily relying on peer-support, and potentially acquiring inaccurate information of system usage and performance, resulting in inadequate expectations of system performance.

For mobile banking, as for other areas or TA research, actual use variables have only been used in a minority of studies. According to Shaikh and Karjaluoto (2015), only two recent studies in their review included usage measures. Both studies relied on subjective self-report measures of actual use (Bankole & Cloete, 2011; Medhi, Ratan, & Toyama, 2009).

A meta-analysis conducted by Taiwo and Downe (2013) indicated that the effects sizes within the UTAUT that have been reported in previous studies range from small to medium. Only Performance Expectancy showed a medium effect with regard to the prediction of Behavioural Intention (Taiwo & Downe, 2013).

Whilst the correlation between the reported intention to use a technology was not significantly different from the actual usage behaviour, it is not clear whether the studies that were included all feature objective measures of use or also subjective self-reports of usage.

10.1.21 UTAUT and advanced modelling – Regressions and beyond

Brown, Venkatesh and Goyal (2014) surveyed over 1,100 employees in a workplace setting over multiple time points regarding the phenomenon of expectation confirmation. Comparing six separate models of technology acceptance based expectation confirmation, they also included measures of self-reported intention to use and objectively measured actual use. Using advanced polynomial modelling led to remarkable R^2 values, contrasting to the considerably lower values for a linear approach, which was performed simultaneously for comparison. Furthermore, similar R^2 values were achieved for the modelling of Behavioural Intention to Use the relevant software (linear R^2=.39, second order quadratic R^2=.58, third order cubic R^2=.69) and actual use of the software (linear R^2=.35, second order quadratic R^2=.51, third order cubic R^2=.70). This is of particular interest as this closeness in objective actual use measures and subjective intention to sue measures has been very rare in past research (see Turner et al., 2010).

10.1.22 UTAUT 2

These findings indicate that the assumptions behind the potential abilities of a technology and the actual performance of a device can vary significantly, thereby influencing the opinion of the user with regard to the device. This nevertheless did not manifest in the variable most commonly used to predict or assess technology acceptance: Intention to use. An adaptation of the UTAUT for the technology acceptance of consumers highlighted the differentiation necessary between organizational settings and consumer oriented technology, such as lifestyle technology (Venkatesh et al., 2012). This adaptation was labelled UTAUT2, and had several differences to the original UTAUT.

Firstly, a motivational component that was based on the individual rather than a work context was necessary, leading to the inclusion of the construct 'hedonic motivation'. Secondly, the expenses that are linked to technology use at work do normally not affect the user but rather the organization. Therefore, the 'costs' associated with the investment into technology were included as a factor as well. The final factor that was assed was the aspect of habit, which was hypothesized to be another important predictor in a personal use setting.

This highlights the difference between a voluntary use setting and a non-voluntary setting, in which personal enjoyment of the interaction as well as behavioural patterns in the interaction are less important. The introduction of the UTAUT2 and the realization that workplace technology and lifestyle technology cannot be treated in the same way leads to another type of technology acceptance modelling: hedonic technology acceptance models.

10.2 Chapter 2: Technology Acceptance of Hedonic Technology

The models introduced in Chapter 1 have mostly been developed and used for the prediction of technology acceptance and the interaction between humans and technology in workplace settings or for work-related technology. Nevertheless, there are multiple different forms of technology, which cannot be placed in this sector at all, but may have profound influence on our daily life. These technologies are either assistive technologies, such as robots and electronic agents or sorts of lifestyle technology, which are meant to facilitate human-to-human interaction and provide benefits for an individuals lifestyle. Examples for lifestyle-technology are general consumer electronics including smartphones and entertainment devices, as well as related services, such as YouTube etc.

Differences in the way that users perceive and interact with these two types of systems (i.e. assistive and lifestyle technology) have been supported by research by Atkinson and Kydd (1997), Baptista and Oliveira (2015), Bruner II and Kumar (2005), Kim and Sundar (2014), Lallmahomed, Ab.Rahim, Ibrahim, and Rahman (2013), and van der Heijden (2004). Differences were found in the way that the behavioural intention to use a technology was affected by the constructs perceived usefulness, perceived ease of use and perceived enjoyment. These effects differed from the influences that would be expected from utilitarian systems (Sun & Zhang, 2006).

Hong, Thong and Tam (2006) highlighted that the use of the robust measures of technology acceptance, as based on utilitarian aspects such as the TAM, TRA and others, should not be used in situations that involve technology that is of a more hedonic nature, as they are less likely to capture the necessary information to successfully predict levels of technology acceptance

In the following, technology acceptance models will be introduced that have been developed for the purpose of assessing levels of technology acceptance in non-work related settings. Firstly, the key step toward technology acceptance modelling of lifestyle technology will be introduced: the Model of Acceptance of Technology in Households (MATH) by Brown and Venkatesh (2005).

Following this, and the introduction of extensions and refinements of this model, modelling for assistive technologies such as the ALMERE model (Heerink et al., 2010) will be introduced, to allow a comparison between modelling from different perspectives.

10.2.1 The MATH model

Venkatesh and Brown (2005) developed the Model of Technology Adoption in Households (MATH). The aim was to create a model of technology acceptance that is more accurate for the adoption of technology in the household. The notion of a clear difference between the use of technology in a household environment and in the workplace, which was brought forward by Venkatesh in 1996, was supported in subsequent studies by Venkatesh & Brown (2005), Chuan-Fong Shih and Venkatesh (2004), and Brown and Venkatesh (2005).

Brown and Venkatesh (2005) stated that the key differences lie within interaction complexity. This refers to dissimilarities between the tasks carried out at work and at home, especially taking into account the complexity of negotiations amongst family members and the overall structure of the household.

The MATH model was initially developed for the assessment of the adoption behaviour with regard to the PC in households. While Brown, Venkatesh and Bala (2006) state that this model is intended to be generalizable to cover different technologies, this statement was made before the development of pure lifestyle technologies. The base of the MATH model is the Theory of Planned Behaviour (Ajzen, 1991), which already has the same roots as the TAM (Davis, 1989). Contrasting to the common exclusion of attitudinal variables, as can be found in studies using the UTAUT model (Venkatesh et al., 2003), the MATH model explicitly includes these variables. Brown and Venkatesh (2005) tested the qualitative outline of the original MATH model for quantitative use. This is an important step to providing a valid and reliable quantitative tool.

This revised MATH model included household life cycle (Gilly & Enis, 1982) as well as income, and explained 74% of variance of behavioural intention to adopt technology in the home setting (Brown & Venkatesh, 2005). The inclusion of the household life cycle model proposed by Gilly and Enis (1982) was meant to give insight into the impact of the household structure and development over time on the adoption of technology. The household lifecycle model by Gilly and Enis (1982) separates the living arrangements within a household into 11 categories based on the age, marital status and number of children in a household. However, it doesn't take into account any product life cycle elements (Day, 1981). This model was chosen as previous research had shown significant differences in purchasing and consumption behaviour between households in different categories (Schaninger & Danko, 1993; Wilkes, 1995).

Another major improvement from the TAM and UTAUT was the introduction of separate outcome expectancies based on different aspects of the attitudinal factors. Venkatesh and Brown (2001) split the attitudinal outcome expectancies into 'utilitarian outcomes', hedonic outcomes' and 'social outcomes'. While the utilitarian aspect is closely related to the assessment of performance increase, the hedonic aspect covers what could be seen as perceived enjoyment. The hedonic aspect was phrased in a PC specific way, which is, according to Venkatesh and Brown (2001) not generalizable to other technologies (see Webster & Martoccio, 1992).

The aspect 'social outcomes' can be seen as a completely new approach, as this aspect introduces the impact of technology use on the social status of a person and the interaction with the users' reference group. It was defined as being "the increase in prestige that coincides with a purchase of the PC for home use" (Brown, Venkatesh & Bala, 2006, p.207). With regard to the subjective norms and reference groups that might influence a person's decision process with regard to the acceptance of such a technology for home use, was also split into different categories, in order to maximize the coverage of possible sources of influence.

The differentiation was made between the user's own social network as a reference group, media input and outside sources of information, as well as workplace reference points such as colleagues (Brown, Venkatesh & Bala, 2006). Technological advances, as well as cost of a technology and the development of these costs were also included in the MATH model (Venkatesh & Brown, 2001). Brown, Venkatesh and Bala (2006) did not find any significant contribution of the cost, the development of costs or technological advancement with regard to technology acceptance. This held true for all different categories of households proposed in the model of Gilly and Enis (1982).

An interesting finding of Brown, Venkatesh and Bala (2006) is that the users of technology rely more heavily on attitudinal factors when making their use decisions, than do people who are about to adopt the technology. The latter rely on all factors proposed in the model, namely attitudinal, control and normative beliefs (Brown, Venkatesh & Bala, 2006).

10.2.2 ALMERE

Heerink, Kröse, Evers and Wielinga (2010) carried out a study to assess technology acceptance amongst elderly community dwelling adults with regard to assistive devices in the form of social agents. As the research was carried out in the community of Almere in the Netherlands, the model was named ALMERE as a tribute to the participants. These assistive social agents were advanced electronic agents and robots, which were meant to be conversational partners for the participants and which should assist in completing various tasks. Projected shortages of supply in terms of workforce to supply care for elderly members of society (Turkle, 2012) made this technology particularly interesting for research. It was seen to potentially enhance the ability of elder people to interact with others and thereby maximize the efficiency of personal care that might be given (Heerink et al., 2010).

The assistive devices that were tested in this study formed an overlap between what is known to be a service robot and a companion robot. The focus was clearly set on social interaction rather than actual physical support. The core of the ALMERE model is formed of the UTAUT model, on which the ALMERE study was based (Heerink et al., 2010).

Previous studies employing the UTAUT model to predict acceptance of a social companion robot have shown that robots set up to be more expressive in their behaviour, or extraverted, were seen by the users as having higher levels of social intelligence than their more introverted counterparts (deRuyter, Wetzels, & Kleijnen, 2001; Heerink et al., 2010). This led to higher scores for technology acceptance or behavioural intention to accept these devices (Heerink et al., 2010).

In line with previous studies, the following constructs were added to the UTAUT in order to adapt it fully to the desired measurement conditions: Perceived Enjoyment, Social Presence, Perceived Sociability, Trust, and Perceived Adaptivity (Heerink et al., 2010). Perceived Enjoyment was added to the model, as even assistive devices that are at core designed to provide help and fulfil a utilitarian function, will still include a notion of enjoyable interaction, especially in the area of social agents (Heerink et al., 2010). For a detailed explanation of this construct please see previous chapter.

The construct 'Social Presence' describes the notion of actually interacting with a social 'being' and not simply an object or a simulation. This construct is extended by the construct 'Perceived Sociability', which describes the degree to which such an online agent or social agent is perceived to have positive social qualities that make it interesting or pleasant to interact with.

A construct that for a long time was based only on inter-human interaction (Lankton & McKnight, 2011) was also added in the form of the construct 'Trust'. Instead of using existing assessment tools for this construct, two new items were developed for this study; both of which focussed on the trustworthiness of the robot in terms of likely adherence of the user to advice given by the robot.

'Perceived Adaptivity' refers to the degree to which the technology, or in this case social agent, is able to adjust to the changing needs of the users. This construct was included, as previous research had indicated that especially in the technology domains catering for older users adaptation to changing user circumstances and ability levels are paramount for high levels of technology acceptance (Heerink et al., 2010).

10.2.3 Technology Trust

Concepts relating to trust have been regarded as generally problematic as hard to define and categorize in previous research (Corbitt et al., 2003; Escobar-Rodríguez & Carvajal-Trujillo, 2014).

Li et al. (2012) defined trust as having, amongst other qualities, a bi-directional component. One of the defining factors that cause difficulty and confusion regarding the use of trust in a technological context might therefore be the fact that the bi-directional component is partially broken in the application of inter-human trust attributes to technology. As the technology can mostly only exhibit a static response to a given interaction sequence, the bi-directionality that would link to a dynamic aspect (Li et al., 2012), would not exist as such. This might explain confusion on part of the participants when rating technology based on inter-human trust constructs, which was experienced in this research.

The use of trust related variables in e-commerce settings showed major implications for the modelling structure in several studies ((Escobar-Rodríguez & Carvajal-Trujillo, 2014; Li et al., 2012). Given that at this point monetary transactions have to be considered, as well as the security of the site in terms of personal data, this is a logical next step. However, given that there are no monetary interactions involved in the general interaction with lifestyle technology (excluding the new in-app purchasing structure employed by many providers), the trust attributes in lifestyle technology do not have this utilitarian and security related underlying aspect. Correlations found with privacy and security related variables in previous studies have indicated potential overlap in utilitarian settings (Escobar-Rodríguez & Carvajal-Trujillo, 2014; Fu Tsang, Lai, & Law, 2010).

The trust aspect of technology use in the case the abandonment of assistive technology was outlined by Hocking (1999). This was related to inefficiency, general untrustworthiness, appearance and difficulty of use; factors, which can be assessed in general terms via trust variables as introduced by Lankton and McKnight (2011). Hocking (1999) stated that the enjoyment of the user in interacting with a given technology rises with surprise. This is likely to be limited to cases in which surprise is followed by a positive emotion, as surprise itself has previously been defined as a transitory emotional response relying on other emotions to follow as qualifiers of the surprising event (Ekman, 2004). It therefore carries lower positive or negative emotional loadings than other emotions. The user's trust in the technology had already been included in the ALMERE model, although it only featured with a single item in the assessment tool. Similarly, trust was included as a very narrowly defined construct in an extended version of the UTAUT by Escobar-Rodríguez and Carvajal-Trujillo (2014) and Venkatesh et al. (2011).

A number of recent studies have followed on from this to include related variables in utilitarian setting that relied on safe interactions and the addressing of safety related concerns, such as mobile banking (Casey & Wilson-Evered, 2012; Corbitt et al., 2003; Corritore, Kracher, & Wiedenbeck, 2003; Eastlick, Lotz, & Warrington, 2006; Enid, 2010; Escobar-Rodríguez & Carvajal-Trujillo, 2014; Fogel & Nehmad, 2009; Kim, Ferrin, & Rao, 2008; Komiak, Weiquan, & Benbasat, 2005; Li et al., 2012; Morgan-Thomas & Veloutsou, 2013; Oum & Han, 2011; Wu et al., 2014).

In the field of human-robot interaction, the issue of trust was approached in more detail than in the original field of TA. Breaking away from a solely logical and function or task oriented interaction with a system, the interaction with robots and social agents has introduced the matter of trust. Especially when interacting with a system designed to mimic humanoid reactions, both, in terms of emotional states expressed through visual cues and behaviour as well as communication patterns, users seem to project human qualities and apply assessment methods normally used for human interactions to great extent.

The use of trust related variables was also used in the field of online services for dispute regulation (Casey & Wilson-Evered, 2012). Trust components used in such utilitarian settings followed less inter-human trust related constructs, as were featured in the model by Lankton and McKnight (2011), and more practical trust concepts (see Li et al., 2012).

In the study by Casey and Wilson-Evered (2012) trust variables relating to the user trust in the technology did not have a direct effect on behavioural intention to use the system, but had an indirect effect via Effort Expectancy, commonly referred to Perceived Ease of Use. Trust variables related to the organisation itself were not shown to have a significant effect on behavioural intention, similar to social variables included in the model (Casey & Wilson-Evered, 2012).

Trust, as a general construct, can be separated into two different types of trust (Lankton & McKnight, 2011): trust that relies on comparable attributes of a fellow human being, i.e. trust between humans, and trust in machines or technology. The former type is likely to be the most common perception of the construct, and will be referred to as 'interpersonal trust' (Lankton & McKnight, 2011). Three sub-categories of this type have been identified.

'Integrity' describes the degree to which a human being can be expected to act in a way that is in line with commitments made through statements or other indications of intent. Wang and Benbasat (2005) defined it as the adherence to a given or agreed upon set of principles. This can be seen as a more general extension to the definition by Mayer et al. (1995), which featured the qualifier "…a set of principles that the trustor finds acceptable…" (p.719).

'Competence' describes in how far a person is considered able to perform a certain action or display a certain behaviour taking into account abilities as well as limitations. While, for automation purposes, this aspect of trust has been defined as merely the extent of "performing functions properly" (Muir & Moray, 1996, p.434), later definitions have included terms such as 'competencies', 'skills' or 'abilities' (Komiak, Wang & Benbasat, 2005; Mayer et al., 1995).

Finally, ‘benevolence’ covers the aspect as to how far a person can be expected to act in one’s best interest and with good intentions. This can be seen, as highlighted by Mayer et al. (1995) as intentions that differ from motives of an egocentric nature.

On the other side of the trust spectrum, are trust beliefs that have been established as ways to mirror interpersonal trust on technology – ‘technology trust’ beliefs. Matching the three aspects introduced above for interpersonal trust, technology trust consists of the following three sub-constructs: ‘reliability’ to match ‘integrity’, ‘functionality’ to match ‘competence’, and ‘helpfulness’ to match ‘benevolence’. While the phrasings ‘helpfulness’ or ‘functionality’ are deliberate changes of the accepted terminology for the related interpersonal trust aspects to indicate a similar result without the personal aspect of intention, this is different for the aspect of ‘integrity’. The concept of ‘integrity’ has been seen as closely related if not comparable to the already existing concept behind ‘reliability’, in the sense that the definitions of reliability have been centred around predictability and consistency of behaviour, without basing this on the adherence to sets of principles (Muir & Moray, 1996; Lippert & Davis, 2006; comp. Rempel, Holmes & Zanna, 1985).

Lankton and McKnight (2011), who introduced the concepts outlined above in their most recent format, studied the influence of trust with regard to the use of online social networks such as Facebook. This is a very interesting research area, as technology in this case bridges human-to-human interaction as an online agent with the ability to filter or highlight behaviour of the user to other users and, furthermore, act independently of the user through apps and automatic posting. In their study, Lankton and McKnight (2011) showed that these trust factors explained between 24.4% and 25.2% of variance in terms of ‘intention to use’, which is a respectable result, compared to results of studies using the TAM or UTAUT model (Davis et al., 1989; Venkatesh et al., 2003).

A factor closely related to the assessment of trust, as introduced before, is the perception of social presence (Heerink et al., 2010). This factor in essence describes the degree to which a person feels or perceives that a device or technology is present in a situation as a partner for interaction. Social presence should nevertheless not be confused with a type of affordance. While social presence does require the technology to be available for interaction, affordances do not require the option of interaction to be known to the user in any given situation. Affordances therefore merely describe the pure existence of an interaction potential between the user and the technology, not the differentiation between the existence and the awareness of this existence from the user's perspective (Norman, 2004).

Furthermore, a mere awareness of existence does not necessarily trigger the perception of any technology as having social presence, as the social aspect of 'presence', i.e. meaningful and non-task-driven interaction in the form of a dialogue.

10.2.4Emotional Aspects of Technology Use and Technology Abandonment

Correia de Barros, Duarte and Cruz (2009) researched the aspect of fear in the acceptance and use of technology. Fear as a motivational factor can be seen as being included in several technology acceptance models in an intrinsic and an extrinsic form, as will be explained in the following. With regard to the extrinsic component, fear can be seen as a form of computer anxiety or technology interaction anxiety, as has already been included in previous models of technology acceptance (Davis et al., 1989; Venkatesh et al., 2003). This could be labelled as an extrinsic form of fear as it either blocks the interaction either before the initial use or at a later stage due to fear of negative consequences of the interaction. A potential link to continuation models, which are mostly based on perceived satisfaction with an interaction could be hypothesized (Bhattacherjee, 2001; Ku, Chen, & Zhang, 2013; Shih-Chun, Stu, & Yuting, 2010; Thong, Hong, & Tam, 2006).

The intrinsic motivational part of fear could be seen as a motivator in terms of looking for reassurance and problem solving through the use of the target technology. A moderation effect of fear on either satisfaction or intention to use could therefore be hypothesized.

Correia de Barros, Durate, and Cruz (2011) built a framework of emotional aspects influencing technology use on the work by Ortony, Clore, and Collins (1988). This split the emotional reactions into a 3x3 matrix of 'aspects', the reference variable for 'appraisal' and the 'general reference point' (comp. Johnson & Tversky, 1983); an attempt to formalize the experience of emotions and make it accessible to forms of computation and calculation. Taking into account the possible limitations in interactions with technology before the 'usage' decision has to be made, Correia de Barros, Duarte and Cruz (2011) have developed an extensive emotional response framework based on the concepts by Norman (2004) and the framework by Ortony et al. (1988).

Beaudry and Pinsonneault (2010) provided a comprehensive meta-analysis regarding studies focusing on emotions in the use of and interaction with information technology. Venkatesh et al. (2003) were listed as the most common example, referring to sub-studies of affect and anxiety in technology use. While 'affect' did not show significant relationships with intention to use, 'technology related anxiety' was negatively related to this predictor of TA.

Findings regarding negative relationships between anxiety and intention to use were also made by findings of Brown, Massey, Montoya and Burkman (2002), and even earlier by Compeau and Higgins (1995) and Todman and Monaghan (1994). Similar findings were reported regarding the negative relationship between anxiety and perceived ease of use and regarding anxiety and the negative relationship with playfulness (Venkatesh & Davis, 2000; Webster & Martocchio, 1992; Williams et al., 2015). Contrasting to these findings, Compeau, Higgins, and Huff (1999) reported that no negative relationship between anxiety and system use was found. It has to be noted that all previously introduced studies considered use of a technology or system that was actually in use at the time, not a prototypical system that would be available at a point in the near future and could therefore only be anticipated.

The emotions reportedly linked with acquiring knowledge of information technology ranged reportedly from happiness to frustration, sadness and anger, while the emotional displays of happiness were the most common (Kay & Loverock, 2008; also see Oulasvirta, Wahlström & Anders Ericsson, 2011).

Nevertheless, similarities between pre-adoption and post adoption studies were found with regard to the emotional aspect of enjoyment. Chin and Gopal (1995) reported that the construct of enjoyment with regard to technology in a pre-adoption setting was able to account for 15% of the variance of intention to use or adopt the technology. Positive relationships between enjoyment and intention to use have been reported for several post-adoption studies (Davis et al., 1992; Koufaris, 2002; Venkatesh, 1999). A positive effect was furthermore reported by Venkatesh (2000) with regard to the construct perceived ease of use.

In their study with regard to technology abandonment of assistive devices, Verza, Lopes Carvalho, Battaglia, and Messmer Uccelli (2006) highlighted that less than expected levels of performance of the device, disregard of the end-users opinions as well as variability in the needs of a user over time can cause abandonment of technology. It was furthermore stated that a rate of one in three devices being abandoned is a common phenomenon for assistive devices (Verza et al., 2006). This impacts largely on the expenditures made with regard to the development and purchase of such devices (Verza et al., 2006). An intervention in terms of an adjusted protocol for the initial need assessment as well as the final selection of the device showed a significant reduction of technology abandonment.

10.2.5 Technostress

The technostress movement took a similar approach to technology abandonment as a negative alternative to technology acceptance. This area of research focuses on the stress that is induced in end-users through the use of and interaction with technology. Whilst problems with technology in the workplace have been outlined before in terms of the assessment methods that led to the development of the TAM (Davis et al., 1989), technostress is aimed not at the absence of 'perceived ease of use' or 'perceived usefulness', but stress that is caused by a user interacting with a system (Ragu-Nathan, Tarafdar, Ragu-Nathan, & Qiang, 2008). Technostress was introduced by Brod (1984) and has so far been more or less superseded by Technology Acceptance Modelling and, in parts, by technology abandonment. It is however still used in the context of continuous information retrieval such as library searches and the management thereof. As a general concept it is comparable the ideas of occupational stress (Beehr & Newman, 1998) and could be considered the inverse of computer self-efficacy (Compeau & Higgins, 1995). The latter and computer anxiety (see also Parayitam, Desai, Desai, & Eason, 2010; Powell, 2013) will be addressed in the studies to follow, as they will be incorporated in the development work of the LTAM.

10.2.6 Technophobia

Similarly to technostress, another field of research exists, which is mainly concerned with adverse effects of interaction and factors that prevent people form interacting with technology in the first instance. The core area of research there is looking into an effect called 'technophobia'. Technophobia describes an "aversive behavioral, affective, and attitudinal responses to technology" (Brosnan, 1999, p.105), and has been shown to correlate with constructs such as computer anxiety and general attitudes of users toward computers (Brosnan, 1999). Technophobia could potentially be seen as the counterpart to technology addiction or pathological use of technology, as has been researched by Hinvest and Brosnan (2012) with a link to educational contexts. Thorpe and Brosnan (2007) have shown that computer anxiety can reach levels of intensity for some people that are comparable to social anxiety as classified in the DSM-IV.

This term has been linked with technology acceptance relatively early by researchers such as Moldafsky and Kwon (1994) and Brosnan (1999), shortly after the initial publications regarding the TAM (Davis et al., 1989) and related ways of measuring technology acceptance. Interestingly, studies have reported that a non-voluntary setting can reduce experienced levels of computer anxiety, which is a factor that should be taken into consideration when distinguishing between utilitarian and hedonic technology (see Arch & Cummins, 1989).

In terms of related factors that have been shown to interact with technophobia in terms of predictive ability for TA, gender has been noted in multiple studies (Anthony, Clarke, & Anderson, 2000; Brosnan, 1999). Other factors that have been linked with technophobia are personality factors; especially neuroticism (Anthony et al., 2000). The inclusion of personality measures alongside TA measures could be seen as a valuable addition for establishing new relationships and applications for these models. More recently, research into factors within and around technophobia, has led to the inclusion of negative affective descriptors such as computer anxiety in TA models; namely the UTAUT (Venkatesh et al., 2003). The adverse effects and the related indicators in terms of 'computer anxiety' and personality factors are regarded as being of high importance, and will therefore be included in this research.

10.2.7 Fixed Effect Fallacy (Monk, 2004)

In his 2004 paper, Monk outlined a Fixed Effect Fallacy, based on product ratings. This concept originated from language and semantics research, and highlights the problem, that the arbitrary choice of items to be rated can influence the results, if not controlled for in the analysis (Monk, 2004). This problem was taken into account in this research via multiple routes. Firstly, the technology acceptance model iterations that were used were tested on multiple different types of technology. This allowed investigation of inconsistencies of ratings between different technologies. Secondly, the self-reported Intention to Use the technology by the participants was analysed regarding group differences based on the make of product that the participants were using.

Ideally, this would be tested using stratified samples and a preselected set of technology, which would be rated by all participants for an overall comparison. This was unfortunately not possible within the remit of this research.

10.2.8 Development of a Lifestyle Technology Acceptance Model (LTAM)

The previous sub-chapters highlighted the evolution of technology acceptance modelling. While pure technology acceptance modelling for the workspace seemed to have reached a momentary peak with the UTAUT and the TAM 3, different aspects such as technology trust (Lankton & McKnight, 2011) and social presence, as introduced in the ALMERE model (Heerink et al., 2010) emerged. Comparing the abovementioned hedonic technology acceptance models, it becomes clear, that previously established lists of technology acceptance factors (Caine et al., 2006) are by no means exhaustive.

The differences in predictive power between the work-technology and lifestyle-technology based models show the necessity to combine the different fields of research into a different modelling approach for the segment of lifestyle technology (see Table 4). It can be seen in the comparison that particularly hybrid applications of TA models perform less well than purely utilitarian models. Taking into account the positive and life enriching as well as the negative aspects of technology use, such as technophobia and technostress, the LTAM development will include measures of 'computer anxiety' and personality factors based on the Five Factor Model (McCrae & Costa, 1982).

Whilst the UTAUT 2 has extended the UTAUT for non-workplace related technology in parts, any comparisons will be made to the original UTAUT. This will be done for two reasons. On the one hand, the UTAUT 2 extensions will (apart from 'habit') be included in the LTAM model. On the other hand, the core research aim is to build a model that performs better than a purely workplace related model. Furthermore, the UTAUT can be seen as the gold standard, as no other models seems to have been more widely used (compare Marangunić & Granić, 2015; Williams et al., 2015).

Table 4: Differences in variance accounted for by model and class of technology

Model	Study	R^2	Adj. R^2	Class
UTAUT	Venkatesh et al., 2011 (SmartID)	.64	N/A	Utilitarian
	Venkatesh et al., 2011 (eGov)	.63	N/A	Utilitarian
	Lankton & McKnight (2011)	.382 to .450 (Trusting Intention)	N/A	Hybrid
	Lankton & McKnight (2011)	.244 to .252 (Continuation Intention)	N/A	Hybrid
	El-Gayar & Moran (2006)	.55 (ITU)	N/A	Utilitarian
	El-Gayar & Moran (2006)	.11 (Use)	N/A	Utilitarian
TAM	Kim & Sundar (2014)	.24 to .47 (partial loadings)	N/A	Hybrid
	Hong, Thong, Tam (2006)	.63 (Continuation Intention)	N/A	Hybrid
TAM 2	Venkatesh & Davis (2000) (Mandatory)	(t1) .44 / .52 (t2) .47 / .42 (t3) .39 / .39	N/A	Utilitarian
	Venkatesh & Davis (2000) (Voluntary)	(t1) .39 / .37 (t2) .44 / .34 (t3) .42 / .42	N/A	Utilitarian
TAM 3	Venkatesh & Bala (2008)	.43 to .45	N/A	Utilitarian
ALMERE	Heerink et al., 2010 (iCat)	.70	N/A	Hedonic
	Heerink et al., 2010 (RoboCare)	.68	N/A	Hedonic

The LTAM will furthermore include cognitive aspects in terms of cognitive ability measures. These direct measures of executive functioning will be used to approximate the level of brain function in the participants; a better measure of mental capacity than intelligence (Czaja et al., 2006). Such direct executive functioning measures have not been researched in technology acceptance before. Especially the field of lifestyle technology acceptance has not been researched with the use of cognitive ability measures.

Core additions that will be tested in this research are detailed trust variables. Whilst these variables have been used in relation to online social networks (Lankton & McKnight, 2011), the use of trust variables, even in less detailed form, is still new to the field of lifestyle technology acceptance. Gadgets such as TabletPCs or E-Readers have so far not been researched with the use of detailed sets of trust related variables.

In terms of usage behaviour, this research will also, where feasible, circumvent one of the major drawbacks of UTAUT related research, indirect measures of actual use (Williams et al., 2015). Usage tracking via online systems will be used where possible in order to test the newly developed model not only in terms of self reported behavioural intention to use or self reported use, but objective measures of actual use.

The first step of this will be described in the next chapter, which outlines the methodology for this research. This will be followed by a comparative study, utilizing the same constructs and measures to predict levels of technology acceptance of E-Readers and Tablet PCs.

10.3 Chapter 3: Methodology

10.3.1 Outline

This chapter is focused on the methodologies used in the five individual studies of this research. It covers the rationale for using the different technologies, the combinations of variables used, distribution channels, and analysis procedures. Using different technologies in the studies broadened the range of technologies for which the LTAM was validated at the end of this research.

10.3.2 Materials:

10.3.2.1 Survey

The studies were designed to be mainly survey studies, relying on the use of online questionnaires. A key model that was included in the initial drafting was one of the versions of the very widely used TAM (Technology Acceptance Model) as introduced by Davis et al. (1989). One of the more recent iterations of this model is the UTAUT (Venkatesh et al., 2003). It has been extensively tested against other models and has been used a measure for comparison of newly developed scales in related areas of research as well (Heerink et al., 2010; Lankton & McKnight, 2011; Yang & Yoo, 2004). Despite newer versions of the UTAUT existing (Venkatesh et al., 2012), the initial UTAUT remains the gold standard of TA research to date.

Key elements of this survey have been compiled from the survey developed by Venkatesh et al. (2003) in the UTAUT framework. Many questionnaires that are currently used in the field of TA include the key elements that can be found in the UTAUT such as the constructs 'Perceived Ease of Use', 'Intention to Use' and 'Perceived Usefulness'. These constructs have been in the TA literature since the early beginnings (Davis, 1989) of the TA field emerging and can be found in similar form in previous work from other disciplines (Hauser & Simmie, 1981).

Table 5: Predictor variables used in different models / studies

UTAUT	E-Reader	Tablet PC	Facebook	Computer
Computer Self-Efficacy	Computer Self-Efficacy	Computer Self-Efficacy		Computer Self-Efficacy
Computer Anxiety	Computer Anxiety	Computer Anxiety	Computer Anxiety	Computer Anxiety
Facilitating Conditions	Facilitating Conditions	Facilitating Conditions		Facilitating Conditions
Subjective Norms	Subjective Norms	Subjective Norms		Subjective Norms
Attitudes toward technology	Perceived Enjoyment	Perceived Enjoyment		Perceived Enjoyment
Perceived Ease of Use (PEOU)	PEOU 1/ 2	PEOU 1 / 2		PEOU 1 / 2
Perceived Usefulness	Perceived Usefulness	Perceived Usefulness	Perceived Usefulness	Perceived Usefulness
	Image	Image		Image
	Reputation	Reputation		Reputation
	Functionality	Functionality	Functionality	Functionality
	Competence	Competence	Competence	Competence
	Reliability	Reliability	Reliability	Reliability
	Integrity	Integrity	Integrity	Integrity
	Helpfulness	Helpfulness	Helpfulness	Helpfulness
	Benevolence	Benevolence	Benevolence	Benevolence
				Personality Dimensions

The UTAUT model initially covered the aspect ‘Attitudes toward Technology’, but these did not hold up in the analysis of Venkatesh et al. (2003). The additional variance explained by the items in this construct was reportedly already accounted for by the PEOU and PU constructs. Differences in the scale structures introduced in the UTAUT model and used by Yang and Yoo (2004) led to the inclusion of both measures, the initial UTAUT construct and the Yang and Yoo constructs, for broader testing.

While the UTAUT model generally operationalizes items in the form of 5- or 7-point Likert scales, Yang and Yoo (2004) used semantic differentials, allowing participants to choose from options on a distinct dimension. A similar technique using semantic differentials similar to Kelly’s constructs (Kelly, 1955; Fransella & Dalton, 2000; Fransella, 2003) had been used successfully in a previous research project.

Based on a paper by Czaja et al. (2006), questions with regard to the use of both, computers in general and the Internet, were added. The participants were prompted to indicate their most common uses for the Internet (frequency based Likert scale). The exact phrasing of such items as used in the aforementioned paper could not be established, which will have to be taken into consideration in the comparison of the results of this study with the findings presented in the original paper.

Additional questions added by the researcher include questions regarding the brand commitment of the participants in terms of purchasing an E-Reader or TabletPC.

10.3.2.2 Trust variables

The ALMERE model (Heerink et al., 2010) introduced the constructs of 'Trust', 'Perceived Sociability' and 'Perceived Adaptiveness' to the modelling of TA. In the ALMERE studies, participants were asked to interact for a given amount of time with either social on-screen agents or emotionally expressive robots, which were programmed to react to the participant in a very human-like fashion.

The aspect of trust was introduced, as the agents and robots were engaging with the participants in a situation to give advice about decision-making. Nevertheless, the operationalization of this factor was regarded as questionable. This was due to the small number of items used (2 items) and the lack of reference to existing trust measures in either the interpersonal trust or human-technology-trust field. For these reasons the trust measures included in ALMERE were replaced by trust measures introduced by Lankton and McKnight (2011) in on-line research into trust and social networking platforms.

In the research at hand a complete battery of items was used to identify the prevalent trust structures in human-technology interaction. The findings indicated that, especially with non-work-related technology, interpersonal and function-based aspects of trust overlapped and formed a model with better explanatory properties.

10.3.2.3 Piloting

The survey went through an extensive review process. A pilot sample study was conducted to ensure usability and functionality. This pilot study included a sample of five academics and students who completed the questionnaire and gave feedback on the experience. The data gathered in the pilot study was excluded from the later analyses.

10.3.3Use in different studies

10.3.3.1 Studies 1 and 2

For Studies 1 and 2, all variables were included in the questionnaire. Study 1 was designed as an exploratory study. The second study was set up to mirror Study 1 to confirm previous findings. All variables and constructs of the LTAM were included in this study. No measures of cognitive ability were used.

10.3.3.2 Study 3

A revised version as established after analysis of data gathered in Studies 1 and 2 was used for Study 3. Changes were made to the questionnaire in terms of the technology aimed at. The LTAM was set up for this study to assess the levels of technology acceptance of the participants with regard to the use of computers in general. Nevertheless, the focus of the general 'computer use' was linked with lifestyle of leisure use of the technology. It clearly excluded the use of computers for work related activities.

10.3.3.3 Study 4

In Study 4, a shortened version of the survey was used. The focus of this study was on the confirmation of the trust variables in the setting of online social networks, as proposed by Lankton and McKnight (2011). Furthermore, the collaboration with other researchers, as outlined in more detail at a different point, made it essential to keep the survey as short as possible. Inclusion of all variables would have been prohibitive in terms of the participant workload. Details of the variables used in the Facebook study can be found in Table 5.

10.3.3.4 Study 5

A revised version was used for Study 5. This version was established after analysis of data gathered in the studies regarding E-Readers, Tablet-PCs, Facebook and Computers. Changes were made to the questionnaire in terms of the technology aimed at. The LTAM was set up for this study to assess the levels of technology acceptance of the participants with regard to the use of the university's online learning environment Blackboard (BlackBoard, 2013).

10.3.3.5 Distribution (PRON /SPN / RPS)

The survey was compiled as one version per study and was then duplicated on the Qualtrics survey platform to allow for multiple different links to exist. The surveys were advertised through multiple different channels, differing between the platforms. Psychological Research on the Net (PRON; Krantz, 2014) and Social Psychology Network (SPN; Plous, 2014) both use social networks such as Facebook and Twitter for the distribution of their links.

University student samples from the University of Westminster and the University of West London were recruited through internal advertisement on notice boards, intranet pages, and word-of-mouth. The participants were given the opportunity to either directly click on the link (online distribution as performed by PRON, SPN and on the intranet pages of the Universities) or take a slip of paper with the link address and short information regarding the study (notice boards).

The UK participants were mainly recruited through a research participation scheme at the University of Westminster, offering the students 30 minutes of completion credit for participating in this research project. This scheme requires students to collect at least three (3) hours of credit within a year. The US sample was recruited through PRON and SPN, allowing researchers to upload studies to be completed by students. While the researcher did not offer any credit to the US students, the researcher is aware that some Universities might encourage or require students to participate in these studies to complete certain courses or modules.

10.3.4 Cognitive ability measures

In Chapters 4 and 5 the use of cognitive ability variables in terms of technology acceptance will be discussed. To measure these cognitive ability variables the CANTAB system was used. This system was developed by Cambridge Cognition, and is based on a TabletPC. It was designed for use with either the touchscreen or wired push buttons as controls. The measures used and how they fit into the overall framework will be discussed in the following.

10.3.5 Ethics for all studies

The studies were carried out in compliance with the BPS guidelines for ethical research practice. They were approved by the University of Westminster Ethics Committee SSHL, and met the requirements of the BPS (British Psychological Society). As recruitment was possible in the US via online platforms, the research also complied with APA (American Psychology Association) ethics guidelines and United States Government Research Guidelines. All participants had to give consent after reading the introduction to the questionnaire to be able to answer any of the items.

The participants were asked to give additional consent to allow for their data to be used at the end of the survey. This procedure was put in place as no personal data that could identify the individual participants was recorded, which would have made post data collection withdrawal impossible.

Study 5 (tracking use of Blackboard) needed to be given extra consideration regarding possible data protection issues. This was due to the collection of usage data of the students; data, which the students might in general not be aware of being collected about them. To mitigate this potential issue, the use of this data was set up as a 'opt-in' rather than 'opt-out' approach. Giving or refusing permission for the research to use the data had no impact on the award of basic participation credits in the Research Participation Scheme. Opting-in gave additional credits. Participants were always fully debriefed after completion of studies or study parts, where appropriate.

10.3.6 Analysis procedures in detail

In this research a multitude of analysis procedures was used. The key reasons for choosing the approaches that were used are based on the merits of the procedures themselves and the existing TA literature.

At the core of TA research is the amount of variance accounted for in the intention to use a technology and in the actual use. These measures are usually assessed using regression models. Following developments in this research area and the standards set by the original research that established the UTAUT (Venkatesh et al., 2003), Partial Least Squares Structural Equation Modelling (PLS-SEM) was used for most part of the analysis. This methodology minimizes sampling effects in terms of problematic effects of non-normally distributed data and requires the use of bootstrapping. The concept of bootstrapping will be explained at a later point in this chapter.

The TA related constructs used in these regressions were, in line with existing research, established through PCA (Primary Component Analyses). These included factor rotations that were based on the Oblimin (oblique minimization) paradigm. It is not the most conservative of paradigms, but has been used in most TA research to date. Oblimin rotations have an advantage over the more conservative Varimax (variance maximisation) rotations from a conceptual point of view. Varimax rotations force an orthogonal factor structure, which implies that the constructs are entirely independent of each other. This is a common approach for personality factors, where such a lack of overlap is theoretically sound and desired.

When the number of factors used to predict an outcome, such as TA, is important, but the amount of variance accounted for even more so, factor overlap is acceptable. This is also sound from a theoretical perspective, as there are no theoretical limitations as to why small amounts of overlap should not be permitted.

10.3.6.1 Data preparation

Data collection was performed using the online survey service Qualtrics (www.qualtrics.com). Using this platform allowed for precautions such as the automatic blocking of multiple submissions from the same person.

The first step of the data preparation was the data import and merging. A grouping variable was added to allow the researcher to separate the data again at a later stage for analysis, if necessary. This was also used for indexing of cases.

In a second step, the data was screened for incomplete cases. All cases, which did not have positive responses to both consent items, were deleted from the dataset in compliance with the data protection protocol for this study. Negative answers as well as omissions / non-completions regarding the second consent item were regarded as 'no consent given' and led to the deleting of the associated cases. The questionnaire has been set-up to allow participants to omit questions, should they wish not to answer. For this reason some cases are missing a few responses. The researcher has not deleted any cases that did not have significant, i.e. more than approx. 80%, of answers missing. In the analysis, the valid number of cases will be indicated. The variables were then check with regard to their attributes as defined in SPSS as the export from the questionnaire platform made amendments necessary to allow the necessary computations.

10.3.6.2 Fixed Effect Fallacy (Monk, 2004)

In order to address Monk's (2004) Fixed Effect Fallacy in technology acceptance, non-parametric group based test of difference were conducted using the Kruskal-Wallis test method. This test compared different group for significant group dominance of at least one group to all other groups. The groups were chosen to be the make of the technology, e.g. Amazon Kindle, or Apple iPad. A significant result of the Kruskal-Wallis test would indicate that at least one group is significantly different or dominant to the others. In order to increase the precision of the results, a Monte Carlo method with 99% confidence level and 10,000 iterations was chosen to render exact results.

Overall, the differentiation between different classes of technology can be seen as a meta-approach to this issue. Given that the participants only answered the questionnaires based on the experience with their own devices, rather than assessing a specified group of devices (make / model), this is a far broader approach that needs to be interpreted accordingly.

10.3.6.3 Addition of Interaction Variables

Based on the initial definitions of the UTAUT in terms of moderators and interaction variables (Venkatesh et al., 2003) as well as more recent research (Baptista & Oliveira, 2015; Magsamen-Conrad, Upadhyaya, Joa, & Dowd, 2015; van Schaik, 2009; Venkatesh et al., 2012), interaction variables were calculated for the data set. In their article, Czaja et al. (2006) used interactions to further the predictive ability of their model regarding technology acceptance of computers.

10.3.6.4 Primary Component Analysis (PCA)

In this research it was necessary to compute factor analyses at multiple stages. These were run in PLS modelling using the guidelines established by Gefen and Straub (2005).

10.3.6.5 Cronbach's Alpha values

Tables are provided in the study descriptions, where relevant, featuring the Cronbach Alpha values for the constructs that were tested. In these tables it is also outlines which items were included in the original UTAUT version, as well as which items have been excluded from further analysis and the higher Cronbach Alpha resulting from this. It is generally agreed that a Cronbach Alpha value should exceed .7, thereby indicating a reliable scale or construct (Field, 2009).

10.3.6.6 Regressions / Path Analyses

Regression analyses / path analyses were carried out using PLS modelling. This allows for regressions to be carried out that would normally not meet all distributional requirements for multiple linear regressions, and would have to be run as logistic regressions, with the related limitations. In the relevant study chapters the distribution of the variables that would normally have necessitated the use of a non-parametric regression equivalent for standard linear regressions.

PLS modelling does not normally give adjusted R^2 values or direct beta coefficient loadings, however, PLS modelling using bootstrapping and PLS algorithms together allows for these values to be extracted.

Just like linear regression analysis PLS based modelling can only compare nested models and does not provide overall or standardized model fit values.

As for this research the difference in R^2 of the model additions was of particular interest, the differences in R^2 and the significance thereof were calculated manually by using a standard F-test, degrees of freedom for the numerator and denominator, and a p-value calculator (www.danielsoper.com).

10.3.6.7 Bootstrapping

In order to increase generalizability of the results beyond the scope of the current sample populations, it was essential to test for and follow the predictor-case ratio that has been postulated by Tabachnick and Fidell (2001).

Entering all variables of a model at once could have violated the recommendations with regard to the variable-case-ratio of the larger of the two following: a) eight times the number of predictors plus 50, or b) adding 104 to the number of predictors (Tabachnick & Fidell, 2001). Taking into account cases that would be excluded due to missing values, the minimum number of cases available, for Study 1 for example, would be 149. The minimum required number of cases according to the abovementioned guidelines would be a) 22*8+50=226 or b) 22+104=126. With a) being the larger number, the minimum requirement would be 226 cases, which would have exceeded the number of cases available.

Two solutions to this problem exist, and both have been utilized in this analysis. On the one hand it is possible to conduct preliminary regression analyses to identify the variables with significant impact on the model and then enter the resulting selection of significant predictors as an overall model.

On the other hand it is possible to run a robust regression procedure, which relies on the statistical operation of 'bootstrapping'. Bootstrapping entails random resampling from the cases available to create a large set of data sets composed from randomly selected cases of the existing data set. This raises the number of cases and data sets available to numbers that easily accommodate even for larger numbers of predictor variables.

Especially for complex models, regression analyses using a bootstrap methodology were performed, using the software package smartPLS (www.smartPLS.com). This package allows bootstrapping of PLS based regression analyses in order to identify the confidence intervals for the model parameters and the loadings for the regression paths. Furthermore, bootstrapping is necessary in order to obtain significance values and confidence intervals for the individual predictor loadings, which cannot be calculated directly in PLS based analysis.

The recommended value for the number of bootstrap iterations for regression based approaches is r=2,000, as introduced by Field, Miles and Field (2012). With sufficient computing power available, and a sufficient number of cases to allow model convergence without errors caused by sampling extremes, the decision was made to raise this value in order to assure accuracy of the data for all bootstrap analyses conducted for this study. If not stated otherwise, the bootstrap modelling was conducting using 5,000 resampling iterations as recommended by Hair, Hult, Ringle, and Sarstedt (2014).

In some instances it was necessary to reduce the overall number of model predictors by using the overall average of a construct to avoid issues of matrix singularity. This can be seen as an effect of small sample sizes with limited variance in some variables leading to singular solutions to the proposed model.

Whilst the individual model loadings were bootstrapped and have been given with confidence intervals and bias corrected confidence intervals, bootstrapping also provides confidence intervals for quality criteria such as adj. R^2. Calculations of adjusted R^2 correct the amount of variance predicted by the model by taking into account the ratio between the number of predictors that add to the model better than chance and the number of data points available (cases). This ensures that adding predictors that are not significantly loading onto the model will not lead to spuriously higher amounts of variance accounted for by the model; making it seem better suited than it should reasonably be regarded as. Instead, it will lead to the mathematical equivalent of a penalty being imposed on the model. The mathematical penalty is imposed by the inclusion of the number of predictors in the denominator of the formula. With larger numbers of predictors, the denominator becomes smaller, via the subtraction of the number of predictors from the number of cases. This makes the overall value of the fraction larger, meaning that a larger number will be deducted from the value '1', in order to determine the value of adjusted R^2 for the model.

If degrees of freedom are used for the calculation, the formula to be used is:

$$adj.R^2 = 1 - (1 - R^2)\frac{n-1}{n-p-1}$$

with 'n' being the number of overall cases, and 'p' being the number of predictor variables (Tabachnick & Fidell, 2001).

10.3.6.8 Structural Equation Modelling

Structural equation modelling (SEM) gives more detailed results than conventional regression and factor analysis procedures. Partial Least Squares (PLS) modelling was used for the analysis of the data. This allowed analysis of the data regardless of minor distribution difficulties and ample size restrictions, as PLS is a very robust analysis. On the other hand, confirmatory factor analyses were run using a covariance based approach, as suggested by Hair et al. (2014).

The benefit of running SEM based analyses in general is that it allows for the regression paths to be determined in more detail. This leads to a better understanding and more detailed outline of the model, as the regression factors are no longer considered having an effect only on one level of abstraction or complexity. Furthermore, this opens up more questions regarding the structure of the model that should be used in the future and the interplay between the individual factors and constructs.

10.3.6.9 Summary of Part 1:

In the first part of this research, it was shown that two strands of technology acceptance models and research exist, which differ in their outlook. So far, no model has successfully accounted for equally good amounts of variance with regard to both, utilitarian and hedonic interaction based technology.

Utilitarian models have a long track record of successful applications in the field of office and work related technology. Contrasting to this, the field of lifestyle or hedonic technology acceptance research is relatively young, and has often been based on the classic TA models in combination with other variables. Such hybrid models or extensions in form of combinations of factors from the hedonic and the utilitarian models are likely to bring further insights into better ways of modelling technology acceptance across different technologies.

11 **Part 2:** E-Reader and TabletPC Technology Acceptance

In the previous part it was highlighted how a combination of variables from both hedonic and utilitarian models might be beneficial. The following two studies will feature such a hybrid model based on the UTAUT model and hedonic TA research. Lifestyle technology used for testing the applicability and model fit of this new model extension will include E-Reader and TabletPC technology.

Based on the results from Study 1, the second study will be used as a confirmatory study for the established model parameters. This will lead to a definition of a first stage of the new model.

11.1 Chapter 4: Study 1 – E-Readers

11.1.1 Introduction

With the realization that regular displays can be more fatiguing than paper to read from, the advent of E-Readers can be seen as a major technological change in the lifestyle sector. E-Readers allow users to store many different books on a small and portable device with a respectable battery life. Whilst this could be achieved with TabletPCs as well, the core difference is the display technology, which mimics paper and is considered to be less staining on the eyes.

Especially for people who commute to work or who enjoy reading on the go or on vacations, E-Readers facilitate their lifestyle. The ability to carry multiple 'books' – or the electronic contents thereof – without added weight and the ability to purchase new reading material once the current readings are finished allow a smoother experience for avid readers.

Being primarily designed to allow readers to electronically purchase and read books, these devices can theoretically also be used for work purposes. Built in support of most common document formats allow the integration into a work-based setting as well. However, the lack of editing options to promote content creation rather than consumption highlights recreational use as the primary application of this technology.

11.1.2 E-Readers in TA research

E-Readers have been used for technology acceptance studies by Lee (2013), Lai and Chang (2011) and Shih-Chun et al. (2010). Lee (2013) used the TAM3 model as a basis for this recent study, merging it with other models related to technology use, such as the Model of Innovation Resistance (Rogers, 1995) and the Diffusion of Innovation Theory (Ram, 1987). This research did not include trust elements or social elements as are present in the constructs used by Heerink et al. (2010).

Lai and Chang (2011) used a similar approach, by combining the TAM (Davis, 1989), the Diffusion of Innovation Theory (Ram, 1987), and measures of media richness and convenience.

These constructs are very interesting approaches and additions to the existing technology acceptance models, but do not seem to be suited to an overarching modelling approach. This is the case, as the media richness of a technology or linked devices is not necessarily a core feature of the technology. Perceived media richness is very likely to depend heavily on the interests of the users, thereby creating a self-selecting group of users.

Compatibility, as used by Lai and Chang (2011), is also likely to affect media richness. While the results of their study were impressive in terms of the amount of variance accounted for at 64% for the participant's intention to use (Lai & Chang, 2011, p, 571), the approach chosen seemed too specialized to be of particular use for a more general model of technology acceptance. Shih-Chun et al. (2010) used more comparable constructs in their paper, indicating that the work of Heerink et al. (2010) might indeed provide more insights in to use of lifestyle technology.

The proposed comparison of pre-and post-adoption attitudes toward this technology in this paper (Shih-Chun et al., 2010) was a new addition to technology acceptance modelling. However, a clear indication regarding the overall approach being either a one-time comparison or more of a circular modelling approach with iterative assessments of acceptance and attitudes toward the technology were missing.

Seet and Goh (2012) approached the use of E-Readers in a hybrid cross-over format by measuring intention to use these devices in a collaborative learning environment. By doing so, Seet and Goh (2012) are effectively turning it conceptually into a technology which use can be predicted with utilitarian technology acceptance models.

This becomes clearer when examining the structure of the research conducted for this paper, as it focuses on affordances, rather than attitudes. Affordances are not specifically utilitarian or hedonic. The affordances that were identified in this research, such as ‘mobility’ and ‘collaboration’ (Seet & Goh, 2012, p.516) could however be classified as utilitarian. The impact of the set up is likely to have played a substantial role in the formation of these results, especially in terms of the priming that use has for the perception of such devices as utilitarian by the users.

A comparable approach to the one by Seet and Goh (2012) was taken by Stone and Baker-Eveleth (2013), who compared expectations and usage intentions of students related to the use of electronic textbooks. The setups of the studies at hand were such that the participants were instructed to specifically regard the technologies they were presented with in terms of lifestyle or hedonic devices.

11.1.3 Aim:

The aim of this study was to establish whether the same principles that apply to the assessment of technology acceptance for work technology also apply to lifestyle technology. This was assessed by comparing the variance explained by the original UTAUT model as introduced by Venkatesh et al. (2003) with the results for a new model (LTAM, Lifestyle Technology Acceptance Questionnaire). The LTAM encompasses aspects of the UTAUT, components from the ALMERE model (Heerink et al., 2010) and other models.

Social and interpersonal aspects of technology acceptance were assessed in terms of their predictive power with regard to lifestyle technology. These were recently introduced into different technology acceptance frameworks (see Lankton & McKnight, 2011). Key aspects here were the trust components introduced by Lankton and McKnight (2011), originally conceptualized for the interaction with online social networks. In addition, the social and interaction variables introduced in the ALMERE model (Heerink et al., 2010) were assessed and compared against the UTAUT model (Venkatesh et al., 2003). The ALMERE model was originally also not designed for lifestyle technology, but for interaction with robots and artificially intelligent computer agents.

In part the design of this study and Study 2 address an issue that has been identified in the literature by Monk (2004) as the Fixed Effect Fallacy. Whilst models assume that the results can be generalized as long as there is a general similarity in the item that is being rated, this is not necessarily the case – the items in questions can have a profound influence on the rating by the user. Therefore the type of items, or technology in this case, that is being rated in the perception of the user can make a difference to the results of the modelling.

Due to the sample size and the non-stratified nature of the sample, the distribution of different devices was not set up in a way that would have allowed for multi-group comparisons based on the make or model of the technology in question in the individual studies.

11.1.4 Hypotheses:

In the following, the hypotheses for this study are outlined, some of which bridge to other studies.

1. Hypothesis: Technology Trust will explain a significant amount of variance with regard to Technology Acceptance (operationalized as 'intention to use') of lifestyle technology.

Hypothesis 1 is based on the findings by Lankton and McKnight (2011). Technology trust was operationalized as interpersonal and functionality related trust items when using online social networks. Especially with regard to lifestyle technology such as E-Readers, the aspect of technology trust is expected to explain significant amounts of variance. Lankton and McKnight (2011) found significant effects of trusting beliefs in multiple configurations, both directly and indirectly on the reported intention to use. A multiple regression analysis will be used to determine the amount of variance explained.

2. Hypothesis: Social Aspects of Technology (as taken from the ALMERE Model, excluding Technology Trust) will significantly increase the amount of variance explained, compared to the UTAUT model.

The differences in work related and lifestyle technology are assumed to have an impact on the amount of variance explained by different factors of the technology acceptance models used. The UTAUT model (Venkatesh et al., 2003) is hypothesized to explain large amounts of variance with regard to the reported intention to use. This is despite its origins in workplace related technology. However, factors and concepts that were shown in previous studies (Heerink et al., 2010) regarding non-work related technologies were hypothesized to significantly add to the UTAUT. Accepting this hypothesis would indicate relevance of the social constructs included in the overall questionnaire (LTAM) to the field of lifestyle technology acceptance.

3. Hypothesis: The overall amount of explained variance of the LTAM (Lifestyle Technology Acceptance Questionnaire), will be higher than of the UTAUT alone with regard to lifestyle technology.

Hypothesis 3 can be regarded as an extension of Hypothesis 2 in terms of the overall predictive power of the LTAM. It includes both the social constructs and the trust constructs that are hypothesized to individually add to the UTAUT (Venkatesh et al., 2003). This hypothesis is a key element of Studies 1 and 2, as it will test the LTAM as an appropriate measure for technology acceptance in the lifestyle technology sector.

4. Hypothesis: The six factor levels (Competence, Integrity, Benevolence, Functionality, Reliability, Helpfulness) of Technology Trust will differ significantly between one-function and multi-function devices within the lifestyle technology segment.

This hypothesis will be tested in the analysis section of Study 2, as it requires the use of the Study 2 data set. The core reason of this test of difference can be found in the argument made by Monk (2004) regarding a Fixed Effect Fallacy. Monk argued that there is potentially a difference between the way that different people rate technology based on the items that are chosen or altered for the rating.

11.1.5 Sample

The study was conducted using two different sample groups: one international / US based, and one UK based sample. No differentiation between groups was made in the analysis. The sample included 272 participants selected from student populations. Of these, 230 participants completed the questionnaire. This equals an 85% completion rate.

The age range of the participants was 18-64 with a mean of 22.3, a median of 19 and a SD of 8.3. The gender split was 17.3% men (N=37) and 82.7% women (N=177). This skewed ratio is likely to be the result of the higher proportion of female students in the field of psychology. These descriptive data are correct for the final sample used, not for all cases collected.

The highest share of the sample population - 85.4% - was from the UK. A further 8.9% of the participants reported being from the United States. Approximately 0.5% of the participants indicated having less than High School education. 36.9% of the sample population indicated having High School or GED level education. 'Some College' education was reported by 22.4%, while 26.2% indicated to have a 2-year, and 7% indicated to have a 4-year college degree. Of the participants from this sample population 5.1% had a Master's degree, and 1.9% had a Doctoral degree.

11.1.6 Materials and Equipment

For this study, a combination of surveys was used. This was based on the initial UTAUT questionnaire as used by Venkatesh et al. (2003). Building on this basis, items from the research questionnaires of Heerink et al. (2010), Lankton and McKnight (2011) and Yang and Yoo (2004) were added. This formed the complete LTAM (Lifestyle Technology Acceptance Model) survey. The survey items that were combined were chosen to complement each other, in that no overlap was expected. The research of Heerink et al. (2010) and Lankton and McKnight (2011) were both based on the UTAUT model by Venkatesh et al. (2003). It was therefore not necessary to include all questions from all questionnaires.

For distribution purposes, the Research Participation Scheme (RPS) of the University of Westminster was used. The link to the online questionnaire was made available to first year students in Psychology via the online platform.

11.1.7 Protocol

Participants who had signed up for the study using the Research Participation Scheme online service were provided with the link to the online survey. This survey could be completed at any time using most commonly used devices, including mobile devices.

Whilst the participation was entirely voluntary and no monetary incentives were offered, the students received 'participation credit'. This credit is required for the students to proceed into the next study year, and can be collected via participation in staff research. Given that multiple different studies were available to choose from in order to earn credit points, participation in this study was not a requirement for academic progression.

The participants were first given instruction as to how to complete the survey. This included information about the researchers, complaint procedures, ethical clearance, and consent. After giving consent, the questionnaire was made available for completion. At the end of the survey, the participants were asked to give consent again. This was done to give participants the option to withdraw their data from this anonymized study.

Overall completion time was estimated to be approximately 30 minutes.

11.1.8 Results:

11.1.8.1 Computer and Internet Use

The average number of hours of computer use per week was calculated to be 25.32 hours (SD=14.766). When asked how often they used the internet, regardless of the device that is used to access it, the participants reported to use it 25.19 hours a week (SD=16.686) on average. Furthermore, 65.6% indicated to use the Internet daily for communication purposes, with another 17.2% indicating to do this at least 2-3 times per week. With regard to searching for general information on the Internet, 68.7% indicated to use the Internet daily, while another 21.5% indicated to do this at least 2-3 times per week. Daily use of the Internet was reported by 38.1% of the participants for the purpose of looking up news and weather information. Daily use of the Internet for entertainment or leisure purposes was reported by 40.7% of the sample.

11.1.8.2 E-Reader Use and E-Reader Brand:

For the first part of Study 1 the use of E-Reader devices was assessed to allow comparisons at later stages of the analysis. Over 60% (61.4%) of the participants had never used an E-Reader before, while 0.9% of the sample population were not sure, and 37.7% confirmed to have used an E-Reader before. Over 54% of the participants did not have access to an E-Reader. Nevertheless, 13% did not have access to an E-Reader, but were intending to buy one. Of this sample 27.4% did report having access to such a device, while 4.7% were unsure / did not know. This indicates that more people have used this technology than people who have constant access to one of these devices.

On average, the participants used their E-Readers 5.56 hours per week (SD=5.234). This included 9 cases in which the participants indicated to have access to an E-Reader, but not to use them, indicated as '0' hours per week. This would indicate that 16.1% of those who have access to an e-reader do not make use of it.

When controlling for these cases, the average time of use rises to 6.63 hours (SD=5.053) with a mode of 5 hours (21.3%) per week. Table 6 shows the different types of devices that were reported as accessible to the participants.

Table 6: Types of E-Readers accessible to participants (Study 1)

Device	Access
AMAZON Kindle	79.63%
NOOK	7.41%
Sony E-Reader	5.56%
KOBO	3.70%
Other	3.70%

Given that the UTAUT was originally developed for workplace related technology, the applicability of its variables to lifestyle technology had to be established via factor analyses. This was especially the case, as the LTAM survey that was used in this study was composed of different research tools that had not been used in conjunction before.

In order to address Monk's (2004) Fixed Effect Fallacy in technology acceptance, non-parametric group based test of difference were conducted using the Kruskal-Wallis test method. This test compared different group for significant group dominance of at least one group to all other groups. The groups were chosen to be the make of the technology, e.g. Amazon Kindle, or Apple iPad. A significant result of the Kruskal-Wallis test would indicate that at least one group is significantly different or dominant to the others. In order to increase the precision of the results, a Monte Carlo method with 99% confidence level and 10,000 iterations was chosen to render exact results.

After a pre-selection of the users who owned a device or had unrestricted access to one, a Kruskal-Wallis test was performed. This test was performed on the different model groups of technology, indicating the different brands of E-Readers owned by the participants.

The test resulted in a non-significant Chi-Square of 3.662, with p=.454 (MC exact.: p=.499). Based on these results it can be assumed that there are no significant differences in how the users of the specific model groups responded to their Intention to use the respective devices.

Table 7: Kruskal-Wallis test results, Fixed Effect Fallacy, Study 1

			ITU
Chi-Square[a, b]			3.662
df			4
Asymp. Sig.			.454
Monte Carlo Sig.	Sig.		.499[c]
	99% Confidence Interval	Lower Bound	.486
		Upper Bound	.512

Note: a. Kruskal-Wallis Test; b. Grouping Variable: Make; c. Based on 10000 sampled tables with starting seed 191853852.

11.1.8.3 Factor Analysis for Study 1, E-Reader

The constructs that were adapted from previous workplace technology to this lifestyle technology research held up in terms of their internal consistency values and their factor structure. In comparison with previous research, they performed as well or better (Williams et al., 2015).

A factor analysis was performed using the PLS method with a factorial loading protocol according to Gefen and Straub (2005). The factor loading structure was consistent with the pre-established factors, as can be seen in the loadings in Table A 1, Appendix 2. Weak overall loadings were noted for the construct Facilitating Conditions. The loadings for Facilitating Conditions were below the recommended cut-off of .7 (Field, 2009). The construct was however retained in order to allow for testing of the UTAUT model as it stands in contrast to new additions.

As a second step of the PLS factor analysis, the inter-correlations of the latent factors were compared to the Average Extracted Variance (AVE) values for the factors. Following the guidelines by Gefen and Straub (2005), the square root (SQRT) of the AVE values should always exceed the correlation values considerably.

Higher overall correlations between factors compared to a rotated factor solution is a function of the PLS calculation method, and not necessarily an indication of poor data (Gefen & Straub, 2005). The SQRT AVE values for the factors and the correlations can be found in Table A 2 in Appendix 2.

From the construct 'reputation' the item regarding the brand of the technology was excluded. All other constructs remained as initially stated. Overall scores for the constructs were calculated taking into account the item exclusions as highlighted in the CA analyses (see Appendix for CA values of specific models). Following from the factor analyses, the performance of the new 'hedonic' additions to the 'utilitarian' UTAUT was tested using regression (PLS) analyses.

11.1.8.4 Moderation Analysis:

The effect of Experience on other variables in the model was tested using moderation analysis. For this, the sample was divided into users and non-users of the technology. Moderation analyses were carried out between all variables in the model and the dependent variable Intention to Use.

Two participants had answered that they were not sure whether they had used an E-Reader before. This was recoded and grouped with the no-experience group, as it was assumed that there was no conscious recollection of having interacted with the device and potentially having learned from the resulting experience.

A moderation effect was found for Experience between Attitude towards Technology and Intention to Use. The reported Intention to Use was significantly higher for people who had used E-Readers before, compared to people who reportedly had not had any experience with them.

Table 8: Moderation Analysis of Experience on ATT, Study 1

	beta	SE	t	sig.	LLCI	ULCI	Rsquared
Constant	-4.281	2.314	-1.850	0.066	-8.841	0.279	
Experience	4.095	1.419	2.886	0.004	1.298	6.891	
ATT	1.203	0.144	8.338	0.001	0.918	1.487	
Interaction	-0.403	0.092	-4.363	0.001	-0.584	-0.221	
							0.409

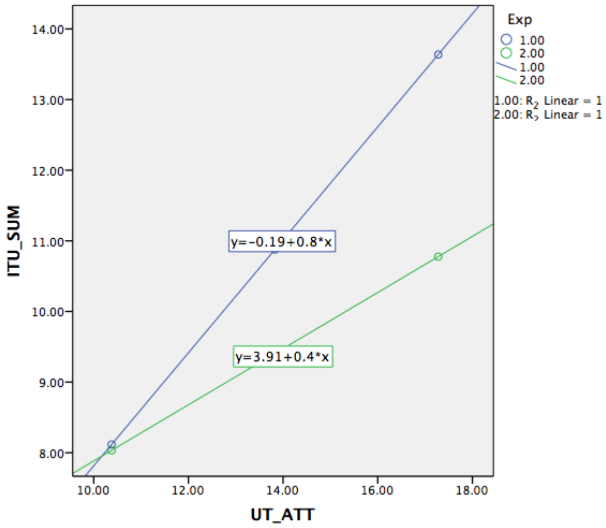

Figure 6: Plotted moderation effect of Experience on ATT and ITU

A second moderation effect based on Experience was found between the variables Perceived Enjoyment and Intention to Use.

The results of the moderation analysis can be found in Table 8. A plot of the effect of experience on the relationship between Perceived Enjoyment and Intention to Use is presented in Figure 6. The full table of results for all moderation analyses carried out for this data set can be found in Appendix 2.

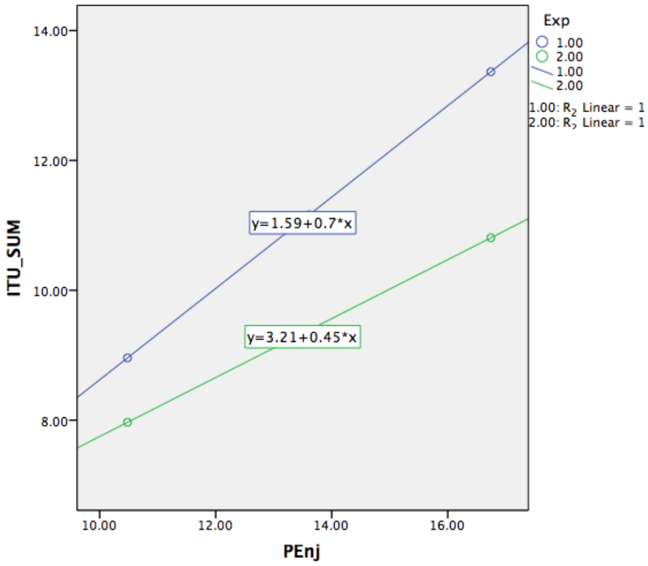

Figure 7: Plotted moderation effect of Experience on PEnj and ITU

Table 9: Moderation analysis of Experience on Perceived Enjoyment and Intention to Use

	beta	SE	t	sig.	LLCI	ULCI
Constant	-0.037	2.442	-0.015	0.988	-4.850	4.776
Experience	1.625	1.631	0.996	0.320	-1.590	4.839
PercEnjoy.	0.953	0.154	6.172	0.001	0.649	1.258
Interaction	-0.250	0.110	-2.270	0.024	-0.467	-0.033

Note: R^2=.375

Based on the results of these moderation analyses the variables Experience, as well as the interaction effects based on the IVs and Experience were included in the modelling carried out.

11.1.8.5 Regression Analysis

The assumptions underlying regression analysis were met by the data or could be achieved through the exclusion of very few extreme outliers, which were most likely caused by careless completion of the research survey.

A series of regression analysis was run using the PLS method. In order to test the individual additions against the UTAUT and against each other, all possible iterations of additions to the original model were analysed, as outlined in Table 10.

Table 10: Model Comparison Strategy for Study 1

Iteration	Model 1	Model 2
1	UTAUT	
2	UTAUT	UTAUT plus Trust
3	UTAUT	UTAUT plus Social Variables
4	UTAUT plus Trust	UTAUT plus Trust plus Social Variables
5	UTAUT plus Social Variables	UTAUT plus Social Variables plus Trust

The UTAUT alone (with the added moderator Experience and the Interaction Effect between ATT and Experience) accounted for 42.5% of variance (R^2=.448, adj. R^2=.425).

Table 11: Results of Model comparisons for Study 1

Model 1	Model 2	Δ R^2	F Δ	df 1	df2	Sig.
UTAUT		.448	19.298	9	211	<.001
UTAUT	UTAUT plus Trust	.053	3.523	15	208	.002
UTAUT	UTAUT plus Social Variables	.025	2.384	13	210	.053
UTAUT plus Trust	UTAUT plus Trust plus Social Variables	.030	3.054	19	205	.018
UTAUT plus Social Variables	UTAUT plus Social Variables plus Trust	.058	3.978	19	205	<.001

Note: significance values of R^2 change were calculated manually as outlined in the methodology section.

Table 12: Overview of Model significance for Study 1

Model	Mean Square	F	Df 1	Df 2	Sig.
1	138.081	19.203	9	211	<.001
2	90.657	13.274	15	208	<.001
3	101.677	14.635	13	210	<.001
4	75.170	11.346	19	205	<.001
5	75.170	11.346	19	205	<.001

Note: Model 4 and 5 are identical and are only featured for completeness.
The full list of all model coefficients can be found in Appendix 2.

11.1.8.6 Hypothesis Testing (E-Reader):

Hypothesis 1: "Technology Trust will explain a significant amount of variance with regard to Technology Acceptance (operationalized as 'intention to use') of lifestyle technology."

As outlined above, a regression analysis using PLS was run, including all sub-constructs individually. Technology acceptance was operationalized via 'Intention to Use' (ITU), as the dependent variable.

The R^2 change for the addition of Trust variables to the UTAUT model was significant with $F_{(6, 205)}$=3.53, p=.002. The new model composed of the UTAUT and the Trust variables accounted for 46.4% of the variance (R^2= .501, adj. R^2=.464).

Table 13: Path coefficients for UTAUT plus Trust model, Study 1

	Original Sample (O)	Sample Mean (M)	SE	t	sig	CI Low	CI Up
ANX -> ITU	-0.107	-0.117	0.067	1.615	0.107	-0.253	0.008
ATT -> ITU	0.985	0.897	0.283	3.482	0.001	0.457	1.462
Benevolence -> ITU	-0.003	-0.006	0.075	0.036	0.972	-0.153	0.143
CSE -> ITU	0.039	0.042	0.058	0.672	0.501	-0.085	0.153
Competence -> ITU	0.038	0.045	0.065	0.583	0.560	-0.076	0.176
Experience -> ITU	0.276	0.194	0.320	0.862	0.389	-0.264	0.832
FAC -> ITU	0.133	0.139	0.067	1.990	0.047	0.010	0.265
Functionality -> ITU	-0.129	-0.115	0.082	1.584	0.113	-0.268	0.051
Helpfulness -> ITU	-0.218	-0.200	0.066	3.285	0.001	-0.326	-0.069
Integrity -> ITU	0.167	0.153	0.069	2.415	0.016	0.019	0.294
Interaction Effect: Experience -> ATT -> ITU	-0.260	-0.208	0.168	1.553	0.121	-0.552	0.020
PEOU -> ITU	0.063	0.087	0.059	1.069	0.285	-0.031	0.202
PU -> ITU	-0.084	-0.101	0.075	1.111	0.267	-0.248	0.042
Reliability -> ITU	-0.057	-0.074	0.064	0.897	0.370	-0.198	0.052
SI -> ITU	0.169	0.166	0.059	2.861	0.004	0.054	0.285

The addition of trust variables also led to a significant increase in the amount of variance accounted for when performed on the model composed of the UTAUT plus Social Variables. The amount of variance accounted for increased from 44.5% (R^2= .473, adj. R^2=.445) to 48.7% (R^2= .531, adj. R^2=.487), which was significant at $F_{(6, 205)}$= 3.054, p=.018.

Table 14: Model coefficients for Iteration 5, Study 1

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> ITU	-0.106	-0.111	0.066	1.603	0.109	-0.239	0.017
ATT -> ITU	0.654	0.547	0.273	2.393	0.017	0.110	1.164
Benevolence -> ITU	-0.031	-0.025	0.070	0.443	0.657	-0.158	0.112
CSE -> ITU	0.008	0.014	0.056	0.137	0.891	-0.105	0.118
Competence -> ITU	0.050	0.056	0.064	0.779	0.436	-0.064	0.183
Experience -> ITU	0.130	0.047	0.276	0.468	0.639	-0.368	0.675
FAC -> ITU	0.147	0.152	0.061	2.416	0.016	0.032	0.271
Functionality -> ITU	-0.112	-0.106	0.081	1.376	0.169	-0.260	0.058
Helpfulness -> ITU	-0.179	-0.172	0.064	2.788	0.005	-0.305	-0.049
Image -> ITU	0.147	0.140	0.061	2.416	0.016	0.021	0.256
Integrity -> ITU	0.179	0.165	0.068	2.645	0.008	0.034	0.296
Interaction Effect: Experience-> ATT-> ITU	-0.159	-0.108	0.152	1.045	0.296	-0.463	0.122
Interaction Effect: Experience-> Perceived Enjoyment-> ITU	-0.293	-0.325	0.189	1.549	0.122	-0.675	0.070
PEOU -> ITU	0.062	0.077	0.058	1.060	0.289	-0.035	0.188
PU -> ITU	-0.061	-0.074	0.080	0.758	0.449	-0.236	0.077
Perceived Enjoyment -> ITU	0.114	0.147	0.103	1.106	0.269	-0.066	0.346
Reliability -> ITU	-0.070	-0.081	0.060	1.169	0.243	-0.202	0.037
Reputation -> ITU	0.083	0.078	0.065	1.281	0.200	-0.051	0.202
SI -> ITU	0.087	0.093	0.064	1.365	0.172	-0.034	0.219

Based on the analyses presented above, Hypothesis 1 was accepted. Technology Trust, as introduced by Lankton and McKnight (2011), is a significant predictor of technology acceptance.

Hypothesis 2: "Social Aspects of technology use will significantly increase the amount of variance explained, compared to the UTAUT model."

With regard to the UTAUT variables, a significant model emerged in a PLS analysis, with $F_{(9, 211)}$= 19.203, p<.001. This model explained 42.5% of variance (R^2=.448, adj. R^2=.425). This model was compared to a significant model ($F_{(13, 207)}$= 14.635, p<.001) that also included social variables ('image', 'reputation', and 'perceived enjoyment'). An R^2 change which approached significance was reported with $F_{(4, 210)}$=2.384, p=.053. This second model explained 44.5% of variance (adj. R^2, R^2=.473).

Table 15: Model Coefficients for UTAUT plus social variables, Study1

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> ITU	-0.106	-0.111	0.066	1.603	0.109	-0.239	0.017
ATT -> ITU	0.654	0.547	0.273	2.393	0.017	0.110	1.164
Benevolence -> ITU	-0.031	-0.025	0.070	0.443	0.657	-0.158	0.112
CSE -> ITU	0.008	0.014	0.056	0.137	0.891	-0.105	0.118
Competence -> ITU	0.050	0.056	0.064	0.779	0.436	-0.064	0.183
Experience -> ITU	0.130	0.047	0.276	0.468	0.639	-0.368	0.675
FAC -> ITU	0.147	0.152	0.061	2.416	0.016	0.032	0.271
Functionality -> ITU	-0.112	-0.106	0.081	1.376	0.169	-0.260	0.058
Helpfulness -> ITU	-0.179	-0.172	0.064	2.788	0.005	-0.305	-0.049
Image -> ITU	0.147	0.140	0.061	2.416	0.016	0.021	0.256
Integrity -> ITU	0.179	0.165	0.068	2.645	0.008	0.034	0.296
Interaction Effect: Experience-> ATT-> ITU	-0.159	-0.108	0.152	1.045	0.296	-0.463	0.122
Interaction Effect: Experience-> Perceived Enjoyment -> ITU	-0.293	-0.325	0.189	1.549	0.122	-0.675	0.070
PEOU -> ITU	0.062	0.077	0.058	1.060	0.289	-0.035	0.188
PU -> ITU	-0.061	-0.074	0.080	0.758	0.449	-0.236	0.077
Perceived Enjoyment -> ITU	0.114	0.147	0.103	1.106	0.269	-0.066	0.346
Reliability -> ITU	-0.070	-0.081	0.060	1.169	0.243	-0.202	0.037
Reputation -> ITU	0.083	0.078	0.065	1.281	0.200	-0.051	0.202
SI -> ITU	0.087	0.093	0.064	1.365	0.172	-0.034	0.219

In a second step, the social variables were added to the model comprised of the UTAUT and trust related variables (Table A 12, Appendix 2).

The model consisting of UTAUT and trust variables accounted for 46.4% of the variance (R^2= .501, adj. R^2=.464). Adding the social variables significantly increased the amount of variance accounted for to 48.7% (R^2= .531, adj. R^2=.487), with $F_{(4, 205)}$=3.978, p<.001.

This analysis showed that the inclusion of the variables that represent the social constructs improved the original UTAUT model significantly. When the social variables were added to the model consisting of the UTAUT and the trust related variables, the increase in amount of variance accounted for still approached significance. Based on these findings, Hypothesis 2 was accepted.

Hypothesis 3:

The overall amount of explained variance of the LTAM (Lifestyle technology acceptance questionnaire) will be higher than of the UTAUT alone with regard to lifestyle technology.

The UTAUT accounted for 42.5% of variance (R^2=.448, adj. R^2=.425), whilst the full combination mode of the UTAUT plus social and trust related variables accounted for 50.9% (R^2= .552, adj. R^2=.509).

In all iterations that were calculated, the additional variables around trust and social aspects of technology use improved the UTAUT significantly, or with values approaching significance. When adding the trust and social variables to the UTAUT model in a single block / at the same time, this leads to a significant increase in amount of variance accounted for ($F_{(10/201)}$=2.335, p=.013).

Based on the individual iterations presented above and in the previous hypothesis testing, Hypotheses 3 was accepted.

11.1.9 Discussion

The analysis focused on different aspects of TA as proposed in different research models (Venkatesh et al., 2003; Heerink et al., 2010; Lankton & McKnight, 2011). While the UTAUT model (Venkatesh et al., 2003) has been a gold standard for technology acceptance in the workplace and for work related technology, the model does not reach the same levels of variance being explained when used for lifestyle-technology.

The amount of previous experience that the participants had with the technology showed to be a significant moderator for the aspects of Attitude towards Technology in the UTAUT and the variable Perceived Enjoyment from the LTAM.

An effect of the sample purely on these variables is unlikely, as the technology might be more of a confounding factor in this. The Fixed Effect Fallacy proposed by Monk (2004) was taken into consideration as well via a Kruskal-Wallis test of the different brands of E-Readers that were used by the participants. No significant differences in the groups based on make of the technology could be established. Whilst this does not differentiate between the individual makes, and the participants only rated one technology / make each, rather than all participants rating all makes / models, it is still a good indication of the make of device not significantly affecting the self-reported intention to use. The small size of the groups in this comparison has however to be taken into consideration in terms of statistical power. This was only partially offset by the use of exact Monte Carlo iterations.

With the UTAUT having been developed mainly for workplace related technology and the ALMERE model and the trust model introduced by Lankton and McKnight (2011) for lifestyle- technology, the differentiation between technologies became visible in the results.

The factor analysis indicated that the construct Facilitating Conditions might not be applicable in the same way to lifestyle technology, as it has been found to be regarding utilitarian technology (Williams et al., 2015).

Regarding Hypothesis 1, the addition of 'trust variables' significantly improved the UTAUT model. Nevertheless, some aspects of it did not load significantly on the model in terms of regression coefficients. Study 4 will show whether these results are based on the application of the trust model to actual devices rather than online services, as has been done by Lankton and McKnight (2011), or whether the differences might lie within the type of device, as will be tested in Study 2.

It seems plausible that an E-Reader is an object that the users or potential users would build rapport with, allowing them to assign feelings of trust to it.

Hypothesis 2 was accepted based on the significant differences between the proposed models. The social variables Image, Reputation and Perceived Enjoyment added significantly to the amount of variance accounted for by the UTAUT. Whilst there seemed to be a variance overlap between the UTAUT variable Attitude Towards Technology and the variable Perceived Enjoyment, these values for variance inflation were still within acceptable limits.

Hypothesis 3 was accepted for the E-Reader study (Study 1) based on the significant differences between the original UTAUT model and the LTAM model. The LTAM as a whole accounted for significantly more variance than the UTAUT, with a difference of over six percent points.

The construct 'computer anxiety', which was found to be a factor in itself in the confirmatory factor analysis carried out, did not turn out to be a significant predictor in the UTAUT. In the light of negative behavioural or affective aspects regarding technology adoption, this might be a positive indicator in terms of lifestyle technology being different from workplace technology (also see Brosnan, 1999).

Overall, the LTAM model was accepted as a better predictive model than the UTAUT, as it accounted for significantly more variance in all iterations than the UTAUT. In the second study, focusing on the use of TabletPCs, the findings discussed above were tested on a confirmatory basis.

11.2 Chapter 5: Study 2 - TABLET PCs

11.2.1 Introduction

Both E-Readers and tablet PCs are current lifestyle technologies, developed primarily for non-work-related purposes. The key difference between these technologies is the way of using technology: single functionality versus multi-functionality. E-Readers have one key-functionality, reading electronic books, but can also be used to access other digital content. Nevertheless this technology is designed to mimic paper as it has the same functionality and feel. A good overview of first user impressions over the years of development of E-Readers can be found in Qian (2011). Tablet PCs have been designed to offer a wide variety of functionalities via 'apps' and programs.

While the development of apps as a one program per task solution may be of interest to many potential users, the key functionality is seen as being the multi-touch display. Instead of mimicking a more basic technology, like the E-Reader mimics paper, a tablet PC endorses a more intuitive, gesture-based type of interaction.

E-Readers aim to enhance an existing technology, i.e. making books 'lighter' by storing several thousand books in one device weighing less than a single book. In contrast, TabletPCs seek to endorse a way of interaction with technology that is more natural, i.e. gesture based, and provide workflow optimisation. Both technologies are embedded in devices that are highly portable and are (for the duration of at least a day) power independent. This seamless integration with a mobile lifestyle, as well as the different approaches to make the feeling of using technology less prominent in the interaction, make these devices very interesting foci of technology acceptance research.

Whilst Kim and Sundar (2014) included Smartphones rather that TabletPCs in their study, the results might also be true for the use of TabletPCs. In this study it was found that the size of the screen was related to the amount of positive attitudes that the users had towards the device.

The Apple iPad has more or less set a standard in terms of TabletPC size. However, the new generation of the iPad mini and other devices of similar size have provided users with more choice. Based on the results by Kim and Sundar (2014), the size of the TabletPC might indeed play a role in the acceptance of the device for online tasks. This acceptance might be different from tasks to be completed in specifically designed apps, as the apps might differ in layout to maximize usability depending on the screen size. Such personal preferences and possibly even technology use related idiosyncrasies of users were picked up by Fourie (2012) from the perspective of making libraries more user friendly and electronic media more accessible.

El-Gayar, Moran and Hawkes (2011) researched the acceptance of TabletPCs in a university setting, with over 350 students participating in their study. Overall, their findings relating to the UTAUT and the behavioural intention to use the TabletPCs was very positive, with over 60% of variance being accounted for.

In this case, it is however not clear whether the high amount of variance explained might be connected with the program of the institution to further eLearning and to make sure that the infrastructure in terms of an eLearning ecosystem to be used with the TabletPCs was present. This may well have influenced the model, as the usefulness and ease of use of the TabletPCs are likely to be related to the availability of content in a specific area of application, i.e. e-learning material and study relevant content. This would be in line with the finding that the Perceived Usefulness was less good a predictor than Attitude toward Technology (El-Gayar, Moran & Hawkes, 2011). Given that the integration program may have resulted in an overall ceiling effect, the amount of variance might have been reduced, leading to other factors being more prominent and potent predictors in the model.

In this study it was also found that Perceived Ease of Use was related to the attitudes toward a technology, which is very similar to Perceived Enjoyment in terms of the approach of the construct to the description of perceived positive and negative views of the technology. It was unclear, whether the variables tested and suggested by Yang and Yoo (2004) were also included in the study by El-Gayar et al. (2011), despite the ideas being referenced.

Related to the abovementioned studies, Luo, Li, Zhang, and Shim (2010) conducted a study regarding the usability and design of handsets. The results of the study were comparable with previously mentioned studies in that the key factors accounting for variance in the data were 'satisfaction' and 'efficiency'; both constructs that could be overlaid constructs present in TA models.

In most studies utilizing TabletPCs in TA research, the use of these devices by the sample population was not entirely voluntary. Users who are obliged to use a device for all the tasks that they are given (or at least a considerable amount of them) might not show the same usage behaviour as users who only have a minimum usage requirement or no requirement to use at all. Furthermore, the action of purchasing or leasing such a device might influence the usage behaviour via the route of cost and pre-use involvement. This might set different expectations for the performance and usefulness of the device, affecting the intention to use ratings via fulfilment or non-fulfilment of these expectations.

Study 2 was run as a replication of Study 1 with a focus on Tablet-PC technology to test the comparability of multi-purpose and single function lifestyle technology. Literature based justifications for the first three hypotheses can be found in Study 1, to avoid unnecessary repetition.

Hypotheses:

Hypothesis 1: Technology Trust will explain a significant amount of variance with regard to Technology Acceptance (operationalized as 'intention to use') of lifestyle technology.

Hypothesis 2: Social Aspects of Technology will significantly increase the amount of variance explained, compared to the UTAUT model.

Hypothesis 3: The overall amount of explained variance of the LTAM (Lifestyle Technology Acceptance Questionnaire) will be higher than of the UTAUT alone with regard to lifestyle technology.

Hypothesis 4: The six factor levels (Competence, Integrity, Benevolence, Functionality, Reliability, Helpfulness) of Technology Trust will differ significantly between one-function and multi-function devices within the lifestyle technology segment.

This hypothesis is based on the differences between different technologies that can be found in terms of the performance of trust variables in the literature (Artz & Gil, 2007; Bisantz & Seong, 2001; Corbitt et al., 2003; Corritore et al., 2003; Escobar-Rodríguez & Carvajal-Trujillo, 2014; Fogel & Nehmad, 2009; Gefen et al., 2003; Gefen & Straub, 2004; Grabner-Kräuter & Bitter, 2013; Wang et al., 2015; Wu et al., 2014). This is in line with the Fixed-Effect Fallacy by Monk (2004). Whilst a Kruskal-Wallis analysis was conducted to compare between individual makes of devices in the E-Reader and the TabletPC categories, this comparison will serve as a differentiator between different classes of devices.

Several different studies have in the past included trust variables in their measures of (utilitarian) technology use, but no comparisons between technologies have been made so far.

11.2.2 Sample

This study was conducted using a sample of first year psychology students from the University of Westminster, London, and students from online platforms outlines before. The sample participating in the Tablet PC study included 177 individuals. Of these, 133 participants were from the University of Westminster, and 44 participants recruited via the Internet platforms mentioned above. The UK participants were mainly recruited through the RPS (Research Participation Scheme).

The age of the participants ranged from 18 to 68 years, with a mean age of 22.47, a median of 19 and a standard deviation of 8.922. Regarding gender, 74.6% of the participants were female (N=132), and 25.4% were male (N=45). This is likely to be due to the uneven gender distribution in Psychology. The ratio of females and males in that year at the University of Westminster (Psychology) was close to 3:1, based on internal statistics.

The main share of the sample population was from the UK (78.0%). The second largest group was from the US (17.5%). Over 40 % (40.7%) of the participants had a High School / GED equivalent education. 'Some college' education was the option selected by 24.3% of the participants, and 23.2% chose '2-year College Degree'. A '4-year College Degree' was chosen as the achieved level of education by 5.6% of the sample. Higher levels of education such as Master's or Doctoral degrees were indicated by 5.1% of the participants of this study (4.0% and 1.1%, respectively).

11.2.3Materials and Equipment

In this study, the same combination of surveys was used, that had already been piloted in Study 1. This included the full UTAUT as introduced by Venkatesh et al. (2003) as a basis for the survey. Onto this basis, the relevant trust and social interaction variables by Lankton and McKnight (2011) and Heerink et al. (2010) were added.

Furthermore, items from Yang and Yoo (2004) were added, which had not been used in this context before. The resulting LTAM (Lifestyle Technology Acceptance Model) survey was distributed amongst University of Westminster students, University of West London students, and via online platforms. These online platforms included the Research Participation Scheme (RPS) at the University of Westminster, and online notice boards at the University of West London.

11.2.4Protocol

Participants at the University of Westminster were given the chance to participate in this research via the RPS. Whilst no monetary incentives were given to the participants, the participants at the University of Westminster were able to earn participation credits, which are necessary for the students to successfully complete their first year of study. These credits could, as in Study 1, be earned by participating in any one or a combination of different studies, rendering the participation in this study entirely voluntary.

The participants from the University of West London were not offered participation credits for their involvement. This was due to this university no operating a similar system to the RPS. All participants were briefed regarding the potential benefits and costs of participation in the research, as well as the ethics clearance, consent and complaint procedures. After consenting to take part, the survey was made available. Completion time of the survey was estimated at approximately 30 minutes.

At the end of the questionnaire, participants were asked to confirm their consent a second time. This allowed them to withdraw from the study even after data collection, which would not have been possible otherwise due to the anonymous nature of the research. No overlap between the samples of Study 1 and Study 2 was permitted. This was regulated via online system filters, which did not allow participants to complete both surveys.

11.2.5Analysis

Following demographics and sample specific descriptive statistics, hypothesis testing will be outlined. This hypothesis testing mirrored questions that were discussed in Study 1, relating to the amount of variance accounted for by the new variables in the new hedonic technology setting.

Factor analyses were computed using SEM (Structural Equation Modelling) methods, to determine whether the factor structure of the first study still applied to this study of different technology. As the UTAUT (Venkatesh et al., 2003) had been developed for utilitarian technology settings, the applicability of it to E-Reader technology was not taken as an indicator that this would also be the case for TabletPC technology.

11.2.6Results

11.2.6.1 Computer and Internet Use

On average, participants reported to spend 25.54 hours a week (Median= 20, SD=21.676) in front of the computer. In terms of spending time on the Internet (without differentiation between devices) the mean time per week for this sample was 28.52 hours (Median=20, SD=30.028). The largest proportion of the participants (62.9%) indicated that they tend to use the Internet daily for communication purposes, while another 16.6% indicated to do so at least 2-3 times per week. Similar distributions can be found with regard to searching the Internet for general information, with 68.6% of the participants reporting to do so daily, and 20.6% indicating to do so 2-3 times a week.

11.2.6.2 Tablet PC Use and Tablet PC Brand

Most participants in this study had used a Tablet PC before (76.8%), with only one participant not being sure whether they had done so (0.6%). Large parts of the sample also indicated to either have ready access to a Tablet PC (44.3%) or having the intention to purchase such a device (16.5%).

On average, the participants who had access to a Tablet PC reported using this device about 11.80 hours per week (SD=17.209). The maximum reported number of hours per week was 90. One participant indicated to have access to the device but use it zero hours per week on average. The mode of the distribution was 2 hours per week.

A third of the sample reported using an Apple Tablet PC (33.3%), 5.6% indicated to use a Samsung device, 2.3% use a Blackberry device, and 1.1% use an Asus device. Further 6.2% of the participants reported using a device of a different make.

11.2.7 Fixed Effect Fallacy (Monk, 2004)

A pre-selection of cases was undertaken to only select the participants that were users of the technology, i.e. owned a device or had constant access to it. The Kruskal-Wallis test for the TablePC data set rendered a non-significant result at p=.290 (MC exact.: p=.302). This indicated that the groups were not inherently different.

It has to be taken into consideration in the interpretation of these results that the individual groups were of different size, which can have influenced the results.

No significant difference was found for the rating between different types of TabletPCs by the participants of this study.

Table 16: Kruskal-Wallis test results, Fixed Effect Fallacy, Study 2

			ITU
Chi-Square[a, b]			4.975
df			4
Asymp. Sig.			.290
Monte Carlo Sig.	Sig.		.302[c]
	99% Confidence Interval	Lower Bound	.290
		Upper Bound	.314

Note: a. Kruskal-Wallis Test; b. Grouping Variable: Make; Based on 10000 sampled tables with starting seed 622500317.

11.2.8 Confirmatory Factor Analysis (CFA) using Structural Equation Modelling (SEM)

Mirroring the factor analysis of Study 1, this data set was analysed using a confirmatory factor analysis (CFA) based on the structural results of Study 1. This CFA was run using PLS modelling, following the factor validity guidelines by Gefen and Straub (2005). The factor loading structure can be found in Table A 15 in Appendix 3. All loadings are structured as expected, and the individual factors did not show excessive cross-loading. The loadings for the variable Facilitated Conditions were, at least in part, poor. The construct was however retained in the analysis to allow the full UTAUT to be tested. Given the solid factor structure found in previous research (Williams et al., 2015), the difference in loading might relate to either the sample or the application of the UTAUT to lifestyle technology.

Following the analysis of the factor structure, the correlations between the factors were compared to their Average Variance Explained (AVE) values. The square root of the AVE values, which should be used as the comparative measures to the correlation coefficients (Gefen & Straub, 2005), can be found on the diagonal in Table A 16 (Appendix 3) in bold print. None of the correlation coefficients was higher or equal to the square root of the AVE, thereby indicating a clear factor structure.

For this analysis Spearman's correlation coefficients were run as not to assume normal distribution of the data or equality of variance.

11.2.9 Moderation Analyses, Study 2

In line with the analysis of Study 1, a moderation analysis was carried out for this data set regarding the variable Experience. For this analysis, the data set was split into users and non-users of the technology, with people reporting to be unsure whether they have used this type of technology before being classified as non-users.

No moderation effects were found for any of the UTAUT variables or social variables. The only moderating effect of Experience on Intention to use was found with the variable Helpfulness.

The results of the moderation analysis for the effect of Experience on the relationship between Helpfulness and Intention to Use can be found in Table 17. Helpfulness therefore had a larger impact for people who did not have experience with this technology, in terms of their self-reported intention to use the technology.

Table 17: Moderation Analysis of Experience on Helpfulness in Study 2

	beta	SE	t	sign.	LLCI	ULCI
Constant	14.479	3.007	4.815	0.001	8.541	20.417
Experience	-6.396	2.033	-3.147	0.002	-10.409	-2.383
Helpfulness	-0.031	0.267	-0.114	0.909	-0.558	0.497
Interaction	0.440	0.186	2.366	0.019	0.073	0.806

Note: R^2=.280

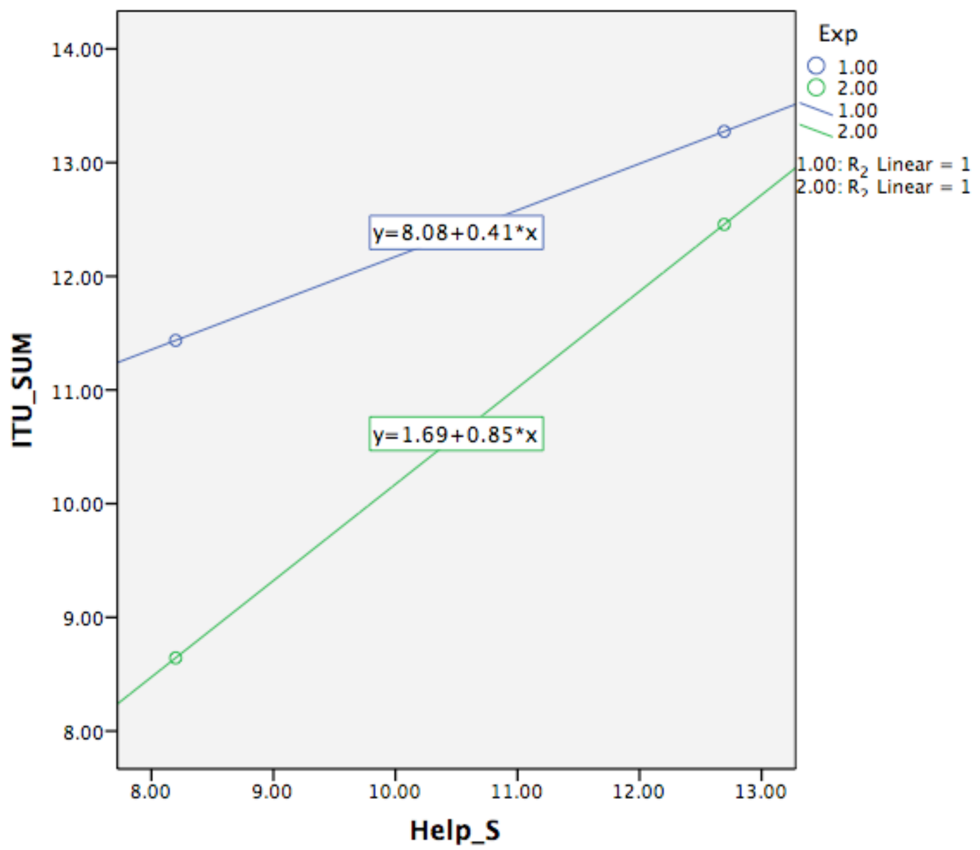

Figure 8: Plotted moderation Effect of Experience on Helpfulness in Study 2

11.2.10 Regression Analyses, Study 2:

This set or regressions started with the UTAUT model, to which the different variable sets were added one by one in all possible iterations. An overview of the results in terms of the amount of variance accounted for and the change in this amount between the models can be found in Table 18.

Table 18: Model comparisons for Study 2

Model	Base	Addition	R^2	Adj. R^2	ΔR^2	F Δ	Df 1	Df 2	Sig.
1	UTAUT	(none)	.516	.491	.516	19.206	8	160	<.001
2	UTAUT	Trust	.557	.514	.041	1.917	7	153	.070
3	UTAUT	Social Variables	.541	.509	.025	2.705	3	157	.047
4	UTAUT + Trust	Social Variables	.569	.517	.012	1.253	3	150	.293
5	UTAUT + Social Variables	Trust	.569	.517	.028	1.290	7	150	.256

Table 19: Model coefficients for UTAUT (with experience), Study 2

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> ITU	-0.054	-0.062	0.070	0.777	0.437	-0.203	0.075
ATT -> ITU	0.511	0.496	0.094	5.460	0.000	0.303	0.672
CSE -> ITU	0.009	0.015	0.063	0.140	0.888	-0.111	0.141
Experience -> ITU	-0.122	-0.119	0.066	1.849	0.065	-0.248	0.010
FAC -> ITU	0.074	0.089	0.065	1.133	0.257	-0.034	0.219
PEOU -> ITU	0.045	0.032	0.082	0.546	0.585	-0.129	0.194
PU -> ITU	0.063	0.064	0.080	0.777	0.437	-0.091	0.226
SI -> ITU	0.081	0.089	0.064	1.272	0.204	-0.029	0.222

Note: A full overview of model parameters can be found in Appendix 3. The variable Experience was added at this stage to allow for the addition of moderation effects in the form of interaction variables based on Experience at a later stage.

11.2.11 Hypothesis Testing

Hypothesis 1: Technology Trust will explain a significant amount of variance with regard to Technology Acceptance (operationalized as 'intention to use') of lifestyle technology.

In the first iteration, the UTAUT was tested against a model that combined the UTAUT and the trust related variables, using PLS. This addition of trust variables was non-significant, with $F_{(7, 153)}$=1,917, p=.070. The amount of variance accounted for increased from 49.1% (adj. R^2, R^2=.516) to 51.4% (adj. R^2, R^2=.557). The individual path coefficients for this combination model can be found in Table 20.

Table 20: Model coefficients for UTAUT plus trust variables, Study 2

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> ITU	-0.065	-0.073	0.073	0.894	0.372	-0.223	0.066
ATT -> ITU	0.369	0.361	0.097	3.796	0.000	0.166	0.548
Benevolence -> ITU	-0.068	-0.053	0.085	0.801	0.423	-0.220	0.119
CSE -> ITU	0.008	0.013	0.064	0.121	0.904	-0.113	0.140
Competence -> ITU	0.160	0.156	0.104	1.532	0.126	-0.045	0.363
Experience -> ITU	-0.121	-0.116	0.066	1.837	0.066	-0.244	0.015
FAC -> ITU	0.029	0.045	0.072	0.405	0.686	-0.099	0.183
Functionality -> ITU	0.024	0.016	0.108	0.225	0.822	-0.189	0.237
Helpfulness -> ITU	0.067	0.068	0.078	0.860	0.390	-0.089	0.223
Integrity -> ITU	0.121	0.120	0.076	1.605	0.109	-0.027	0.268
Interaction Effect: Experience -> Helpfulness -> ITU	0.329	0.308	0.203	1.619	0.106	-0.110	0.700
PEOU -> ITU	0.065	0.052	0.077	0.847	0.397	-0.100	0.198
PU -> ITU	0.026	0.028	0.086	0.306	0.760	-0.140	0.202
Reliability -> ITU	-0.041	-0.042	0.090	0.451	0.652	-0.221	0.132
SI -> ITU	0.087	0.088	0.064	1.349	0.178	-0.036	0.219

Note: A full overview of model parameters can be found in Appendix 3.

In a second step, mirroring the analysis procedure using in Study 1, the trust related variables were added to a model composed of the UTAUT plus the social variables. This led to a non significant increase of amount of variance accounted for in the model ($F_{(7, 150)}$= 1.253, p=.256). The path coefficients for this model can be found in Table 21, below.

Table 21: Model Coefficients for UTAUT plus social variables plus trust, Study 2

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> ITU	-0.038	-0.046	0.078	0.492	0.623	-0.201	0.105
ATT -> ITU	0.347	0.337	0.114	3.037	0.002	0.113	0.567
Benevolence -> ITU	-0.070	-0.058	0.084	0.832	0.405	-0.224	0.108
CSE -> ITU	0.019	0.014	0.073	0.261	0.794	-0.134	0.153
Competence -> ITU	0.096	0.086	0.110	0.871	0.384	-0.130	0.299
Experience -> ITU	-0.105	-0.100	0.068	1.554	0.120	-0.233	0.035
FAC -> ITU	0.018	0.038	0.071	0.258	0.797	-0.106	0.176
Functionality -> ITU	0.018	0.006	0.107	0.166	0.868	-0.199	0.224
Helpfulness -> ITU	0.048	0.042	0.078	0.620	0.535	-0.109	0.195
Image -> ITU	-0.045	-0.036	0.077	0.584	0.559	-0.206	0.103
Integrity -> ITU	0.118	0.120	0.073	1.614	0.107	-0.027	0.263
Interaction Effect: Experience -> Helpfulness -> ITU	0.371	0.353	0.215	1.724	0.085	-0.099	0.768
PEOU -> ITU	0.052	0.037	0.078	0.668	0.504	-0.120	0.191
PU -> ITU	0.042	0.045	0.086	0.487	0.627	-0.115	0.226
Perceived Enjoyment -> ITU	0.032	0.033	0.119	0.269	0.788	-0.197	0.273
Reliability -> ITU	-0.025	-0.024	0.094	0.262	0.793	-0.206	0.173
Reputation -> ITU	0.131	0.138	0.074	1.766	0.078	-0.011	0.286
SI -> ITU	0.083	0.083	0.071	1.179	0.238	-0.048	0.230

Note: A full overview of model parameters can be found in Appendix 3.

Based on this analysis, Hypothesis 1 was, overall, rejected. The Technology Trust variables did not explain a significant amount of variance regarding Technology Acceptance (Intention to Use) when added to the UTAUT, with and without further extensions present.

Hypothesis 2: Social Aspects of Technology will significantly increase the amount of variance explained, compared to the UTAUT model.

A regression analysis run on this data set in two stages returned two significant models. UTAUT was significant with $F_{(8, 160)}$= 19.206, p<.001. Also, the model combining UTAUT and the social variables was significant with $F_{(11, 158)}$=12.994, p<.001.

The change in R^2 of .025 regarding the variance explained by the model was also significant with $F_{(3, 158)}$=2.705 p=.047. This model, including the social variables, accounted for 50.9% of variance (adj. R^2; R^2=.541). Model coefficients can be found in Table 22.

Table 22: UTAUT plus social variables, Study 2

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> ITU	-0.012	-0.019	0.074	0.158	0.874	-0.161	0.128
ATT -> ITU	0.396	0.379	0.112	3.545	0.000	0.156	0.602
CSE -> ITU	0.023	0.018	0.076	0.299	0.765	-0.139	0.157
Experience -> ITU	-0.114	-0.109	0.066	1.711	0.087	-0.239	0.022
FAC -> ITU	0.048	0.067	0.066	0.732	0.464	-0.056	0.200
Image -> ITU	-0.046	-0.039	0.072	0.637	0.524	-0.204	0.096
PEOU -> ITU	0.029	0.014	0.084	0.342	0.733	-0.145	0.176
PU -> ITU	0.045	0.044	0.080	0.569	0.569	-0.107	0.204
Perceived Enjoyment -> ITU	0.119	0.119	0.109	1.096	0.273	-0.096	0.335
Reputation -> ITU	0.154	0.157	0.072	2.157	0.031	0.016	0.305
SI -> ITU	0.077	0.084	0.072	1.071	0.284	-0.053	0.226

Note: A full overview of model parameters can be found in Appendix 3.

Again mirroring the analysis procedures used in Study 1, the social variables were also added to a model that combined the UTAUT and the trust variables. This resulted in a non-significant change in terms of R^2 with $F_{(3, 150)}$=1.290, p=.293. The path coefficients for this can be found in Table A 28, Appendix 3.

Overall, the hypothesis was accepted, as the social variables added significantly to the UTAUT with no other extensions present.

Hypothesis 3: The overall amount of explained variance of the LTAM (Lifestyle Technology Acceptance Questionnaire) will be higher than of the UTAUT alone with regard to lifestyle technology.

The UTAUT with the moderator Experience accounted for 49.1% of the variance (adj. R^2, R^2=.516.). The LTAM model with split trust constructs accounted for 51.7% of the variance (adj. R^2, R^2=.569). This increase in variance accounted for was non significant ($F_{(19, 214)}$=1.569, p=.069). Variance inflation factors (VIF) and tolerance values were obtained (Appendix 3), and were within reasonable bounds (Field, 2009). Hypothesis 3 was overall rejected.

Hypothesis 4: The six factor levels (Competence, Integrity, Benevolence, Functionality, Reliability, Helpfulness) of Technology Trust will differ significantly between one-function and multi-function devices within the lifestyle technology segment.

The testing of this hypothesis required a data merging regarding the data obtained for the technology acceptance with regard to E-Reader and the technology acceptance with regard to Tablet PCs. This resulted in a data set consisting of 423 cases. A 2 by 6 mixed Analysis of Variance (ANOVA) was carried out to test this hypothesis. Using the type of technology as a between subjects factor, the ANOVA was run including all 6 sub-factors of technology trust, with reference to Lankton and McKnight (2011). A test of equality of homogeneity of variance indicated the data set to be problematic. This was resolved by halving the significance level from .05 to .025, in line with Keppel (1992).

Maulchy's test of Sphericity was significant at p<.001. As the Greenhouse-Geisser value was above the recommended cut-off of .750 (Field, 2013), the Huynh-Feldt estimate was used.

Table 23: Homogeneity of Variance, Hypothesis 4, Tablet PC

Variables	Levene Statistic	df1	df2	Sig.
Functionality	3.963	1	404	.047
Competence	5.402	1	404	.021
Reliability	6.809	1	404	.009
Integrity	4.484	1	404	.035
Helpfulness	1.531	1	404	.217
Benevolence	0.927	1	404	.336

A main effect was found for the trust variables with $F_{(3.948,\ 1595.026)}$=745.366, p<.001. A main effect was also found for the type of technology with $F_{(1,\ 404)}$=5.097, p=.024. This was still in line with the halved significance levels based on the adjustment suggested by Keppel (1992). No interaction was found between the type of technology and the trust variables ($F_{(3.948,\ 1595.026)}$=0.902, p=.461). Whilst there was an overall difference in trust scores between the two technologies, this did not hold up on an individual trust aspect level. Therefore, Hypothesis 4 was rejected.

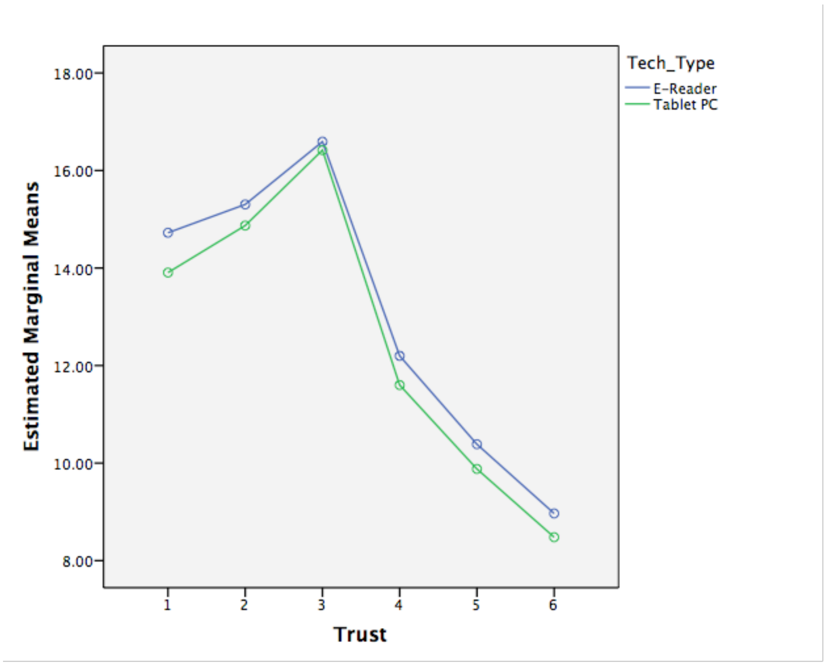

Figure 9: Estimated marginal means of trust scores across different technology types

Note: 1: Functionality; 2: Competence; 3: Reliability; 4: Integrity; 5: Helpfulness; 6: Benevolence

11.2.12 SEM

Following from the CFA, a structural equation model (SEM) was established to compare the regression model that was established in Study 1 (E-Reader study) with the new data set, and to confirm, whether this model is applicable. This would render the model group invariant on two separate accounts. On the one hand, the students who completed the studies are from a different sample population, and therefore the data is different. Furthermore, the model would be technology invariant. This is important to note, as the final model to be established will have to be invariant to changes in technology. In the initial TA research this can be considered to have been less of a difficulty, as most of the models were initially tested with workplace software and computers in general. Looking at lifestyle technology however, the amount of different technologies is considerable and will have to be taken into account when modelling for technology acceptance.
The variables that were used for this SEM were all selected for having been used in the E-Reader regressions.

The benefit of running a SEM was that it allowed for the regression paths to be determined in more detail. This led to a better understanding and more detailed outline of the model, as the regression factors were no longer considered having an effect only on one level of abstraction or complexity. Furthermore, this opened up more questions regarding the structure of the model that should be used in the future and the interplay between the individual factors and constructs. The final model that emerged is depicted in Figure 10. Differences in variance accounted for are due to the difficulties of identifying outliers in terms of the more complex model structure. All cases were included for this modelling.

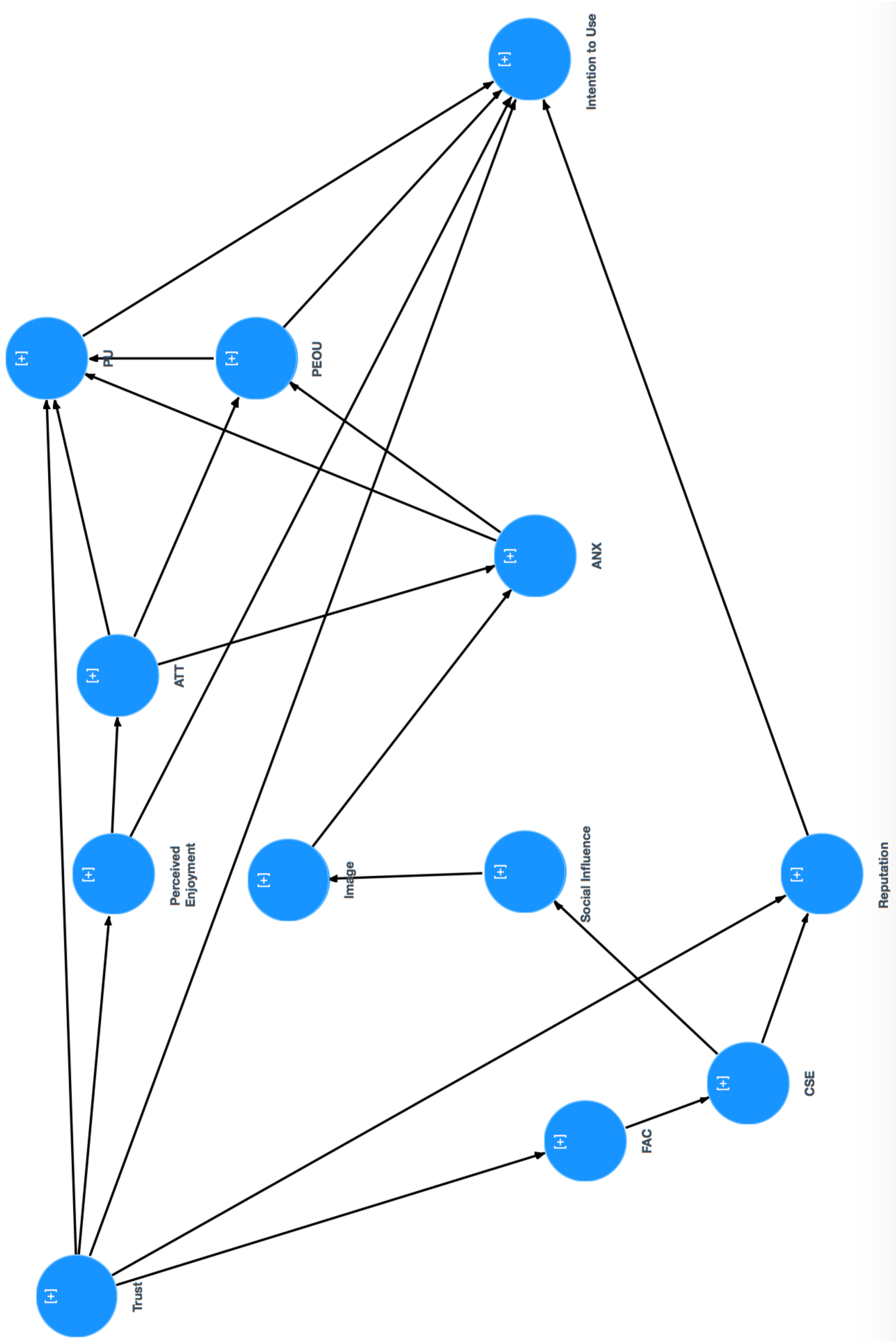

Figure 10: Final SEM for Tablet PC Study

11.3 Study 2: Discussion

In the hypothesis testing of this second study, the trust variables did not preform well in terms of adding significantly to the UTAUT (Hypothesis 1). This was contrasting to the findings of Study 1. It had been expected that the trust variables would perform equally well for the different types of technology. Whilst the results did not indicate the trust variables to be significant predictors, they were approaching significance in some iterations. This might indicate a sampling bias.

The addition of social aspect variables was however significant, even in different iterations (Hypothesis 2). This significant addition showed that the UTAUT does not cover these aspects in terms of variance yet, and that such an addition to the model was warranted. This even held up for a model that included trust variables already, indicating that the differentiation between the two constructs is reasonable.

Especially the fact that the social variables held up throughout the different iterations was remarkable, as this had not been the case in Study 1.

In Hypothesis 3 the LTAM was tested against the UTAUT in terms of overall amount of variance accounted for. The LTAM as a whole did not add significantly to the UTAUT in terms of variance accounted for. A possible reason for this is the low loadings of the trust variables.

Looking into potential differences in the way that trust variables are perceived to apply to different types of technology (Hypothesis 4), a difference between the technologies and the trust ratings became apparent. There were significant differences between the way that functionality, competence, reliability and integrity were perceived for the different device classes – single function (E-Reader) versus multi function (TabletPC). Even though 4 two out of six trust variables showed significant differences, this can be seen as an indication that the split between these device classes is not merely theoretical.

Limitations:

A limitation of the hypothesis testing for Hypothesis 4 was that the research design was not a repeated measures design, therefore the differences could not be measures based on identical participant sets.

11.3.1Building the LTAM model

The CFA run with SEM returned results that were very positive regarding the addition of the trust components to the model. The invariance multi-group analysis held up in a randomized data split (Table A 17). This indicated that there are no larger, non-specified underlying factors that are affecting the model.

The final LTAM model that was established in the PLS based SEM (Structural equation modelling) showed that the Trust variables are a base factor in the model. The Perceived Enjoyment, Reputation, and Image related variables were influencing other parts of the model. This had not been anticipated, as the impact of Image had been expected to be more of a direct influence on ITU (Intention To Use).

Referring back to the introductory chapters regarding technology acceptance and its origins, the connection in the model between Perceived Ease of Use and Perceived Enjoyment is of importance. As mentioned in the first chapter, the possible cross-over effect and covariance of these variables has been scrutinized by researchers in the past (Davis, 1989). In this model, it became clear that the Perceived Enjoyment variables were situated at 'input level' in the model, especially with regard to PEOU, in line with findings and suggestions by Igbaria et al. (1996).

Perceived Ease of Use was considered by some (Davis, 1989; Sun & Zhang, 2006; Venkatesh & Davis, 2000; Venkatesh et al., 2003) to be more important in terms of regression weights on ITU (Intention to Use) than Perceived Enjoyment. This is however not accurate for this model. The direct effect of Perceived Enjoyment outweighs the input of the individual PEOU factors.

The direction of the regression path also partially answers the question whether Perceived Enjoyment is a function of PEOU or an effect. It may conceptually be a function of PEOU, but in regression terms it is a predictor of PEOU. Also, it is an independent factor accounting directly for variance of the measurement variable ITU (intention to use). Whilst the conceptual standing of Perceived Enjoyment remains open, this study suggests that it is a factor in its own right with direct effect; at least in a hedonic technology interaction and technology acceptance setting.

The interplay between the PEOU and PU (Perceived Usefulness) variables was highlighted by Sun and Zhang (2006) and Venkatesh and Davis (2000) and was discussed in the first chapter.

11.3.2 Comparison of LTAM with previous models

Venkatesh and Bala (2008) suggested the link between Perceived Enjoyment and Perceived Ease of use in their TAM3 model. This link was suggested in the research model in the form of Perceived Enjoyment being a predictor variable of PEOU. This link did however not reach the end stage of the model, as it is not featured in the model schematics (Venkatesh & Bala, 2008; Tang & Cheng, 2011).

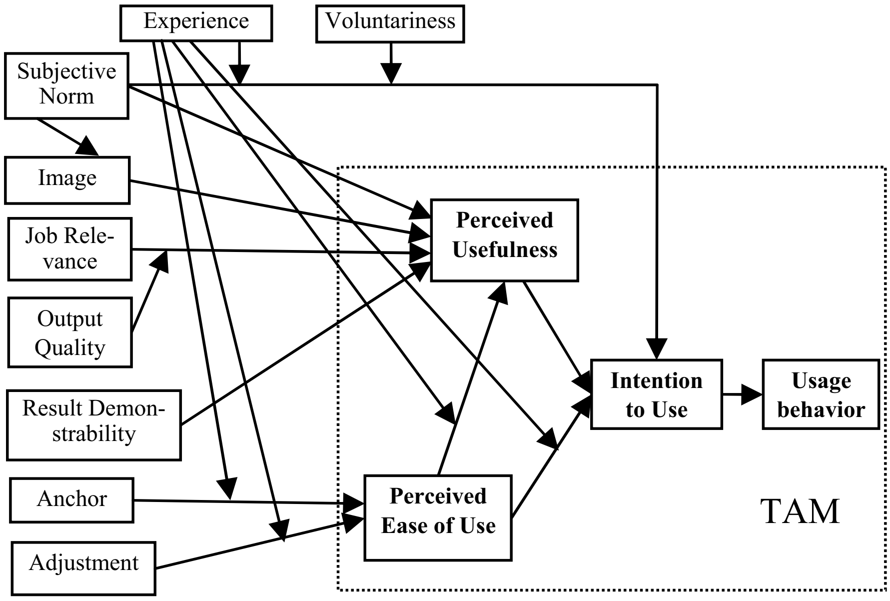

Figure 11: Technology acceptance model 3 (Venkatesh & Bala, 2008) (Tang & Cheng, 2011, p.590)

Underlying factor structures of the core TAM constructs were discussed by Venkatesh & Bala (2008). Table 24 gives an overview of the Perceived Ease of use and Perceived Usefulness constructs and their suggested sub-constructs. In line with the Attitudes Towards Technology construct in the UTAUT (Venkatesh et al., 2003), the construct Perceived Enjoyment should feature in the final model schematics of the UTAUT and TAM3. Given the amount of variance accounted for by this construct, the LTAM schematics clearly feature this construct.

Table 24: Underlying Constructs of TAM core constructs as proposed by Venkatesh and Bala (2008; see pp.277, 279)

Underlying Constructs of Perceived Usefulness	Underlying Constructs of Perceived Ease of Use
Perceived Ease of Use	Computer Self-Efficacy
Subjective Norm	Perception of External Control
Image	Computer Anxiety
Job Relevance	Computer Playfulness
Output Quality	Perceived Enjoyment
Result Demonstrability	Objective Usability

11.4 Summary of Part 2: E-Reader and TabletPC Technology Acceptance

This part of the research has shown the methodology of the studies used, and introduced the findings from two studies regarding lifestyle technology. Results from both studies were regarded as a successful test of the newly established first stage of the LTAM model. The hypothesis testing highlighted the accurate split between these two technologies as different classes or routes to technology interaction.

Regarding the confirmatory aspect of the second study, the constructs established in the existing literature were reproducible and showed good internal consistency and construct validity in the modelling.

Attention has to be drawn explicitly to the performance of variables from the trust constructs introduced by Lankton and McKnight (2011). These variables accounted for significant amounts of variance in the first test of the model. Whilst these variables have to date not been tested in a context with either E-Reader technology or TabletPCs, their importance for the overall area of lifestyle technology becomes apparent with regard to the increase in variance accounted for in the model tests.

12 Part 3 Cognitive Ability and Trust variables in younger and older populations

12.1 Introduction to Part 3:

Trust variables were shown in the previous part to play an important role in TA modelling. Following this, new constructs were introduced to the model that was established in Study 2, which had been shown in previous research to be significant predictors of self-reported intention to use a system (ITU). At the core of these additions was the construct 'Cognitive ability'.

The following two chapters are focussed on research into cognitive ability and the circular relationship between cognitive ability, ageing, and technology acceptance. Based on these findings and relationships, cognitive ability measures were added to the model, which is discussed at a later point. These measures have not been used in TA modelling before, and are likely to reduce the amount of time and resources involved drastically.

12.2 Chapter 6:

12.2.1 Technology Ecosystems, Cognitive Ability and the Ageing Population

Czaja et al. (2006) highlighted that the interaction with new technology is linked to the requirement of acquiring new knowledge about the technology. This type of technology specific learning is likely to be linked with intelligence (Ackerman, Beier, & Boyle, 2005; Rogers, Hertzog, & Fisk, 2000). Technology acceptance is classically based on factors from the environment of the user or within his or her perception of technology. The environmental factors cover social support and peer group usage, amongst others.

Ease of use and functionality are aspects more closely linked with perception of technology. The newly introduced trust variables add a different dimension to the existing models. When thinking about the user base of technology, not all users will find the same technology equally easy to interact with. Recent media coverage highlighted some people struggling to use the latest technology to replace parts of their everyday routine. A prime example of this is the use of Smartphones and Apps to pay for parking in UK cities (Boocock, 2013).

Other similar experiences were reported recently, covering all aspects of life, including healthcare (Royer, 2010), mobile phone use (O'Brien, 2013), online services such as banking (Jeffries, 2007) and household appliances (Shaw, 2012). There is however one user group who seem to suffer in particular when adapting to new technology: older users. The existing TA models have proven to be applicable to members of different age groups (Birnholtz, 2010; Brown et al., 2006; Morris & Venkatesh, 2000), indicating that for workplace technology age of the user is less of an issue (Magsamen-Conrad et al., 2015). It is then important to narrow down the differences between younger and older users that could influence perception of technology in the lifestyle sector. Likewise, physical changes with age will play a role for some devices as well, as dexterity and motor skills are likely to decrease.

However, cognitive ability is of primary importance for a generalizable model. In this chapter, the interplay between cognitive ability and ageing will be addressed. The main connection is a circular relationship between Technology Acceptance, Cognitive Ability, and the Ageing Population (see Figure 12). The inclusion of cognitive ability measures in technology acceptance modelling can have an effect on the technology acceptance and usability perceptions of older people regarding technology in the future. Technology that was designed with differences in cognitive ability in mind, are more likely to be 'acceptable' to people suffering from age-related cognitive decline. Taking this into account, the variance in cognitive ability in users becomes of interest. The natural fluctuation of cognitive ability over the human lifespan could potentially be used as a predictor of the acceptance of new technology.

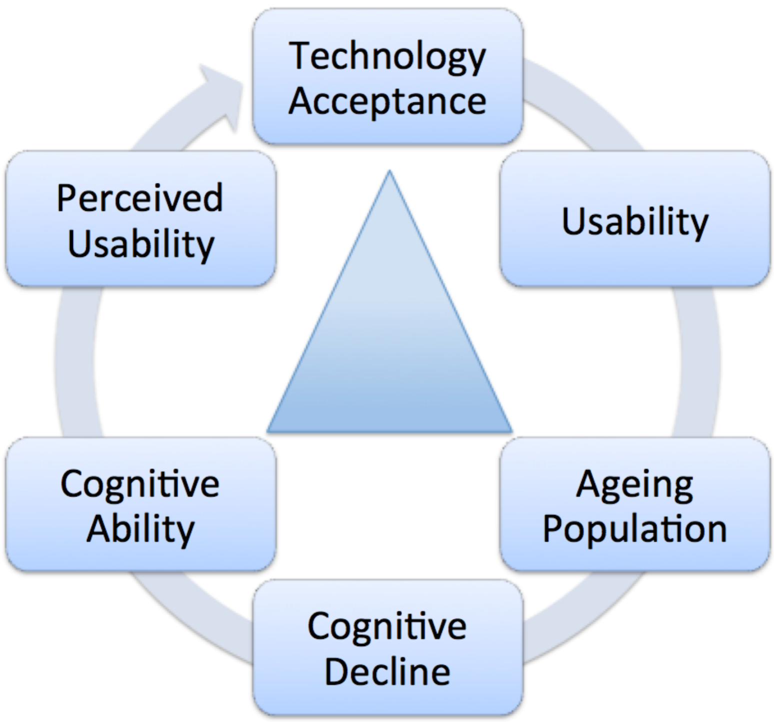

Figure 12: Circular Relationship of TA, Age and Cognitive Ability

Previously introduced studies focused on a relatively narrow spectrum in terms of age range, with most participants being students. Focusing on the younger user groups only provides partial information regarding predictors that can be used for TA.

Different demographic groups offer more factors that can be taken into account. Age-related changes in brain structure/function and the subsequent impact on cognitive ability have been highlighted by recent research (Czaja et al., 2006). These can be considered possible areas of interest for TA research.

12.2.2 Demographic Change: The ageing population

In most developed countries, the population is ageing. This change in demographic structure is predicted to continue over the next decades. The average age of citizens will increase and the number of people in retirement is likely to outnumber the people who are in paid employment. The UK demographic predictions will be taken as an example to indicate the severity of the change in the demographic structure.

The UK had a population of approximately 61.8 million at the beginning of 2010 ("Healthcare report," 2010). Of these, approximately 21% were under the age of 16 in the year 2009. The number of people aged 85 and over has been estimated to be approximately 1.4 million for the same time. These numbers have been significantly different in the past as pointed out by the Office for National Statistics, who compared these numbers with the data available for 1984 (ONS, 2013).

Within the timeframe of 25 years (1984 to 2009) the percentage of people under the age of 16 has dropped by three percent while the number of people over the age of 85 has doubled. According to predictions of the ONS for the next 25 years (i.e. year 2034), the UK will face more than a doubling of numbers in the group of over 85 year olds and a decrease of a further percent among the under 16 year olds.

12.2.3 Cognitive Decline

Fillit and Butler (2006) noted that the zenith of intellectual performance in humans is typically reached in the 40s to 50s. The amount of life experience gained at this point and its positive effects on intellectual performance have not yet been noticeably compromised by degradation in neural performance. However, other research has shown that the biological degradation sets in at ages as early as 30 years (Craik & Bialystok, 2006; Zelazo, Craik, & Booth, 2004).

According to Fillit and Butler (2006), most people show noticeable cognitive decline by the age of approximately 70 years. Age related cognitive decline has to be seen separately from pathological changes in brain structure and performance, such as dementia. Normal decline in cognitive performance can be seen as significant but manageable, especially when compared to the person's performance in previous years of life. Coping strategies are often developed by the affected person to manage these changes.

These coping strategies are mostly built around the cognitive strengths of a person, allowing them to compensate their lowered cognitive performance in certain aspects of life (Fillit & Butler, 2006).

Czaja et al. (2006) showed that the decline of abilities is not linear. It varies between abilities and between individuals in terms of rate and nature of the decline. This means that some abilities may well begin to decline in early adulthood, while others remain unchanged or even increase into older age, before notable declines occur in very old age. An example of the latter can be found in numerical abilities, which reach their maximum level of performance rather late in life (compare Czaja et al., 2006; Czaja, Sharit, Ownby, Roth, & Nair, 2001; Salthouse, 2001; Schroeder & Salthouse, 2004). Overall, this can be seen as an argument for the use of specific measures of cognitive ability and brain functioning, rather than composite scores as found in previous studies (e.g. Czaja et al., 2006).

There are multiple theories trying to account for and describe cognitive decline. These theories can generally be divided into theories that argue that a large amount of the variation is explained by a single overall psychological / cognitive factor such as *g* (Spearman, 1904), and more modular theories that focus on individual differences in neurobiological structure and function (Gruber & Goschke, 2004). The key issue at this point however is not the type of change that can be observed over a human lifespan, but the fact that there are observable and reasonably predictable changes in cognitive ability. There might be different types of decline and certain abilities might suffer more from neurological decline than others. However, it is the general loss of cognitive ability that is the driving factor for inclusion of cognitive ability measure in technology acceptance measures.

There is generally much variability within the ageing population, leading to some people ageing in a more 'successful' way than others. Fisk and Rogers (2002) defined Successful Ageing as the ability to keep several key factors existent: "low probability of disease and disease-related disability, high cognitive and physical functional capacity, and active engagement with life" (Rowe & Kahn, 1997, p.433; compare Jang, Mortimer, Haley & Graves, 2004; Liang & Lou, 2012).

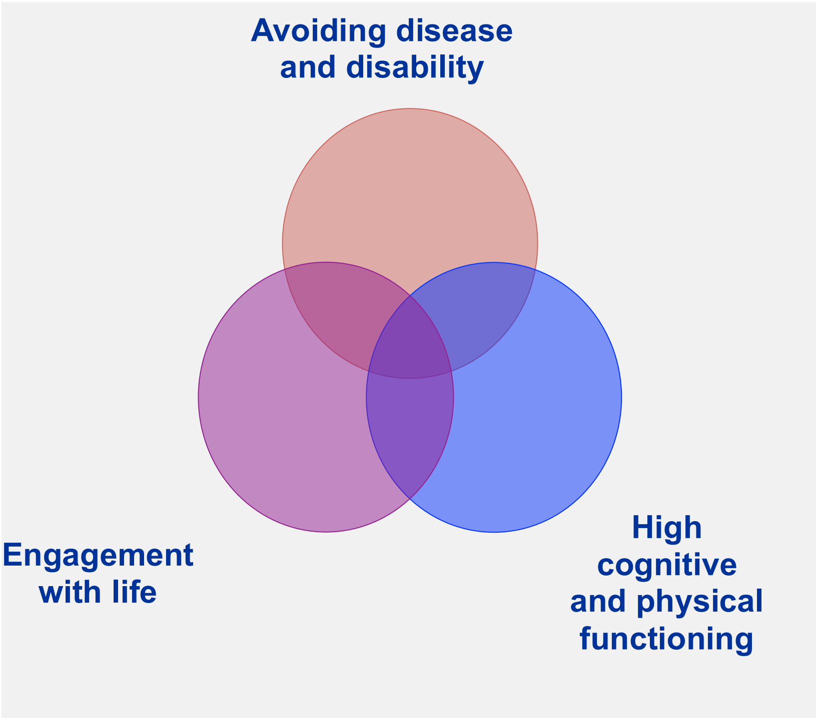

Figure 13: Successful Ageing according to Rowe and Kahn (1997)

With a close link to the concept of successful ageing, Fillit and Butler (2006) highlighted the different aspects that are regarded as beneficial for retaining cognitive health in old age. These include behaviour that "reduces the risk of chronic illnesses and cardiovascular disease, a socially stimulating environment, a positive attitude toward previous life events and a relatively flexible personality" (Fillit & Buttler, 2006, p. 8). Contrasting to this a lack of social support can have negative influences on the onset of cognitive decline.

The aspect of a socially interactive lifestyle links to the technology acceptance related studies carried out by Heerink et al. (2010). These studies focused on electronic social interaction agents and avatars.

The interaction with technology in a 'personal' or 'socially facilitative' way was reportedly perceived as a positive experience. It furthermore accounted for variance regarding intention to use.

Looking at technology use, interaction with computerized equipment and services varies considerably in terms of the cognitive demand it makes. The more complex a system is, the greater the cognitive demand and the greater the potential impact on actual and perceived ease of use. Limited spatial working memory functioning, for instance, could affect the perceived ease of use of an interface design and menu structures. Lowered performance in spatial working memory in advanced age has been found in several different studies (Hart & Bean, 2010; Libon et al., 1994). Similarly, learning new routines for using programs might be affected by a reduced capacity regarding fluid intelligence.

Effects on test performance were found in studies regarding elements of intelligence, especially regarding fluid intelligence or *g*(F) (Craik & Bialystok, 2006; Spreng, Wojtowicz, & Grady, 2010). A very thorough overview over cognitive ability and executive functioning related studies with a focus on age can be found in Turner and Spreng (2012). A link between age and personality factors was found in a study regarding techno-stress by Anthony et al. (2000). It was reported that age and neuroticism were related, which might have implications for technology acceptance. For this reason a short personality measure will be included in the research to link age, cognitive decline, personality, and their impact on TA.

Overall executive functioning has been shown to decline with age as well (Kray, Eber, & Lindenberger, 2004; Kray, Li, & Lindenberger, 2002; Smart & Krawitz, 2015; Wilson et al., 2015; Zahodne, Stern, & Manly, 2015). Angel et al. (2010) referred to the change of aspects of memory that determine the underlying structure of memory functioning with increased age. This was mentioned in addition to the changes to episodic memory, which cannot be seen as a uniform, but individually different effect (Angel et al., 2010).

A very good review of the differences in approach in terms of the concepts of retaining of ability and availability of access to functions in older age can be found in Craik & Bialystok (2006). They discussed the idea that the abilities and capabilities remain the same, however are less accessible due to the decline of the governing control processes (Craik & Bialystok, 2006; compare Nelson, 1996).

In conclusion, strong evidence exists for a change of cognitive ability in people over the lifetime, and cognitive decline with age. Challenges of cognitive decline and possible effects on use of technology highlight the importance of assessing cognitive ability factors in TA. This is especially the case considering the demographic shift.

Inclusion of cognitive ability measures in TA could lead to a change in systems design, allowing people of older age or with cognitive impairments to interact with technology more easily. This could help keeping such users more socially connected. The key reason to focus on cognitive ability, rather than age, is the accuracy that can be achieved with the new measurement tools, as will be outlined in the following chapter. Rather than developing technology suitable to specific age groups, this way of modelling might help engineers and designers to make systems accessible for a wider range of users via the route of cognitive ability.

12.3 Chapter 7: Technology Acceptance and Cognitive Ability

Research has shown the importance of different cognitive aspects such as memory functioning and processing speed for the successful use of technology (Czaja et al., 2001; Sharit, Czaja, Nair, & Lee, 2003). Nevertheless, as Czaja et al. (2006) pointed out, this had so far not been used to predict the use of technology in terms of technology acceptance.

The rationale behind the focus on cognitive factors and attitudinal variables in Czaja et al. (2006) was that previous research had indicated the importance of socio-demographic and performance variables in technology interaction. Rogers et al. (2000) included aspects of cognitive functioning and learning as predictors of successful interaction with technology. The overall rationale seemed limited in that it lacked facilitating conditions or factors such as 'perceived ease of use' and 'perceived usefulness'. These are factors that are unlikely to be covered by attitudinal variables and cognitive aspects that facilitate technology interaction.

Czaja et al. (2006) assessed the impact of a range of specific cognitive functions on the reported levels of technology acceptance and computer use. This was measured for three different age groups: the youngest group selected was between the age of 18 and 39, the middle group between 40 and 59, and the oldest group between 60 and 91 years of age. Especially the choice of the last age range has to be critically considered. This age band covers the time in which most cognitive changes occur, thereby making it a very heterogeneous group, both cognitively as well as culturally. The predetermined factors assessed were Crystallized Intelligence, Fluid Intelligence, Memory, Psychomotor Speed and Perceptual Speed, Technology Acceptance and computer use. Table 25 summarizes the composition of these factors in terms of scales used. 'Use of technology', in this case computer use, was predicted using hierarchical regression models, leading to 45.5% of the variance being explained (adj. R^2) by the model. These results form the base for the set up of Study 3.

General use of technology has in this context to be interpreted as 'use of different types of technology', instead of 'intention to use' or even 'actual technology use'. Both alternatives are more common in TA literature.

Use of technology in general was best predicted by the factors "education, age, ethnicity, fluid and crystallized intelligence, computer anxiety and computer self-efficacy" (Czaja et al., 2006, p.341). In people with lower levels of fluid intelligence, higher levels of computer self-efficacy predicted the use of technology (R^2 =.450) better. Fluid intelligence had been hypothesized by Czaja et al. (2006) to be of high importance for TA. Fluid intelligence decreases over time and will therefore be negatively correlated with age; as opposed to crystallized intelligence, which can increase, or remain relatively constant, with age (Nisbett et al., 2012).

Table 25: Factor – Scale – Composition of Czaja et al. (2006) study

Factor	Test / Scale	Overlap with factor
Crystallized Intelligence	Reading Comprehension	Perceptual Speed
	Multi Aptitude Battery	
	WAIS-III (Intelligence)	
	Shipley	
	Inference Test	Fluid Intelligence
Fluid Intelligence / Executive Function	Inference Test	Crystallized Intelligence
	Alphabet Span	
	Letter Sets	
	Computation Span	
	Paper Folding	
	Trails (B-A)	
	Stroop (Colour – Word)	
Memory	Meaningful Memory	
	CVLT (Immediate)	
	CVLT (Delayed)	
	Digit Symbol (Recall)	
Psychomotor Speed	Simple Reaction Time	
	Choice Reaction Time	
Perceptual Speed	Cube Comparison	Fluid Intelligence
	Number Comparison	
	Digit Symbol Substitution	
	Reading Comprehension	Crystallized Intelligence

The addition of other cognitive abilities to the initial model was reported to result in a significant increase in variance accounted for. The adjusted R^2 for this hierarchical regression was reported with R^2=.392. Computer anxiety and computer self-efficacy were hypothesized as being negatively related to age (Czaja et al., 2006). This would explain lower technology adoption rated at older age. Furthermore, research has shown the importance of attitudinal variables with regard to the use of technology, especially by older people (Czaja et al., 2006; Hur, Kim, & Kim, 2014; Kelley, Morrell, Park, & Mayhorn, 1999; Zheng, Spears, Luptak, & Wilby, 2015).

A potential drawback Czaja et al.'s 2006 study was that it was not based on any commonly used TA model and did not include many of the relevant variables from these models as a core of the study. The very strong focus on cognitive factors and 'use of technology' led to the inclusion of a plethora of measures that have not been used in conjunction with Technology Acceptance Models before. The study undoubtedly resulted in important insights regarding the impact of cognitive factors on the use of technology. However, it also led to a lack of comparability of the results and left questions open about how key factors usually present in technology acceptance models may have been related to or influenced by the cognitive factors. Czaja et al. (2006) pointed out the uniqueness of their approach with regard to the use of a complete assessment of cognitive variables in their assessment. To allow for comparisons between variance explained by classic factors of TA and cognitive aspects as introduced by Czaja et al. (2006), Study 3 included both types of measure.

12.3.1Intelligence

Overall, the different types of intelligence that are generally accepted in the prevailing theories are important factors for problem solving and the adaptation to new contexts in terms of behaviour (Nisbett et al., 2012; Nisbett & Wilson, 1977). A lowering in these levels might cause problems for the user to interact successful with a device or service, as the functional principles, causal chains or interactions between features might not be clear to them.

This could potentially impact their view of the two core concepts of most technology acceptance models: how useful the system will be to them, and how easy it is to use.

Levels of intelligence based on full-scale, survey-based measures have not been widely used in the technology acceptance literature. Especially studies using the classic utilitarian models, such as the TAM (Davis et al., 1989) in its different variations or the TPB (Ajzen, 1991), have mostly been carried out without additional measures of individual performance and ability.

Czaja et al. (2006) included a large array of cognitive measures to assess levels of both crystallized and fluid intelligence. The results showed significant interactions and predictive power with regard to ‘breath of web use’ and ‘breadth of computer use’.

Relationships between crystallized intelligence, education and computer anxiety were hypothesized in the research model. Age related increase in crystallized intelligence works against the cognitive decline mentioned previously. This represents the sum total of information and knowledge available to a person, which increases with age. The differentiation between fluid and crystallized intelligence as made by Czaja et al. (2006) are broad definitions from a cognitive point of view. The classifications used are commonly known as approximations of intelligence, but are not focused on the related and underlying functions of the brain per se. This may disregard more specific aspects of cognitive functioning that may affect technology acceptance. Measures of functioning of different areas of the brain and different task aspects can be regarded as a more sophisticated measurement.

The terminology ‘fluid’ and ‘crystallized’ intelligence will hereafter only be used when highlighting general conceptual overlap between the study carried out here, and the study by Czaja et al. (2006).

12.3.2 Intelligence measures and brain structure

Nisbett et al. (2012) made a clear differentiation between crystallized intelligence, or *g*(C), and fluid intelligence, or *g*(F). According to Hill et al. (2013), *g*(F) can be seen as an independent intelligence component that reflects a person's ability to deal with problems that have not been encountered before and to use inductive and deductive reasoning. Contrasting to this, *g*(C) was noted as representing the factual or semantic information that a person has acquired up to the point of testing. Due to the nature of *g*(F), it is commonly assessed *g*(F) with tests using non-verbal tasks.

Following from Blair (2006), it is thought that *g*(F) is directly linked with the Prefrontal Cortex (PFC), and shows a pronounced reduction with age. The PFC deteriorates at a faster rate than the rest of the cortex, thereby reducing the person's capacity in terms of *g*(F) (Nisbett et al., 2012).

Furthermore, Nisbett et al. (2012) highlighted the importance of brain structure for any performance in terms of intelligence. An example for this is the importance of the functioning of the prefrontal cortex for tasks involving the manipulation and processing of visuo-spatial information. This was linked to the performance on measures that focus on the approximation of fluid intelligence. Quoting the work by Duncan, Burgess, and Emslie (1995), Nisbett et al. (2012) point at the differences between crystallized intelligence scores and fluid intelligence scores in participants with severely affected or damaged brain structure.

Results from these studies indicated that there is little if any connection between the fluid and crystallized intelligence scores. The same seems true for the functioning of the prefrontal cortex and scores of crystallized intelligence. This was demonstrated using cases that showed high levels of crystallized intelligence, alongside poor prefrontal cortex functioning and levels of fluid intelligence.

An important aspect of using measures of cognitive performance is then to identify which aspects of brain functioning reliably indicate performance levels on different tests. This relates to the argument whether the changes in cognitive performance are based on an overall reduction of processing capacity or more distinct changes on neuronal level (also see Finkel, Reynolds, McArdle, & Pedersen, 2005; McArdle, Ferrer-Caja, Hamagami, & Woodcock, 2002). Multiple studies have found that *g*(F) can not fully explain the decline in *g*(C). However, this can be done using memory related measures and variables, which are in turn subject to effects from g(F) (McArdle et al., 2002; McArdle, Hamagami, Meredith & Bradway, 2000).

These interactions and relationships clearly outline the complexity of the processes involved and the difficulty of modelling it with a unitary factor approach (Nisbett et al., 2012). External factors such as societal and cultural factors are also hypothesized to have an influence on the development of cognitive ability (Bartholomew, Deary, & Lawn, 2009; see Van Der Maas et al., 2006).

This view is still in line with the two-factor model of intelligence, using one common factor and a more specific factor to account for overall cognitive performance. This could be helpful, as the common or shared factor in isolation has even been regarded as a statistical error term, rather than a distinct factor of a specific value (Bartholomew et al., 2009).

12.3.3Memory and Working Memory

In TA, memory tasks have been divided into episodic and workload or working-memory related tasks (Czaja et al., 2006). The working-memory related tasks are mostly designed to correspond with what Miyake et al. (2000) referred to as ‘updating’. This aspect covers the retrieval and manipulation of memorized sequences or patterns. A further overlap is the ‘inhibition’ aspect of executive functioning (Miyake et al., 2000). This aspect is particularly prominent in tasks involving visual perception and spatial working memory.

The inclusion of spatial working memory as an approximation of both working memory and spatial visualization has to be considered carefully in terms of predictive accuracy, given that these have been regarded as independent aspects in the past.

According to Engle (2002), working memory can be summarized as the process that allows humans to store, and at the same time manipulate information. It facilitates the differentiation between relevant and non-relevant information and correct and incorrect responses to a task or problem (Engle, 2002). Working memory has been theorized to consist of three separate parts. The first part is the verbal subsystem, governing speech and language. The second part is the episodic memory, which deals with information about individual and non-factual memories, such as personal experiences. Thirdly, the visuo-spatial subsystem governs what is referred to as spatial working memory; storing visual information and allowing us to manipulate and rotate it. These subsystems of the working memory are conceptualized to be governed by 'attentional control' (Baddeley, 2001).

Relatively recent research (Finkel, Reynolds, McArdle, Hamagami, & Pedersen, 2009; Finkel et al., 2005; Finkel, Reynolds, McArdle, & Pedersen, 2007) highlighted the importance of age and processing speed when it comes to the performance of the working memory. Schroeder and Salthouse (2004) and Salthouse (2009) have shown the overall impact of cognitive decline on different parts of processing that are required for these aspects of memory and overall executive functioning.

Working memory and spatial working memory in particular can potentially have immense impact on the way that people interact with technology. Knowing how to navigate using a menu structure, buttons, or screen gestures is paramount to any successful interaction. The menu structures have been simplified for most mobile devices and services, compared to desktop versions of the same service / software. This simplification poses the difficulty that touch-screen devices require a balance between the number of items on the screen and the effective 'touch areas' that the screen can differentiate between and the user can interact with effectively and error-free.

This means that not all menu items can be displayed at the same time, making it necessary for the user to at least partially remember the appropriate interaction gestures for the device and where they currently are in the menu structure. A decline in spatial working memory and working memory could therefore cause problems in interacting with the latest technology.

12.3.4Executive Functioning and Technology Acceptance

Instead of using memory tasks and approximations of intelligence, it is possible to take a neuropsychological approach to measuring cognitive ability. For this, it may overall be more useful to focus on the construct of 'executive functioning' rather than the more generalized term 'intelligence'. Executive functioning (EF) formed the underlying core of the measures used in Study 3. The separate aspects of executive functioning were operationalized independently in test procedures, which will be outlined in the following.

Executive functioning is a taxonomy used to describe "the coordination and control of cognitive operation" (p.3540, Angel et al., 2010). Krey et al. (2004) used an established differentiation in the definition of executive functioning. They related it to "(a) the coordination of cognitive processing in complex tasks, (b) the inhibition of habitual response tendencies, (c) the initiation and stopping of task execution, and (d) the switching between task sets" (p.144, Krey et al., 2004).

Different taxonomies of executive functioning are currently in use. For this research, the definition given by Miyake et al. (2000) will be used. It is reasonably recent and has found good recognition in the field. Also, its structure lends itself to use in the field of technology acceptance. It shows overlap with the original executive controller introduced by Baddeley (2001).

According to a study by Miyake et al. (2000), the basic concept of executive functioning is comprised of three key aspects. These aspects include the functions 'shifting', 'updating', and 'inhibition'. As pointed out by Lehto, Juujarvi, Kooistra, and Pulkkinen (2003), these functions are mostly a prerequisite to good performance on tests that are meant to assess 'executive –' or 'frontal lobe functioning'.

The individual aspects of executive functioning are clearly separable, thereby strengthening the argument that EF is not one monolithic function but a complex set of interacting sub-functions (Miyake et al., 2000).

Counter arguments to this have been made in multiple studies (Baddeley, Della Sala, Papagno, & Spinnler, 1997; Rabbitt, 1997; Rabbitt, Diggle, Smith, Holland, & Mc Innes, 2001; Rabbitt, Lowe, & Shilling, 2001; Rabbitt, Osman, Moore, & Stollery, 2001).

It was suspected that the lack of correlation between 'shifting', 'updating', and 'inhibition' was the statistical manifestation of underlying measurement problems. This was seen in the sense of both impurity of the measurements (Burgess, Alderman, Evans, Emslie, & Wilson, 1998), and an underlying similarity of the measures commonly used to assess levels of executive functioning. The research community seems to have agreed that depending on the application, executive functioning can be seen as both, existing in isolation and as a combination of factors (Lehto et al., 2003).

12.3.4.1 Shifting

The function referred to as 'shifting' describes the ability of a person to quickly move their attention between different mental tasks or information that is required (Miyake et al., 2000; Monsell, 1996). This ability has been found to be an important indicator of cognitive failure in patients with brain injuries (Monsell, 1996). Referring to a common measure of executive functioning, the Wisconsin Card Sorting Test (Heaton, Chelune, Talley, Kay, & Curtiss, 1993), Miyake et al. (2000) point out that the function of shifting even applies within one task, as long as it contains multiple different parts that require different mental handling. The ability of shifting has been regarded as a crucial factor in models of executive functioning such as the SAS (Norman & Shallice, 1986).

Task shifting, or shifting in general, has been found to be a cognitive function that commonly declines with age (Kray et al., 2004; Angel et al. ,2010; Turner & Spreng , 2012).

The performance reduction induced by shifting, which is measurable in terms of time delay (Jersild, 1927; Rogers & Monsell, 1995), can differ based on the internal or external nature of the shifting trigger (Spector & Biederman, 1976). The definition of shifting that Miyake et al. (2000) refer to has nevertheless to be separated from other definitions of shifting (Posner & Raichle, 1994).

The definition of Miyake et al. (2000) is based on executive function shifting from one cognitive process to another. This contrasts merely switching attention – regardless whether visual or otherwise. Nevertheless, major impacts on the ability of shifting have been reported based on impairments in the frontal lobe regions in the brain (Baddeley et al., 1997; Rabbitt, Lowe, et al., 2001). Interface, service layout and device design that takes into account the amount of 'shifting' required by the user could lead to higher intention to use on side of the user through higher 'perceived ease of use'.

12.3.4.2 Updating

The ability 'updating' refers to a person's cognitive ability to hold important and relevant information in working memory, even under changing circumstances. This is likely to result in information being rendered no longer relevant and having to be replaced by new information (see Miyake et al., 2000). Therefore, this ability is overall closely related to frontal lobe functioning (Smith & Jonides, 1999) and working memory (Lehto, 1996; Lehto et al., 2003). Nevertheless, this function has been outlined in a distinct way by Miyake et al. (2000): "the essence of Updating lies in the requirement to actively manipulate relevant information in working memory, rather than passively store information" (Miyake et al., 2000, p. 57).

This has previously been shown in brain research by (Smith & Jonides, 1997) and was even earlier outlined in the review by Stuss, Eskes, and Foster (1994). Lehto et al. (2003) disagreed with this specific view of the updating function, covering both aspects of working memory in terms of visual and phonological information, and the management thereof (Baddeley, 2001; Baddeley & Logie, 1994).

This could have potential implications for the use of mainly graphical user interface (GUI) based devices, and the different layouts and menus that the user will encounter while doing so. As mentioned previously, especially with regard to the layout of many mobile or Tablet-PC optimized pages this may be a problem, as the entire menu structure is not normally visible, as has to be memorized. Like shifting, updating has been found to be a factor in which performance decreases with increased age (Kray et al., 2004; Angel et al., 2010; Zelazo et al., 2004).

12.3.4.3 Inhibition

'Inhibition', referring to the ability to inhibit responses that would normally be considered automatic, is the third aspect of executive functioning outlined by Lehto et al. (2003). It was labeled an "inhibition of prepotent responses" (p. 57) by Miyake et al. (2000). They indicated for the Stroop test to be an ideal example of a task relying on this aspect of executive functioning.

Similar to the aspect of 'updating' this aspect was also specified in a more distinct way by Miyake et al. (2000) as the "deliberate, controlled suppression of prepotent responses" (Miyake et al., 2000, p. 58), differentiating it clearly from the separate concepts of negative activation and reactive inhibition (Miyake et al., 2000; comp. Logan, 1994).

The Tower of Hanoi (Piaget, 1976) and Tower of London (Shallice, 1982) both form the base for the CANTAB operationalized version Stockings of Cambridge. It has been argued that they depend on 'inhibition' (Miyake et al, 2000).

The RVP (Rapid Visual Processing) test on the CANTAB system, is another test that is mainly based on inhibition. In terms of the use of GUI and the use of touch-screen technology and gestures to control devices, this may be of high relevance. Particularly the adaptation of existing services to new platforms and devices may require users to exhibit higher degrees of 'inhibition' in an executive functioning sense. More common or 'natural' interaction patterns may not be valid any more and lead to undesirable outcomes. In line with previously mentioned findings, 'inhibition' decreases with regard to performance over the course of a lifespan (Turner & Spreng, 2012; Angel et al., 2004; Kray et al., 2004).

Concluding from the previously discussed information, the importance of both age and cognitive ability for the modelling of technology may have become clearer. The interconnectedness of these aspects makes it a paramount task to include measures of cognitive ability in technology acceptance models. These have to be sensitive to cognitive decline with age, to be usable for technology acceptance predictions regarding particular services and devices across a wide range of ages.

12.3.5 Technology Acceptance and Personality

In addition to cognitive ability, personality factors are commonly used to account for individual differences. Whilst not aimed at performance and problem solving measures of preference have been used in many different areas of research. Following from Oostrom, van der Linden, Born, and van der Molen (2013), only a small number of studies focusing on technology adoption have featured personality factors. Given the number of different TA models, as introduced at an earlier stage, this spread is even thinner per model.

The samples of these studies were also mostly comprised of students. Whilst different age groups were included in many TA studies, the combination of TA and personality might lead to different results. Therefore, a combination of age and age related variables with personality dimensions would be seen as beneficial.

Different aspects of the Five-Factor-Model (McCrae & Costa, 1987) have been tested in combination with TA. Openness to experience was found to show a significant relationship with technology adoption in a study by Nov and Ye (2008a). This related to the use of a digital library system.

Similar findings were made with regard to collaborative project management software (Devaraj, Easley, & Crant, 2008). Such systems can generally be classified as utilitarian technology. Whilst the interaction and collaboration with others plays an important role, the goal-oriented nature of the system clearly differentiates it from hedonic technology.

In terms of hedonic technology use, the work of provides insights into TA using personality factors. Combining personality dimensions with Perceived Enjoyment, they found significant predictive relationships. These also significantly added to the amount of variance accounted for in the intention to use the technology; in this case blogging.

The activity of blogging can be regarded as a hedonic technology use. Sharing opinions and experiences online is only part of a work routine for a select number of people. Whilst blogging can be lucrative for the writer in terms of potential sponsorships and reputation, it is mostly not goal oriented as such.

Sharing information on an educational basis is not considered goal-oriented behaviour, as the user does normally not generate direct feedback with such an interaction. In a study similar to Wang, Lin, and Liao (2012), Saleem, Beaudry, and Croteau (2011) linked personality factors to Computer Self-Efficacy. This was tested on a library checkout system, comparable to the setup of Nov and Ye (2008a); (see also Nov & Ye, 2008b).

Neuroticism has been linked to computer related anxiety (Korukonda, 2005, 2007; Korukonda & Finn, 2003). This is an important aspect regarding the field of technostress or technophobia. As seen in previous studies, computer anxiety can have an effect on intention to use a system or technology (Brosnan, 1999; Hinvest & Brosnan, 2012; Thorpe & Brosnan, 2007). A reduction in this anxiety based on personality profiling could lead to adaptive design, allowing more users of all age groups to successfully interact with new technology. Given the research into personality aspects as influential for technology adoption, the Five-Factor-Model was included in this research.

Introducing personality as a predictor in the new LTAM model will show whether the impact of personality is still significant for ITU. This will be of particular interest with regard to the cognitive ability measures, which have not been used in conjunction with personality measures for TA modelling before. Furthermore, it is important to validate the impact of personality on TA in an age-balanced sample. Personality is often considered to be relatively stable over time. Nevertheless, a balanced sample will increase validity.

12.3.6Conclusion

In conclusion, the introduction of cognitive ability measures into technology acceptance modelling can be regarded as the logical next step for making technology more accessible to people. To this stage, the differentiations that were made in research were based on age and age related performance when interacting with technology. Given that the age related changes in cognitive performance could be assessed in much more detail using cognitive ability measures, these will be used to replace the factor of age in the modelling.

By doing so, the cognitive ability of the user can be taken into consideration as a whole, allowing researchers to look into populations with different cognitive ability, rather than age. This is particularly important, as cognitive performance may differ within age-based samples, however not necessarily in favour of the younger users – potentially leading to misinterpretations of the resulting data. Research to date, which included age as a predictor (see Czaja et al. 2006) showed drawbacks in terms of the group representations. Given that the majority of age-related cognitive decline occurs between from age 65 onwards, a large age variance in this 'older' group would potentially lead to spurious results.

For these reasons, cognitive ability measures were included in the LTAM model, and will be tested in the chapters to follow. The findings will be compared with age ranges both in terms of differences and in terms of predicting technology acceptance.

12.4 Chapter 8: Study 3 - Cognitive Ability and Computer use in different age groups

12.4.1 Introduction

The previous cognitive ability and ageing related chapters discussed the work by Czaja et al. (2006). Their study featured the inclusion of cognitive ability measures and intelligence related variables in a Technology Acceptance setting, and included testing participants of different age groups. For Study 3, a similar approach to the one used by Czaja et al. (2006) was chosen. However, the drawback of not including a full TA model – as found in the study by Czaja et al. (2006) – was remedied via inclusion of the UTAUT (Venkatesh et al., 2003) and the LTAM.

With regard to the different age groups a different setup was selected, as the age groups – especially the young and the old group – did encompass wide age ranges. By doing so, they also covered different development and decline stages regarding cognitive functions that can possibly affect the results of the study. In this study the age bands were selected to be narrower. This was done to emphasize any potential differences between younger and older participants, in terms of cognitive abilities and technology acceptance levels.

12.4.2 Computers

In line with the original TAM and UTAUT, the third technology that was focused on was computers. However, in this research, the computer use was predefined to only be of a recreational and lifestyle nature. Any work related aspects of computer use, or the use of other gadgets and devices to simulate computer use, such as smartphones, TabletPCs and remote use of computers via other devices were excluded. Common hedonic uses of computers include browsing the Internet, using email or messenger services, or gaming.

The inclusion of computers as a distinct technology class was of great importance, especially with regard to the differentiation between hedonic and utilitarian use of technology. Firstly, testing both the UTAUT and the LTAM with ‘computer use’ made comparisons between the original studies and this research possible. Any drastic differences between the amounts of variance explained might then be attributed to either the sample or the differentiation between the UTAUT being used for hedonic, rather than utilitarian use of a technology.

Secondly, differences between the LTAM and the UTAUT in terms of amounts of variance explained could then be compared on a technological platform that has been well established in the TA literature. Despite the introduction of TabletPCs and smart phones, it still binds a large amount of the overall usage time for IT.

12.4.3 Aim

The study was aimed at using the cognitive ability approach to technology acceptance, as has been used by Czaja et al. (2006) and others to identify the impact of cognitive aspects on the intention to use technology. Furthermore, the interaction between the cognitive aspects and the LTAM questionnaire (as validated in the previous studies for E-Reader (Study 1) and Tablet PC (Study 2) technology) will be taken into account.

It was hypothesized that especially with regard to age, the cognitive factors add significantly to the amount of variance explained by the LTAM model. Czaja et al. (2006) highlighted that other factors that had been identified both in their own research and other literature before (compare Brosnan, 1999; Sharit et al., 2003; Thorpe & Brosnan, 2007) have not been covered in the 2006 study and are generally accepted to be of importance for predicting use of technology.

The CANTAB system by Cambridge Cognition has up to this point not been reported has having been used in any technology acceptance study.

This study was also aimed at covering similar aspects in terms of cognitive factors as have been covered by Czaja et al. (2006) while making the testing less strenuous for the participants and easier to conduct. This was done with the use of the CANTAB system, allowing the researcher to run sensitive yet robust tests in quick succession with high accuracy. With several tests covering multiple cognitive aspects, the testing sessions were even shorter as fewer tests were required to cover the same number of factors used in previous studies (Czaja et al., 2006).

12.4.4 Cognitive ability and TA

It was hypothesized that cognitive ability as a combined variable will correlate significantly with technology acceptance (operationalized via 'intention to use') and add to the variance explained by previous technology acceptance models such as the TAM (Davis, 1989) and UTAUT (Venkatesh et al., 2003).

This study can be seen as an extension of the TAM (Davis, 1989) in the spirit of the TPB (Ajzen, 1991). The TPB, as outlined at an earlier point, has the general advantage in terms of accuracy of the assessment, that a multitude of situation specific factors are collected to make more accurate prediction with regard to the participants' behaviour. Contrasting to this, the TAM and the following UTAUT do not take such situational factors into account, but try to make a more generalized assessment.

In this study, as in the study introduced by Czaja et al. (2006), the additional information collected is not of a situational but of an intra-individual nature. This will possibly allow for more accurate predictions on an individual rather than on a situational level. The results would remain generalizable, not only between different situations but also over a certain period of time for the individual, and for different populations, as the abilities and aptitudes tested were considered normally distributed in the general population.

12.4.5 Hypotheses

Hypothesis 1: "Technology Trust will explain a significant amount of variance with regard to Technology Acceptance (operationalized as 'intention to use') of lifestyle technology."

Hypothesis 2: "Social Aspects of technology use will significantly increase the amount of variance explained, compared to the UTAUT model."

Hypothesis 3: The cognitive ability variables as operationalized through CANTAB will add significantly to the newly established LTAM model.

Hypothesis 4: The personality variables operationalized in the TIPI (Ten Item Personality Inventory) will add significantly to the newly established LTAM model.

12.4.6 Sample

The age groups were set up to cover the younger age group from 18-22 years of age – a common student population – and an older age group over 65 years of age. Czaja et al. (2006) highlighted the importance of socioeconomic factors, amongst others, in terms of their impact on technology use and general technology acceptance, stating that "[…] education, socioeconomic status, attitudes toward the technology, the perceived benefits of technology, and access to technology, influence, technology adoption." (Czaja et al., 2006, p. 334).

According to Kelley et al. (1999), key factors influencing the use technology, such as computers, for older people were restrictions with regard to technology access, insufficient knowledge and the costs linked to the technology. Furthermore, as mentioned by Czaja et al. (2006) and as found in other literature (e.g. Rogers et al., 1998), these limitations are in many cases known to the participants / prospective users.

The young age group was recruited through the Research Participation Scheme (RPS) at the University of Westminster, as had been used before in Study 1 and Study 2. The older groups were recruited through personal contacts. Participation in the study was entirely voluntary and no rewards in the form of monetary or other means were offered (excluding the RPS credit offered to students, which nevertheless had no monetary value).

A pilot study with 5 participants was set up to ensure the quality of testing sessions, correct delivery of the tests, and handling of the resulting data. Data gathered in the pilot study was not used for further analysis. The pilot study highlighted difficulties of the participants in the older age group to handle Tablet-PC based or laptop based questionnaires. This led to the redrafting of the questionnaire in paper form. Changing into this format not only solved these difficulties, but also reduced the potential bias of assessing technology and its attributes on another piece of electronic technology.

Group 1: 18-27 year olds (N=25)

The mean age for this group was 20.63 years (SD=2.884). Over 70% of the participants were female. Regarding education, 65.6% of the participants have received at least 2 years of college education. A master's degree was held by 3.7% of the participants. Nearly all of the participants were students (96.3%). Only one person indicated to be unemployed and currently looking for work. In terms of ethnicity, this group of participants was relatively mixed, with 51.6% of the participants being of white British or other white origin. A Pakistani background was indicated to apply by 18.5% of the sample. All participants indicated to be currently residing in the UK.

Group 2: over 60 year olds (N=25)

The mean age for this group was 69.84 years (SD=7.122). The minimum age was 60 and the maximum age was 86. Sixty-four percent of the participants were female in this group. All participants indicated to be residing in the UK at the time of the study and to be of white British origin. Forty-eight percent of the participants reported to have received some college education. A 4-year college degree or equivalent was held by 20% of the participants. Eight percent held a PhD, MD or equal professional degree. Most of the participants in this age group were retired (76.0%), while 16% indicated that they were self-employed, and 4% indicated to be employed for wages. A further 4% reported to be homemakers.

12.4.7 Materials and Equipment

The LTAM questionnaire was compiled according to the findings from Study 1, and was used for all participants in paper form. This also included the items from the Ten Item Personality Inventory (TIPI) by Gosling, Rentfrow, and Swann (2003). The CANTAB system was set up previous to the first testing to ensure that the data collected would be of the correct format and could be extracted easily and securely. Every participant was given an ID number, enabling matching the questionnaire and the CANTAB testing sessions of the individual participants. A list of the variables available for the CANTAB tests used can be found in Appendix 4.

12.4.8 CANTAB: Motor Orientation Task (MOT)

The MOT (Morris, Evenden, Sahakian, & Robbins, 1987; Owen, Downes, Sahakian, Polkey, & Robbins, 1990) is merely a screening tool with the aims to a) familiarize the participant with the operation of the equipment, and b) to screen out participants who are unable to operate this type of equipment. It is based on the concept of flashing targets (in the form of 'X's) appearing on random locations on the screen, while a sound is played to alert the user to the change of the display. The task of the user is to touch the centre of the 'X' as soon as it appears.

The system will record the participant's reaction time, error rate in terms of missed targets, both in terms of time and locations, as well as the accuracy of the pointing operation. This test has been used in many studies before (Luciana & Nelson, 1998; Owen et al., 1990; Pantelis et al., 1997), although mostly for clinical samples. Nevertheless, it is well suited as an introduction to using the CANTAB system and reducing the effects of the technology on the results of the testing. Administration time for the MOT is approximately 1 minute. Only one version of this measure is available.

12.4.9 CANTAB: Rapid Visual Processing (RVP)

The RVP (Jones, Shahkian, Levy, Warburton, & Gray, 1992; Sahakian, Jones, Levy, Gray, & Warburton, 1989) is based on number sequences being shown in very quick succession on the screen and the participant having to identify certain pre-set 3 digit sequences. The CANTAB system does not use the touch screen display but wired buttons for this, allowing for a better measurement of the actual reaction time as the participant's hand does not have to be moved to the screen. The clinical mode of this measure used here takes 7 minutes to complete, with other modes usually requiring less time.

12.4.10 CANTAB: Spatial Working Memory (SWM)

The SWM (Morris et al., 1988; Robbins et al., 1997) is a test focused on the ability of a person to remember specific spatial information and build a strategy around this changing information. During this test the participants are presented with a number of coloured boxes in random locations on the screen. The instructions are for the participant to find items in the form of smaller different coloured blocks hidden in these boxes. Only one of these blocks is hidden in a box per round. After the participant has found the first block, a new one will be hidden in a different box.

It is important for the participant to remember that no box will be used for hiding one of these bocks twice. Therefore the participant has to establish a strategy to open all the boxes without opening one that contained a block before. The administration time for the clinical version of this measure is approximately 9 minutes, with other versions being usually completed in less time.

12.4.11 CANTAB: Stockings of Cambridge (SOC)

The SOC (Owen et al., 1990) is a reliable indicator of frontal lobe functioning and includes elements of spatial planning. It is based on the so-called 'Tower of London' test, an electronic version of the classic 'Tower of Hanoi' (Piaget, 1976). The participants are presented with the outlines of three 'stockings', which are filled with three coloured balls.

Using a split-screen setup, the participants are shown the current state and the desired end state, with an animation indicating the required movements or interactions to move from the status quo to the desired end. The balls can only be moved one at a time, and have to be moved in a way that obeys general physical laws for 3D objects, such as gravitational forces. This means for example that balls will not simply sit in mid-air, but will always slide down the stocking as far as possible. The participants' scores in terms of time takes, moves made and errors made are recorded and can be used for further analysis. Administration time for this measure in the standard clinical mode is approximately 10 minutes. Other modes tend to be completed more quickly.

12.4.12 WTAR

To assess general levels of intelligence of the participants quickly and easily, the WTAR Wechsler Test of Adult Reading (The Psychological Corporation, 2001) was chosen as a tool for this study. The WTAR is a widely used test that allows a good approximation of levels of general intelligence. Not CANTAB based, but a paper-pencil test, the WTAR is quick and easy to administer, as it comprises of 50 short words, which the participants are asked to pronounce.

The rationale behind this is that the words' pronunciations differ from their spelling, thereby making the task more complex than it might initially seem to be.

Due to the fact that the words are no longer than a few syllables the participants are less able to guess or infer the pronunciation based on other linguistic references the word might entail and must rely on their knowledge and previous use of the word, similarly to the NART (Ferraro & Sturgill, 1998; Nelson & O'Connell, 1978). Where the WTAR was used, the country of origin, ethnicity, and education, as well as the age of the participants were recorded.

Nevertheless, especially the NART – very similar to the WTAR – has been found to be sensitive to differences in ethnicity, education and social class or status (Crawford, Stewart, Cochrane, Parker, & Beeson, 1989; Cummings, Houlihan, & Hill, 1986; Nelson & O'Connell, 1978).

12.4.13 Matching between the CANTAB / WTAR and the tests used by Czaja et al. (2006)

Within the original 21 measures used by Czaja et al. (2006), a set of seven factors were hypothesized, including: Perceptual Speed, Fluid Intelligence, Spatial Visualization, Working Memory, Episodic Memory, Crystallized Intelligence, and Psychomotor Speed (Czaja et al., 2006). Several of these measures can be either replicated or approximated by using the CANTAB test batteries. The matching of the most relevant factors (according to the findings reported by Czaja et al., 2006) using the CANTAB and WTAR measures will be outlined in the following.

Table 26: Matching between CANTAB / WTAR and the test used by Czaja et al. (2006)

Factors	Measurements used by Czaja et al. (2006)
Fluid Intelligence	Alphabet Span, Letter Sets, Computation Span, Paper Folding, Trails (B-A), Stroop (Color-Word), Inference Test (hypothesized to relate to crystallized intelligence as well)
Crystallized Intelligence	Shipley, WAIS-III Information, Multi. Apt. Battery, Reading Comprehension (hypothesized to relate to perceptual speed as well)
Perceptual Speed:	Digit Symbol Substitution, Number Comparison, Cube Comparison
Psychomotor Speed:	Choice RT, Simple RT
Memory:	Meaningful Memory, CVLT Immediate, CVLT Delayed, Digit-Symbol Recall

12.4.14 Crystallized Intelligence and Fluid Intelligence

Crystallized Intelligence and Fluid Intelligence was approximated in terms of an overall ‘general intelligence’ measure using the WTAR (The Psychological Corporation, 2001), which has been shown to have good correlations with the NART (Nelson, 1978). The NART has been used in many studies for this purpose, with clinical (O’Carroll et al., 1992; Russell et al., 2000) and non-clinical samples (Crawford et al., 1989; Berry et al., 1994; Mockler, Riordan & Sharma, 1996; Ferraro & Sturgill, 1998).

According to Mockler, Riordan & Sharma (1996), referring to a study by Crawford et al. (1989), the NART showed strong links with the general indicator of intelligence ‘g’, thereby encompassing both fluid and crystallized intelligence. Furthermore, the NART has been validated against different versions of the WAIS-R (Wechsler, 1981) test battery (Berry et al., 1994; Mockler, Riordan & Sharma, 1996; Russell et al., 2000), which, in a more recent version, have been used by Czaja et al. (2006).

12.4.15 Memory

The SWM and the SOC assessed the memory functions of the participants. While the SOC assesses general working memory (Owen et al., 1990; Luciana & Nelson, 1998; Purcell et al., 1998), the SWM specifically assesses the spatial working memory capacities of individuals (Robbins et al., 1998; Pantelis et al., 1997; Purcell et al., 1998).

12.4.16 Psychomotor Speed and Perceptual Speed

Psychomotor Speed and Perceptual Speed were assessed using the RVP and the MOT. The RVP allows monitoring of the time taken between perception and the resulting action, while the MOT assesses the movement speed based on activity 'triggers' or prompts on the screen. Both tests have been used for similar purposes in clinical and non-clinical settings.

12.4.17 Protocol

Participants were initially contacted either via the RPS system (young group) or via email and phone communication (older group). A time was scheduled for the testing, requiring only one session. The location of the testing for the younger participants was a University of Westminster Research cubicle. The older participants were, due to travelling restrictions on their part, tested in their homes. The setup was discussed with the participants beforehand, to ensure that a quiet setting in a reasonable environment could be guaranteed. In the testing session, the participants first completed a paper pencil version of the LTAM questionnaire. This version mirrored the online / on-screen representation as closely as possible in terms of numbers of items per page etc.

Following this, the participants completed the MOT, RVP, SWM and SOC in this order. They were briefed to take breaks in between the tests, if necessary. The WTAR and the personality related measure (TIPI) were administered last.

12.4.18 Analysis

12.4.18.1 Outline

As the first part of this section, a pre-analysis was run on the cognitive ability variables generated by the measures. Correlations were run between the selected variables to establish whether measurement overlap between measurements existed.

In a second step, a pre-analysis was run for the cognitive ability measures between the two groups. Possible significant differences between the groups would have to be taken into consideration for the choice of analysis procedures of the main analysis.

12.4.19 Preliminary Analyses

12.4.19.1 Fixed Effect Fallacy (Monk, 2004)

A pre-selection of cases was undertaken to only select the participants that were users of the technology, i.e. owned a device or had constant access to it.

The Kruskal-Wallis test for the TablePC data set rendered a non-significant result at $p=.290$ (MC exact.: $p=.302$). This indicated that the groups were not inherently different. It has to be taken into consideration in the interpretation of these results that the individual groups were of different size, which can have influenced the results.

No significant difference was found for the rating between different types of TabletPCs by the participants of this study.

Table 27: Kruskal-Wallis test results, Fixed Effect Fallacy, Study 2

			ITU
Chi-Square[a, b]			4.975
df			4
Asymp. Sig.			.290
Monte Carlo Sig.	Sig.		.302[c]
	99% Confidence Interval	Lower Bound	.290
		Upper Bound	.314

Note: a. Kruskal-Wallis Test; b. Grouping Variable: Make; Based on 10000 sampled tables with starting seed 622500317.

12.4.19.2 Correlations

For all tests (RVP, SWM and SOC), all variables that were recommended for use in the analysis by the test designers and from the pre-analysis showed high and significant Spearman's correlations with most if not all other test variables from the respective test.

This can be seen as an indicator that the recommendation to use these variables are representative predictors for the respective tests does also hold up for the data set at hand.

Table 28:Correlations for CANTAB variables

		SWM Between errors	SWM Strategy	SOC ITT5	SOC STT5	SOC MinMoves 5oves
RVP A	Correl. Coefficient	-.470**	-.372**	.052	-.472**	.472**
	Sig. (2-tailed)	.000	.005	.703	.000	.000
	N	56	56	56	56	56
SWM Between errors	Correl. Coefficient		.724**	-.194	.126	-.310*
	Sig. (2-tailed)		.000	.153	.355	.020
	N		56	56	56	56
SWM Strategy	Correl. Coefficient			-.384**	.138	-.336*
	Sig. (2-tailed)			.003	.310	.011
	N			56	56	56
SOC ITT5	Correl. Coefficient				.000	.240
	Sig. (2-tailed)				.998	.075
	N				56	56
SOC STT5	Correl. Coefficient					-.559**
	Sig. (2-tailed)					.000
	N					56

In order not to impact negatively on the already low predictor-case ratio of the regression models for this data set, the variables recommended by the test designers as the most impactful variables for the CANTAB tests were used for further analysis procedures. Any addition to these core variables would have negatively affected the case-predictor ratio. The variables included can be found in Table 29 below.

Table 29: Variables from CANTAB used in Study 3

Test	Variable	Description
Motor Orientation Task (MOT)	Mean Latency	The average of the time between the display of the stimulus on the screen and the reaction of the participant (normed distances from system).
	Mean Error	Average of the distance between the middle of the stimulus and the interaction point on the screen.
Rapid Visual Response	A’	Score indicating the accuracy of the participant in terms of correct recognitions of sequences (percentage).
Stockings of Cambridge	Mean ITT 5	Average of the initial thinking time required between display of puzzle and first move made by participant on a 5 move problem.
	Mean STT 5	Average of the subsequent thinking time required between first move made by participant and completion of a 5-move problem.
	Number Solved MinMov	Number of puzzles solved using the minimum number of moves required.
Spatial Working Memory (SWM)	Between Errors	Errors made by the participant between correctly locating two stimuli.
	Strategy	Composite score for using a strategy (repeated and adjusted pattern) for problem solving, rather than random moves.

12.4.19.3 Pre-test regarding group differences for cognitive performance

The different age groups were hypothesized to have significantly different cognitive ability levels, primarily based on age related cognitive decline. This was tested for before entering the overall analysis.

CANTAB variables:

Independent sample Mann-Whitney-U tests were run for the cognitive variables used in this study to identify any possibly significant differences between the age groups. This procedure was chosen over other tests of difference due to the underlying assumptions. The Mann-Whitney-U test allows for groups to be compared without making the assumption of a normal distribution of the data. Not making assumptions as to whether the distributions were normally distributed and in how far they resembled each other was considered to be a more conservative procedure.

The variable MOT Mean Latency returned a significant difference, with $U(50)=208.500$, $Z=-2.363$, $p=.018$ (2-tailed). This indicated differences between the age groups regarding the interaction with the system and initial reaction times. Older participants showed a significantly larger time-lag.

Regarding the error rate from the same test (MOT Mean Error), no significant differences between the age groups were reported ($U(50)=285.000$, $Z=-.962$, $p=.336$ (2-tailed)). No significant difference was found between the age groups reading the variable RVP ‘A, with $U(50)=2548.000$, $Z=-1.640$ $p=.101$. Furthermore, no significant differences were found for the variables SOC Mean ITT 5 ($U(50)=324.000$, $Z=-.247$, $p=.805$), SOC Mean SST 5 ($U(50)=273.000$, $Z=-1.184$, $p=.236$), or SOC Number Solved Min Moves ($U(50)=328.000$, $Z=-.176$ $p=.860$).

A significant difference between the age groups was found for the variable SWM Between Errors, with $U(50)=123.000$, $Z=-3.944$, $p<.001$. The same held true for the related variable SWM Strategy from the same test, with showed a significant effect at $U(50)=156.500$, $Z=-3.340$, $p=.001$. Older participants therefore made significantly more mistakes on the SWM and had less effective solving strategies.

WTAR:

A nonparametric test of difference in the form of a Mann-Whitney U test was run for the WTAR score variable, which approximates general intelligence. This indicated a significant difference between the age groups with U(50)=80.000, Z=-4.724, p<.001. Older participants scored significantly higher on this test approximating general intelligence.

Overall, the hypothesis that significant differences between the groups existed was accepted. This is however with the limitation that is does not apply to all sub-factors and variables used. Based on this pre-analysis, it was decided to include the factor 'age' in the interaction variable, which was included in the LTAM model at a later stage of the analysis. Details of the interaction variables can be found in the Methodology Chapter (Chapter 3).

Table 30: Mann-Whitney-U test results for cognitive ability variables

	Mean Rank		Sum of Ranks	
	Age Group		Age Group	
Pre-Analysis Variables	Younger	Older	Younger	Older
MOT Mean Latency	21.72	**31.66***	586.50	**791.50***
WTAR	16.96	**36.80****	458.00	**920.00****
MOT Mean Error	24.56	**28.60**	663.00	**715.00**
RVP A	**29.81**	22.92	**805.00**	573.00
SOC Mean ITT 5	26.00	**27.04**	**702.00**	676.00
SOC Mean SST 5	24.11	**29.08**	651.00	**727.00**
SOC Number Solved MinMoves	**26.85**	26.12	**725.00**	653.00
SWM BetweenErrors	18.56	**35.08****	501.00	**877.00****
SWM Strategy	19.80	**33.74****	534.50	**843.50****
Intention to Use (ITU)	**28.63**	24.20	**773.00**	605.00

Note: *p<.05; **p<.01; Bold typeface indicates higher value in comparison.

Regarding the validity of using a computerized test to assess aspects of TA, the MOT results are important. The significant difference between the groups was in terms of the latency for the MOT, but not the error rate. Therefore older people take longer than younger people to interact with the system, however do not make more system-based mistakes using it.

12.4.19.4 Intention to Use and group differences

Group differences were also calculated for the variable Intention to Use (ITU). The results indicated that there was no significant difference between the TA of older and younger users. The Mann-Whitney-U test resulted in U(50)=280.000, Z=-1.300, p=.194,. In combination with the differences found in cognitive performance, this indicates a covariance of the variables. The impact of these variables on the overall models will be assessed in the following hypothesis testing section.

12.4.20 Moderation analysis

A moderation analysis for this data set in the same way that had been carried out for Studies 1 and 2 was not necessary. This was due to the fact that all participants had the same level of experience with the devices, making a moderation analysis for an effect of Experience on Intention to Use impossible and obsolete.

However, given the nature of this study and the aim to reproduce the findings of Czaja et al. (2006), made it necessary to analyse the data for a moderating factor of Age on the relationships between predictors and the DV (Intention to Use).

Moderation effects were found for Age on Benevolence and Image. The interaction between Age and Benevolence was significant at p=.002. This indicated that there was a moderation effect between Age and Benevolence. Older participants scored lower on ITU, the higher the rating of Benevolence was. Contrasting to this, Benevolence had very little impact on the youngest participants.

Table 31: Moderation Effect of Age on Benevolence and ITU, Study 3

	beta	SE	t	sig.	LLCI	ULCI
Constant	14.149	.200	70.798	.000	13.747	14.551
Age	-.012	.008	-1.640	.108	-.028	.003
Benevolence	-.132	.045	-2.932	.005	-.222	-.041
Interaction	-.006	.002	-3.328	.002	-.009	-.002

Note: R^2=.169

Table 32: Moderation Effect of Age on Image and ITU, Study 3

	beta	SE	t	sig.	LLCI	ULCI
Constant	14.191	.200	70.987	.000	13.788	14.593
Age	-.012	.008	-1.511	.137	-.027	.004
Image	-.070	.072	-.971	.337	-.214	.075
Interaction	-.006	.003	-2.127	.039	-.012	.000

Note: R^2=.180

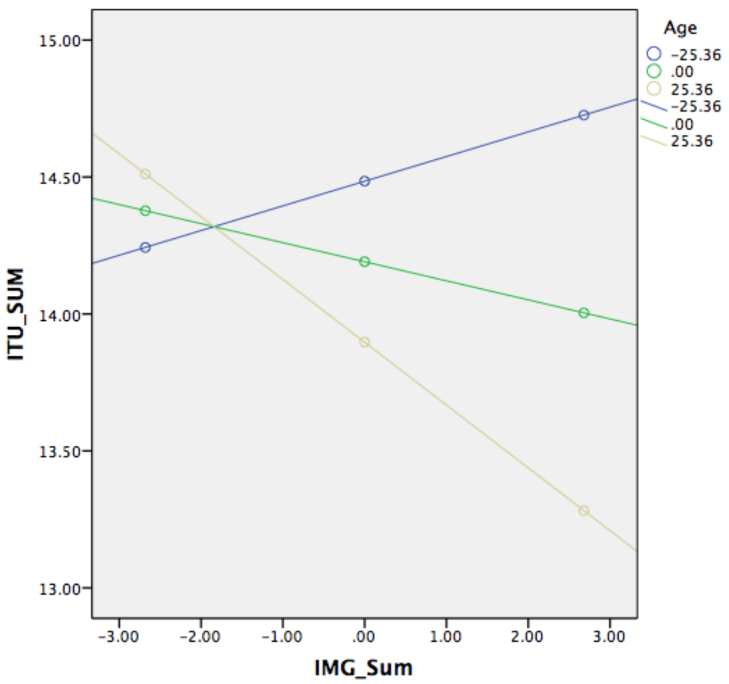

Figure 14: Plot of interaction between Image and ITU moderated by Age, Study3

A significant interaction was found between Image and Age at p=.039. This indicated a moderation effect between Image and ITU based on Age. Whilst younger people reported higher ITU with higher ratings of image, this relationship was inversed for older participants. Both moderation effects were included in the model testing for the regression analyses.

12.4.21 Mediation Analyses

A significant mediation effect was found for the variable PEOU and the effect of the variable WTAR on ITU. The Sobel test was significant, and the BCa (bias corrected accelerated) Confidence Intervals (CI) did not include a zero effect size. This means that it is highly likely that the true value for the effect size is larger than zero, meaning that a mediation effect exists. No significant mediation was found regarding PEOU and the two other cognitive ability variables. Whilst the BCa CIs did not include a zero effect size, the Sobel tests were non-significant for either analysis. This would indicate that whilst there is very likely an effect (with a size larger than zero), the effect size would not have been significant. A minimal level of mediation can therefore not be ruled out. Further details of these analyses can be found in Appendix 4.

12.4.22 Regression analysis

In line with the analyses performed for previous studies a set of regression analyses was carried out to test the impact of the newly added variables and constructs on the UTAUT model. For this study, this also included the cognitive ability variables, which were introduced for the first time at this stage of the research. For this part of the analysis only the cognitive ability variables were used that showed a significant difference between the groups in the pre-analysis.

For the regression analyses presented here, the number of bootstrap samples had to be reduced in order to allow the model to converge without the occurrence of extreme values in the parameter estimation, which would have terminated the algorithm. Unless stated otherwise, the number of bootstrap samples in this study was 2000, which is considered a reasonable number of iterations by Field (2009). Larger iterations were more likely to cause singular matrix issues.

Table 33: Model Comparisons for Study 3

Model	Base	Addition	R^2	R^2 adj.	ΔR^2	F Δ	df 1	df 2	sig.
1	UTAUT		0.241	0.117	0.241	4.500	8	44	>.001
2	UTAUT	plus Trust	0.477	0.253	0.236	1.869	7	37	0.103
3	UTAUT	plus SOC	0.481	0.316	0.24	3.699	4	40	0.012
4	UTAUT plus Trust	Plus Soc	0.557	0.285	0.08	0.813	4	34	0.526
5	UTAUT Plus Soc	Plus Trust	0.557	0.285	0.076	0.515	7	34	0.817
6	UTAUT	COG	0.491	0.347	0.25	5.403	3	41	0.003
7	UTAUT Plus Trust	plus COG	0.544	0.293	0.067	0.931	3	35	0.437
8	UTAUT plus Cog	plus trust	0.544	0.293	0.053	0.382	7	34	0.906
9	UTAUT plus Soc	plus COG	0.542	0.346	0.061	1.099	3	37	0.357
10	UTAUT plus COG	plus SOC	0.542	0.346	0.051	0.724	4	37	0.581
11	UTAUT plus Trust plus Soc	plus Cog	0.594	0.274	0.037	0.334	3	30	0.801
12	UTAUT plus Trust plus Cog	plus Soc	0.594	0.274	0.05	0.369	4	30	0.828
13	UTAUT plus Soc plus Cog	Plus Trust	0.594	0.274	0.052	0.274	7	30	0.959
14	UTAUT	plus TIPI	0.45	0.257	0.209	2.356	5	39	0.058
15	UTAUT plus Trust	plus TIPI	0.533	0.221	0.056	0.408	5	32	0.840
16	UTAUT plus TIPI	plus Trust	0.533	0.221	0.083	0.482	7	32	0.840
17	UTAUT plus SOC	plus TIPI	0.597	0.389	0.116	1.324	5	35	0.277
18	UTAUT plus TIPI	plus SOC	0.597	0.389	0.147	2.006	4	35	0.115
19	UTAUT plus COG	plus TIPI	0.541	0.325	0.05	0.545	5	36	0.741
20	UTAUT plus TIPI	plus COG	0.541	0.325	0.091	1.52	3	36	0.226
21	UTAUT plus TRUST plus TIPI	plus SOC	0.648	0.323	0.115	0.653	4	28	0.629

Note: Continued on next page

Table 33: Model Comparisons for Study 3 (continued)

Model	Base	Addition	R^2	R^2 adj.	ΔR^2	F Δ	df 1	df 2	sig.
22	UTAUT plus SOC plus TIPI	plus Trust	0.648	0.323	0.051	0.228	7	28	0.975
23	UTAUT plus Trust plus SOC	plus TIPI	0.648	0.323	0.091	0.465	5	28	0.799
24	UTAUT plus TRUST plus TIPI	plus COG	0.574	0.240	0.041	0.289	3	29	0.833
25	UTAUT plus TRUST plus COG	plus TIPI	0.574	0.240	0.03	0.155	5	29	0.977
26	UTAUT plus Cog plus TIPI	plus Trust	0.574	0.240	0.033	0.144	7	29	0.994
27	UTAUT plus SOC plus Cog	plus TIPI	0.634	0.390	0.092	0.855	5	32	0.522
28	UTAUT plus SOC plus TIPI	plus COG	0.634	0.390	0.037	0.505	3	32	0.681
29	UTAUT plus COG plus TIPI	plus SOC	0.634	0.390	0.093	1.016	3	32	0.414
30	UTAUT plus SOC plus COG plus TIPI	plus Trust	0.665	0.272	0.031	0.066	7	25	0.999
31	UTAUT plus TRUST plus Cog plus TIPI	plus SOC	0.665	0.272	0.091	0.136	4	25	0.968
32	UTAUT plus Trust plus SOC plus Cog	plus TIPI	0.665	0.272	0.071	0.127	5	25	0.985
33	UTAUT plus Trust plus SOC plus TIPI	plus COG	0.665	0.272	0.017	0.017	3	25	0.997

Table 34: Path coefficients for UTAUT (with age), Study 3

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> ITU	0.130	0.145	0.179	0.724	0.469	-0.194	0.520
ATT -> ITU	-0.210	-0.205	0.188	1.118	0.264	-0.581	0.164
Age -> ITU	0.235	0.237	0.189	1.238	0.216	-0.132	0.613
CSE -> ITU	0.077	0.073	0.148	0.523	0.601	-0.225	0.361
FAC -> ITU	0.229	0.205	0.251	0.911	0.362	-0.326	0.649
PEOU -> ITU	0.240	0.253	0.182	1.320	0.187	-0.111	0.618
PU -> ITU	0.061	0.055	0.129	0.470	0.639	-0.194	0.313
SI -> ITU	0.130	0.145	0.179	0.724	0.469	-0.194	0.520

Note: Complete model parameters can be found in Appendix 4.

12.4.23 Hypothesis Testing:

Hypothesis 1: "Technology Trust will explain a significant amount of variance with regard to Technology Acceptance (operationalized as 'intention to use') of lifestyle technology."

A PLS based, bootstrapped regression analysis was run on the data. The initial model that was calculated included the UTAUT model and the Trust variables as established by Lankton and McKnight (2011). This model accounted for 25.3% of the variance (adj. R^2, R^2=.477). This was a non-significant improvement from the UTAUT, which accounted for 11.7% of the variance (adj. R^2, R^2=.241), at $F(7, 37)=1.869$, $p=.103$.

Table 35: Path coefficients for UTAUT plus Trust variables (age moderated), Study 3

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> ITU	0.377	0.310	0.261	1.446	0.148	-0.241	0.809
ATT -> ITU	0.057	0.064	0.246	0.230	0.818	-0.410	0.562
Age -> ITU	-0.337	-0.269	0.286	1.179	0.239	-0.867	0.286
Benevolence -> ITU	-0.252	-0.228	0.205	1.225	0.221	-0.612	0.206
CSE -> ITU	-0.139	-0.153	0.243	0.573	0.567	-0.612	0.327
Competence -> ITU	0.045	0.037	0.247	0.183	0.855	-0.473	0.495
FAC -> ITU	0.443	0.465	0.241	1.839	0.066	-0.032	0.945
Functionality -> ITU	0.214	0.190	0.232	0.923	0.356	-0.251	0.660
Helpfulness -> ITU	-0.128	-0.144	0.206	0.622	0.534	-0.546	0.241
Integrity -> ITU	0.227	0.195	0.216	1.048	0.295	-0.259	0.589
Interaction Effect: Age -> Benevolence -> ITU	-0.002	-0.002	0.003	0.608	0.543	-0.007	0.004
PEOU -> ITU	0.063	0.020	0.289	0.217	0.828	-0.575	0.528
PU -> ITU	0.076	0.119	0.250	0.306	0.760	-0.342	0.647
Reliability -> ITU	0.096	0.083	0.176	0.545	0.586	-0.284	0.410
SI -> ITU	0.016	0.009	0.201	0.079	0.937	-0.384	0.424

Note: Full model parameters can be found in Appendix 4.

In a further step, the trust variables were added to the UTAUT plus Social Variables model, resulting in a non significant improvement as well, at $F(7, 34)=0.515$, $p=.817$. Path coefficients for this model can be found in Table 37.

Further comparisons of the trust variables with combinations of the UTAUT, social and cognitive ability related variables all led to non-significant changed in the amount of variance accounted for (see Table 33). Full details on path coefficients regarding this can be found in Appendix 4.

Table 36: Endogenous variables, UTAUT plus Trust model, Study 3

	R Square	R Square adjusted	ITU	Cronbachs Alpha
ANX	0.692	0.572	3.289	0.884
ATT	0.495	0.485	3.381	0.809
Age	0.230	0.198	3.215	1.000
Benevolence	0.081	0.022	2.344	1.000
CSE	0.209	0.140	2.091	1.000
Competence	0.428	0.364	2.643	1.000
FAC	0.862	0.843	2.151	0.156
Functionality	0.548	0.475	2.558	1.000
Helpfulness	0.378	0.260	1.728	1.000
ITU	-	-		1.000
Integrity	0.782	0.728	2.756	1.000
PEOU	0.898	0.181	3.611	0.897
PU	0.684	0.573	2.011	0.799
Reliability	0.861	0.601	1.609	1.000
SI	0.483	0.262	1.855	0.756

Table 37: Path coefficients for UTAUT plus Trust plus Social Variables (Age Moderated), Study 3

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> ITU	0.296	0.237	0.301	0.983	0.326	-0.352	0.768
ATT -> ITU	0.232	0.211	0.290	0.799	0.424	-0.394	0.800
Age -> ITU	-0.216	-0.197	0.333	0.648	0.517	-0.918	0.421
Benevolence -> ITU	-0.264	-0.166	0.364	0.727	0.468	-0.798	0.633
CSE -> ITU	-0.240	-0.263	0.283	0.845	0.398	-0.851	0.291
Competence -> ITU	0.153	0.175	0.316	0.482	0.630	-0.417	0.779
FAC -> ITU	0.369	0.448	0.292	1.264	0.207	-0.167	1.110
Functionality -> ITU	0.126	0.079	0.252	0.499	0.618	-0.460	0.586
Helpfulness -> ITU	-0.201	-0.169	0.272	0.738	0.461	-0.698	0.382
Image -> ITU	-0.156	-0.195	0.241	0.647	0.518	-0.673	0.255
Integrity -> ITU	0.248	0.168	0.322	0.770	0.442	-0.566	0.789
Interaction Effect: Age -> Benevolence -> ITU	-0.001	0.000	0.004	0.181	0.857	-0.009	0.007
Interaction Effect: Age -> Image -> ITU	-0.006	-0.007	0.011	0.523	0.601	-0.030	0.013
PEOU -> ITU	0.168	0.119	0.363	0.463	0.644	-0.565	0.762
PU -> ITU	0.146	0.200	0.282	0.517	0.605	-0.359	0.763
Perceived Enjoyment -> ITU	-0.416	-0.454	0.314	1.323	0.186	-1.146	0.118
Reliability -> ITU	0.110	0.099	0.207	0.530	0.597	-0.332	0.499
Reputation -> ITU	0.227	0.175	0.229	0.992	0.321	-0.299	0.642
SI -> ITU	-0.020	-0.028	0.230	0.089	0.929	-0.513	0.426

Note: Full model parameters can be found in Appendix 4.

Overall, Hypothesis 1 was rejected. The trust variables as introduced by Lankton and McKnight (2011) did not add significantly to the amount of variance accounted for by the UTAUT or the UTAUT plus other extensions when applied to the hedonic use of computers.

Hypothesis 2: "Social Aspects of technology use will significantly increase the amount of variance explained, compared to the UTAUT model."

A sequence of PLS based regression analyses with bootstrapping was run in order to determine the impact of the social variables on the UTAUT and combination models of the UTAUT and extensions. In the initial iteration, the social variables were added to the UTAUT with age as a moderator and an interaction effect for the variable 'Image'. This resulted in a significant change in the amount of variance accounted for, at $F(4, 40)=3.699$, $p=.012$. The path coefficients for this combined model can be found in Table 38.

Table 38: Path Coefficients for UTAUT plus social variables (age moderated), Study 3

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> ITU	0.292	0.209	0.249	1.173	0.241	-0.275	0.721
ATT -> ITU	0.308	0.254	0.220	1.398	0.162	-0.187	0.695
Age -> ITU	-0.165	-0.134	0.229	0.720	0.471	-0.619	0.282
CSE -> ITU	-0.131	-0.144	0.187	0.697	0.486	-0.495	0.251
FAC -> ITU	0.342	0.373	0.181	1.891	0.059	-0.004	0.708
Image -> ITU	-0.237	-0.224	0.138	1.726	0.085	-0.485	0.072
Interaction Effect: Age -> Image -> ITU	-0.007	-0.008	0.006	1.079	0.281	-0.020	0.004
PEOU -> ITU	0.189	0.142	0.250	0.754	0.451	-0.353	0.631
PU -> ITU	0.180	0.215	0.233	0.773	0.439	-0.221	0.687
Perceived Enjoyment -> ITU	-0.324	-0.339	0.237	1.371	0.170	-0.835	0.123
Reputation -> ITU	0.136	0.120	0.129	1.048	0.295	-0.134	0.381
SI -> ITU	-0.036	-0.036	0.170	0.213	0.831	-0.366	0.305

Note: Full model parameters can be found in Appendix 4.

In further analyses it was shown that the addition of social variables to any of the combinations between the UTAUT, trust related variables, cognitive ability variables, or personality factors led to a non significant increase in the amount of variance accounted for (see Table 33 for comparison data and Appendix 4 for path coefficients).

Hypothesis 2 was generally accepted, as the social variables significantly improved the amount of variance accounted for by the UTAUT, even if this was not held up in iterations that included other model extensions.

Table 39: Endogenous variables, UTAUT plus Social Variables, Study 3

	R Square	R Square adjusted	VIF	CA
ANX			3.235	0.884
ATT	0.499	0.489	3.377	0.809
Age	0.234	0.202	2.850	1.000
CSE	0.171	0.118	1.662	1.000
FAC	0.860	0.848	1.897	0.156
ITU	-	-	-	1.000
Image	0.242	0.139	1.625	0.852
PEOU	0.800	0.762	3.747	0.897
PU	0.718	0.656	2.107	0.799
Perceived Enjoyment	0.983	0.979	3.369	0.869
Reputation	0.514	0.377	1.454	0.858
SI	0.615	0.778	1.770	0.756

Hypothesis 3: "Cognitive ability measures will significantly increase the amount of variance explained, compared to the UTAUT model."

In line with the previous analyses, a set of regressions was performed to test the impact of the cognitive ability variables on the UTAUT and combination models. This was done using PLS modelling and bootstrapping procedures. For the cognitive ability variables it was necessary to reduce the number of bootstrapped samples in order to avoid matrix singularity issues. This can indicate a variance issue in the data or an issue with the case-predictor ratio. Given the relatively small sample size, the latter was accepted as the most likely cause.

Bootstrapping iterations were reduced from the recommended R=5000 (Hair et al., 2014) to between R=2000 and R=500; the latter being the recommended number of iterations for initial data testing (Hair et al., 2014), and are therefore still acceptable for a general indication of a loading structure.

After the initial iterations with all variables of the cognitive ability block, a selection was made based on the previous findings in terms of significant differences between the age groups. This was in line with the background literature (Heerink et al., 2010) and the potential loadings in terms of more general intelligence aspects (e.g. g(c) and g(f)) (Czaja et al., 2006; Czaja et al., 2001; Sharit et al., 2003).

Table 40: Path coefficients for UTAUT plus cognitive variables (age moderated), Study 3

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> ITU	0.380	0.288	0.231	1.643	0.100	-0.201	0.742
ATT -> ITU	0.288	0.282	0.210	1.372	0.170	-0.132	0.713
Age -> ITU	-0.622	-0.580	0.304	2.047	0.041	-1.129	0.082
CSE -> ITU	-0.081	-0.086	0.179	0.450	0.653	-0.453	0.252
FAC -> ITU	0.345	0.379	0.184	1.872	0.061	0.028	0.725
PEOU -> ITU	0.071	-0.016	0.248	0.287	0.774	-0.518	0.454
PU -> ITU	0.165	0.169	0.209	0.792	0.429	-0.221	0.621
SI -> ITU	-0.034	-0.098	0.163	0.211	0.833	-0.411	0.223
SWM BetweenErrors -> ITU	-0.014	-0.026	0.259	0.054	0.957	-0.634	0.423
SWM Strategy -> ITU	0.141	0.168	0.209	0.674	0.501	-0.209	0.618
WTAR -> ITU	0.433	0.416	0.190	2.279	0.007	0.004	0.753
WTAR -> PEOU	-0.341	-0.344	0.122	2.804	0.005	-0.571	-0.088

Note: Full model parameters can be found in Appendix 4.

The addition of cognitive ability variables to the UTAUT model increased the amount of variance accounted for from 11.7% (adj. R^2; R^2=.241) to 34.7% (adj. R^2; R^2=.491), which was a significant change at $F_{(3, 41)}$=5.403, p=.003. Whilst the amount of variance accounted for was generally improved by the addition of the cognitive ability variables in the following iterations, no further change in R^2 was statistically significant (see Table 40). The WTAR score (crystallized intelligence approximation) was a significant predictor in the model with p=.007.

Table 41: Endogenous Variables, UTAUT plus Cognitive Variables, Study 3

	R Square	R Square adjusted	VIF	CA
ANX	0.691	0.593	3.037	0.884
ATT	0.493	0.483	3.117	0.809
Age	0.250	0.218	5.079	1.000
CSE	0.174	0.122	1.538	1.000
FAC	0.683	0.656	2.003	0.156
ITU	-	-	-	1.000
PEOU	0.825	0.801	3.906	0.897
PU	0.687	0.636	1.936	0.799
SI	0.516	0.424	1.794	0.756
SWM BetweenErrors	0.520	0.414	3.132	1.000
SWM Strategy	0.739	0.674	2.851	1.000
WTAR	0.719	0.639	2.187	1.000

Table 42: Path Coefficients for UTAUT plus Trust plus Cognitive Variables (Age moderated), Study 3

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> ITU	0.403	0.342	0.287	1.401	0.162	-0.233	0.890
ATT -> ITU	0.174	0.165	0.324	0.538	0.591	-0.499	0.764
Age -> ITU	-0.671	-0.641	0.392	1.712	0.087	-1.405	0.132
Benevolence -> ITU	-0.298	-0.249	0.262	1.137	0.256	-0.761	0.295
CSE -> ITU	-0.092	-0.125	0.279	0.328	0.743	-0.693	0.406
Competence -> ITU	-0.015	0.009	0.257	0.059	0.953	-0.527	0.477
FAC -> ITU	0.330	0.359	0.243	1.359	0.174	-0.108	0.873
Functionality -> ITU	0.134	0.098	0.273	0.490	0.624	-0.450	0.668
Helpfulness -> ITU	-0.079	-0.104	0.225	0.351	0.725	-0.572	0.314
Integrity -> ITU	0.199	0.157	0.277	0.717	0.474	-0.447	0.700
Interaction Effect: Age -> Benevolence -> ITU	-0.006	-0.007	0.009	0.708	0.479	-0.025	0.011
PEOU -> ITU	0.031	-0.037	0.340	0.092	0.927	-0.754	0.590
PU -> ITU	0.179	0.212	0.263	0.680	0.497	-0.267	0.755
Reliability -> ITU	-0.005	0.049	0.201	0.027	0.978	-0.371	0.452
SI -> ITU	-0.057	-0.044	0.254	0.223	0.824	-0.531	0.481
SWM BetweenErrors -> ITU	0.062	0.051	0.286	0.218	0.827	-0.594	0.555
SWM Strategy -> ITU	0.151	0.176	0.304	0.498	0.618	-0.432	0.778
WTAR -> ITU	0.403	0.372	0.273	1.474	0.141	-0.194	0.916
WTAR -> PEOU	-0.341	-0.348	0.116	2.950	0.003	-0.555	-.0101

Note: Full model parameters can be found in Appendix 4.

The cognitive ability variables did not load significantly on the self-reported intention to use the technology in the iterations with the UTAUT and trust variables or UTAUT and social variables. The WTAR score variable was closest to achieving significance as a predictor of ITU in these iterations. This variable also showed a significant pathway on PEOU, p=.003

Table 43: UTAUT plus Social variables plus Cognitive variables (age moderated), Study 3

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> ITU	0.371	0.270	0.265	1.401	0.161	-0.259	0.805
ATT -> ITU	0.347	0.332	0.253	1.369	0.171	-0.160	0.849
Age -> ITU	-0.520	-0.492	0.363	1.433	0.152	-1.164	0.266
CSE -> ITU	-0.117	-0.119	0.201	0.583	0.560	-0.509	0.277
FAC -> ITU	0.301	0.346	0.208	1.448	0.148	-0.076	0.758
Image -> ITU	-0.178	-0.151	0.163	1.094	0.274	-0.458	0.190
Interaction Effect: Age -> Image -> ITU	-0.007	-0.008	0.007	0.928	0.354	-0.021	0.006
PEOU -> ITU	0.140	0.053	0.292	0.478	0.633	-0.528	0.662
PU -> ITU	0.227	0.224	0.230	0.985	0.325	-0.226	0.686
Perceived Enjoyment -> ITU	-0.254	-0.253	0.224	1.137	0.256	-0.707	0.174
Reputation -> ITU	0.058	0.059	0.145	0.398	0.690	-0.229	0.338
SI -> ITU	-0.077	-0.104	0.204	0.377	0.706	-0.516	0.304
SWM BetweenErrors -> ITU	0.024	0.013	0.285	0.084	0.933	-0.621	0.523
SWM Strategy -> ITU	0.132	0.157	0.241	0.549	0.583	-0.303	0.654
WTAR -> ITU	0.364	0.348	0.213	1.709	0.088	-0.099	0.765
WTAR -> PEOU	-0.341	-0.349	0.118	2.887	0.004	-0.557	-0.125

Note: Full model parameters can be found in Appendix 4.

Table 44: Endogenous variables, UTAUT plus Social Variables plus Cognitive Variables, Study 3

	R Square	R Square adjusted	VIF	CA
ANX	0.730	0.625	3.404	0.884
ATT	0.497	0.487	3.735	0.809
Age	0.240	0.208	5.681	1.000
CSE	0.171	0.118	1.717	1.000
FAC	0.841	0.827	2.131	0.156
ITU	-	-	-	1.000
Image	0.241	0.138	1.821	0.852
PEOU	0.790	0.750	1.215	0.856
PU	0.684	0.615	4.300	0.897
Perceived Enjoyment	0.967	0.959	2.181	0.799
Reputation	0.280	0.077	3.470	0.858
SI	0.720	0.575	1.581	0.756
SWM BetweenErrors	0.387	0.172	1.906	1.000
SWM Strategy	0.357	0.108	3.392	1.000
WTAR	0.620	0.456	3.110	1.000

Concluding, Hypothesis 3 was accepted. The cognitive ability variables add significantly to the UTAUT, whilst this did not hold up in other iterations in combination with other model extensions.

Hypothesis 4: *The personality variables operationalized in the TIPI (Ten Item Personality Inventory) will add significantly to the UTAUT model.*

Multiple PLS based regression analyses were run to compare the amount of variance accounted for in the models via the TIPI variables. The TIPI variables were grouped in the common Big 5 dimensions (McCrae & Costa, 1987; McCrae, Scally, Terracciano, Abecasis, & Costa, 2010) Extraversion, Openness, Conscientiousness, Agreeableness, and Neuroticism. The changes in the variance accounted for in the models can be found in. The path coefficients for the individual analyses can be found in Appendix 4.

Adding the TIPI variables to the UTAUT model resulted in a change of R^2 with $F_{(5, 39)}$=.2.356, p=.058 that was non-significant. Similar non-significant changes were shown in all other iterations that included the TIPI variables (see Table 45). As the personality variables based on the TIPI measure (Gosling et al., 2003) were not significant predictors of technology acceptance in any of the models that were tested in these systematic iterations, Hypothesis 4 for this study was rejected.

Table 45: Path Coefficients, UTAUT plus TIPI variables, Study 3

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> ITU	0.248	0.180	0.265	0.937	0.349	-0.388	0.663
ATT -> ITU	0.241	0.247	0.241	0.998	0.319	-0.266	0.722
Age -> ITU	-0.307	-0.269	0.267	1.152	0.250	-0.880	0.215
CSE -> ITU	-0.120	-0.116	0.190	0.631	0.528	-0.497	0.273
FAC -> ITU	0.467	0.473	0.206	2.265	0.024	0.109	0.909
PEOU -> ITU	0.005	-0.048	0.278	0.017	0.986	-0.611	0.470
PU -> ITU	0.111	0.100	0.219	0.505	0.614	-0.312	0.514
SI -> ITU	0.041	-0.047	0.162	0.256	0.798	-0.360	0.260
TIPI 1 -> ITU	-0.001	-0.016	0.149	0.006	0.995	-0.340	0.294
TIPI 2 -> ITU	-0.135	-0.155	0.157	0.855	0.393	-0.458	0.166
TIPI 3 -> ITU	-0.040	-0.029	0.182	0.219	0.827	-0.389	0.308
TIPI 4 -> ITU	-0.157	-0.153	0.163	0.963	0.336	-0.473	0.142
TIPI 5 -> ITU	-0.109	-0.119	0.177	0.615	0.539	-0.450	0.238

Note: More information regarding the model can be found in Appendix 4.

12.4.24 Discussion

Regarding Hypothesis 1, the addition of trust related variables to the UTAUT did not explain a significantly larger amount of variance for ITU in this study. This can be attributed to three potential causes. First of all it might indicate that there are other factors that play an important role with regard to technology acceptance prediction. Secondly, there were differences in the samples and in the technology that were assessed between this study and the previous studies.

Furthermore, the relatively small number of cases might have influenced the analysis. However, all reasonable steps were taken to reduce this possible impact through the use of Bootstrapping procedures and the use of PLS modelling.

In Hypothesis 2, benefits were found in the addition of social variables to the UTAUT model. The initial addition of the social variables led to a significant increase in the amount of variance accounted for. However, the increases in the amount of variance accounted for were non-significant in all following iterations that included other model extensions. The reason for this might be the generally low amount of variance in the data. Given that the Variance inflation values (VIFs) were all within reasonable bounds, an overlap in the variance accounted for is less likely.

When testing the CANTAB variables for the significance of their impact on the predictive model only the crystallized intelligence related measure was a significant predictor. This indicates that there might potentially be smaller influences of visual perception and prefrontal functioning. A relationship between this cognitive aspect and the use of graphical user interfaces could however be hypothesized, which could potentially be more pronounced in the use of technology with more complex menu structures (e.g. utilitarian use programs), compared to technology that were designed for interface simplicity (e.g. Tablet-PCs / hedonic use).

The addition of cognitive ability variables did lead to a significant increase in the amount of variance accounted for regarding the original UTAUT model. Whilst the spatial Working Memory variables were non-significant predictors in the models, the score relating to the WTAR, a crystallized intelligence approximation was a significant predictor in some of the iterations.

The fact that both of the fluid intelligence variables did not impact the predictive models in a significant way during the systematic iterations indicated that this was not merely an effect that was likely to be caused by this particular sample. Such an effect, if caused by the sample, would require for all test performances to be very evenly and closely distributed, which is not the case in this dataset.

Hypothesis 4 indicated the absence of any significant impact of personality on ITU. The variables of the TIPI (Gosling et al., 2003) did not show any significance as predictors of ITU, which was unexpected. It seems that differences in personality between technology users can be disregarded to a large extent; even in lifestyle-technology. It can be hypothesized that some of the variance that was accounted for by personality in previous research may be taken up by other variables. Reasons for this could be differences in personality distribution between samples or the generally small impact of personality on ITU. Future studies might find mediated effects through structural equation modelling. The impact of personality on technostress or technophobia will have to be considered (Thorpe & Brosnan, 2007).

The variable 'Age' was a significant predictor moderator in the proposed models. The interaction variables calculated including 'age', 'image', and 'benevolence' showed that the interactions of the age variable with other variables have a significant effect on the predictive models. No significant interaction was however found between age as a moderator and the cognitive ability variables. This is in line with the initial proposition that the cognitive ability variables will be a more accurate measure of cognitive ability than the use of age as an approximation for cognitive decline and overall performance.

The differences in terms of age and cognitive performance were visible in the pre-analysis. The older participants scored significantly lower on measures of spatial working memory and crystallized intelligence as approximated with the WTAR than did the younger participants. This was a good indicator for the use of the cognitive performance variables.

Concluding from this, the variable age is not an appropriate 'shortcut' to account for age related changes in TA models. Cognitive ability measures in conjunction with age

as a moderator for other variables can potentially be used to create better models.

An additional observation that was made was the significant path coefficient of WTAR on PEOU. This mediated effect, which was established in the initial mediation analysis, held up throughout all model iterations. It can therefore be concluded that aspects of cognitive ability have an impact of the perception of Perceived Ease of Use.

Regarding the Fixed Effect Fallacy introduced by Monk (2004), the Kruskal-Wallis test that was performed did not indicate significant differences between the groups, based on the make of the computer used by the participants. As in Study 1 and Study 2, the sample size was a limiting factor for equal groups sizes. For future research a stratified sample based on different makes and / or models of technology would be preferable for testing such differences.

Limitations of this study can be found in the sample size. Whilst the sample size was chosen as large as practically possible for this study, the overall amount of variables reduced the case-predictor ratio considerably. This led to some calculations including bootstrapping procedures having to be run at lower numbers of iteration or without bootstrapping in order to avoid matrix singularity problems.

Future studies should aim to collect larger numbers of cases in order to circumvent this issue. Given the time involved in the individual testing of the participants, using a selection of the best predicting variables introduced in this study may ease this challenge.

12.5 Summary of Part 3:

The results of Study 3 showed that the addition of the cognitive ability variables to the UTAUT significantly increased the amount of variance accounted for in intention to use lifestyle technology without other model extension being present. Whilst the crystallized intelligence approximating variable (WTAR) was a significant predictor in some iterations, the spatial working memory related variables were non-significant in all iterations of the models.

To this point, it has been shown that the original UTAUT model can be used for lifestyle technology prediction for E-Readers and TabletPCs when extended with social interaction and trust related variables. This could not be replicated for Trust variables when testing this extension on computers as lifestyle technology in Study 3.

13 PART 4: Confirmatory study of trust in online systems and bridging to utilitarian use

The previous studies indicated benefits of using trust constructs for the modelling of lifestyle technology acceptance. These constructs originated from research in online social networking. In this part of the research the LTAM was be tested in combination with the trust variables in the setting that they were originally developed for.

In the final study, the LTAM was tested against the UTAUT model in a workplace related, utilitarian technology use setting. This test can be seen as the most important part of this research, as it was designed to show whether the LATM can bridge the gap between the hedonic and utilitarian use of technology, or whether these two types of technology should be approached with separate modelling procedures. In this final study, a differentiation was also made between self-reported behavioural intention to use a technology, and objective measures of actual use.

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14.1 Chapter 9: Study 4 - Social Networks and Technology Acceptance

Lifestyle technology has over the past years been enriched with Online Social Networks as a new class of technology. In connection with the handheld devices and constant connectivity to the internet, this had immense impact on the way that technology is not only incorporated into a person's lifestyle, but can actually form it.

The large scale use of online platforms to exchange thoughts, share life events and stay in touch over long distances is a distinctly different use of technology than could have been anticipated in the development of early technology acceptance models such as the TAM (Davis, 1989) or even the UTAUT (Venkatesh et al., 2003).

After the positive results of the three initial studies regarding E-Readers, TabletPCs, and PCs in terms of trust related variables, online social networks were the next lifestyle technology to assess. This was for multiple different reasons. Firstly, online social networks were the technology context in which the trust variables were originally introduced and tested by Lankton and McKnight (2011). Therefore, a replication of the original study introducing the trust components was seen as a reasonable step to ensure applicability and validity of the constructs.

Secondly, online social networks for a third and independent class of technology in the lifestyle sector. The first study of this research focussed on single-function devices (E-Readers), which serve a particular lifestyle purpose. The second study widened the applicability of the LTAM model to multi-function devices. These multi-function devices, such as TabletPCs are likely to be used for online social networking by at least a part of the users. The third study focussed on a classical PC application of the LTAM model. PCs are likely to be another major gateway to using online social networks. However, all these technologies can be classified as specific devices. Online social networks are by definition not devices but are platform-independent.

Given the changes in technology that have led to the development and use of apps – computer programs that are very task specific and with a narrow scope of functionality each – such software based technologies are essential for the understanding of technology use in the lifestyle sector. The use of apps may in general determine for future generations whether a device is utilitarian or hedonic.

The aim of this study was to establish whether the Trust related factor structure introduced by Lankton and McKnight (2011) would hold up in a replication study with a student sample from the US and UK.

Due to the size of the questionnaire and the related workload for the participants, it was not possible to test the entire LTAM model on this sample. The heightened workload was not based on the amount of variables in the LTAM, but rather on the collaborative nature of the study. This required the combined use of several different measures, limiting number of items used for both researchers involved (see below).

14.1.1 Note on Collaboration:

The questionnaire used here was a collaboration between Mr B. Altemeyer and Mr D. Barron, both PhD students at the University of Westminster. The collaboration for this study was clearly separated based on the areas of expertise, with Mr Barron responsible for the schizotypy and 'conspiracy theory' material. Mr Altemeyer was responsible for the Technology Acceptance and the Technology Trust material. Whilst the data was collected in one shared online survey, analyses of the different aspects were conducted separately. The results of the crossover analysis between technology acceptance, schizotypy and measures of proneness to conspiracy beliefs, will be published separately in Personality and Individual Differences under the title: 'Associations Between Schizotypy and Belief in Conspiracist Ideation' (Barron, Morgan, Towell, Altemeyer, & Swami, 2014).

14.1.2 Sample

The overall sample size for this survey was over 300, with 220 completed cases for analysis. Based on the recruiting methods for this study, most participants were from a student population.

14.1.2.1 Note on sample overlap

The samples of this study and the E-Reader study showed a moderate degree of participant overlap. This was due to both studies being open for the students at the University of Westminster at the same time. Overall this reduces the possibility of generalization based on the data available. As the sample populations were partially identical, the model fit between the samples were expected to correlate to a certain extend. This did however not impact the differentiation between the technologies used in the studies.

Overall, the large number of participants form the US makes it less likely for the overlap in a part of the sample to be a severe problem in terms of data analysis.

14.1.3 Materials and Equipment

This study was conducted as an online survey, consisting of only one questionnaire with several sub-sets of questions. The key elements of this questionnaire covered demographics, technology acceptance and technology trust in Facebook (Lankton & McKnight, 2011), Schizotypy and conspiracy beliefs. Only technology trust, technology acceptance, and demographic data will be outlined and analysed at this point. Analyses of the Schizotypy and conspiracy theory related variables can be found in Barron et al. (2014) (see Appendix 1).

14.1.3.1 Technology Acceptance and Technology Trust

The technology acceptance related aspects of this survey were mainly based on the 2011 study by Lankton and McKnight. In their paper, Lankton and McKnight (2011) introduced the notion of technology trust as a mirrored concept to inter-human trust. Trust between humans was considered to be divisible into three separate aspects: Competence, Integrity, and Benevolence.

These constructs had been found in previous research (Lippert & Davis, 2006; Muir & Moray, 1996) to be applicable to settings in which people assessed trusting another person. In a technology related or technology mediated setting however, these were not considered to apply. This was purely related to the concepts themselves, but to the human attributes that were carried in the wording. Therefore, Lankton and McKnight (2011) mirrored these three trust core constructs for technology interactions (see Table 47).

Table 46: Mirrored trust constructs according to Lankton and McKnight (2011)

Inter-Human Trust	Human-Machine Trust
Competence	Functionality
Integrity	Reliability
Benevolence	Helpfulness

In terms of technology acceptance related items that were not based on the work of Lankton and McKnight, parts of the UTAUT were included in this study (Table 46). Due to the length of the survey and the related workload for the participants, a full inclusion of either the UTAUT (Venkatesh et al., 2003) or the LTAM was not feasible. As the focus of this study was the replication of the study by Lankton and McKnight (2011) with specific focus on the trust variables, this was not considered a major limitation.

14.1.4 Protocol

The online surveys were advertised through multiple different channels. This included the Research Participation Scheme (RPS) at the University of Westminster. This scheme requires students to take part in research projects that are carried out by members of staff. Participation in such research results in credit points, which are required to progress into the second year of study. No monetary value was attached to the credit points. Students at the University of Westminster were offered 0.5 points (30 minutes) worth of participation credit for this study. The estimated time required to complete the survey was 25-30 minutes.

This option was not available to any participants recruited via online networks such as Psychological Research on the Net (PRON) and Social Psychology Network (SPN). No incentives for participation were offered to students outside of the University of Westminster. It can however not be ruled out that other Universities require students to complete open-access surveys on these platforms to earn credit.

14.1.5 Analysis

This study was performed mainly as a confirmatory study for the technology trust related constructs. It was designed to allow a regression analysis and a CFA (confirmatory factor analysis). A structural equation modelling (SEM) approach to CFA was taken to give comparable results regarding the trust component parameters used by Lankton and McKnight (2011). This mirrored the procedures used in the original study as closely as possible, and follows the recommendations for comparative model testing and theory confirmation by Hair et al. (2014). PLS based factor loadings, AVE values and inter-factor correlations can be found in Appendix 5.

The analysis section is split into four parts. Part 1 includes demographics and descriptive statistics. For Part 2, the Cronbach's Alpha values for the individual constructs were calculated. The third part of the analysis section focused on confirmatory factor analyses (CFAs). These CFAs were run to determine how well the constructs used by Lankton and McKnight (2011) fitted the sample at hand. They were run on a first –order, and a second-order factor model basis.

The first-order model had the sum scores of the construct as the highest level of abstraction in terms of latent variables. In the second order factor model, an overall latent factor labelled 'trust' was the highest level of abstraction. The CFAs themselves were structured into subsets before conducting a 2-step analysis.

The first step was the fitting of the models, modifying factor and variable relationships if necessary. In a second step, the models were tested for invariance. Results from these two stages of CFA modelling were then compared to earlier research findings.

In Part 4 of the analysis, regression models were run using Partial Least Squared SEM based analyses.

Analyses regarding the Fixed Effect Fallacy by Monk (2004) did not apply to this study, as all participants were asked to refer to the same technology (Facebook) for this research. This made group comparisons impossible.

14.1.6 Part 1: Descriptive Statistics:

Of the 220 participants who completed the questionnaire, 80.9% were female and 19.1% were male. Age of the participants ranged from 18 to 61 years of age, with the mean being 21.38 (SD=5.658). Information regarding the nationality can be found in Table 47.

Table 47: Facebook study nationalities (only where information was provided)

Country	Frequency	Percent
UK	153	70.2
USA	54	24.8
Australia	3	1.4
Germany	2	0.9
Canada	2	0.9
Other	4	2.0

Less than 5% of the participants held a Master's (3.2%), Doctoral (0.5%) or Professional degree (0.9%). Over 65% of the participants had completed High School (35.0%) or had experiences some form of college without obtaining a degree (31.8%). A further 27.3% had completed either a 2 or 4 year College degree. Only 1.4% of the participants had experienced less than High School education.

14.1.7 Part 2: Cronbach Alpha Analysis

Internal consistency analyses were run for this data set. The results are shown in Table A 86 and Table A 92, Appendix 5.

14.1.8 Part 3: Confirmatory factor analysis (CFA) using structural equation modelling (SEM):

Two separate analyses were run in terms of CFA on this data set. A first-order factor model was run featuring the trust constructs as the highest level of abstraction in terms of factor structure. A second-order factor-model was computed, in line with the original research by Lankton and McKnight (2011); which was found to provide the best fitting model in the original paper.

14.1.8.1 First-order Factor Model

A confirmatory factor analysis (CFA) was run for the Facebook sample regarding the trust constructs. This included the respective variables for the inter-human as well as the human-machine trust-constructs and the variables for Intention to Use (see Table 48).

The sample size was adequate for this kind of analysis. However, further additions in terms of a full UTAUT - LTAM model or other parameters from the models would not have been feasible. These would have required parameter restrictors, negatively affecting the parameter to identifier ratio. The common guideline of k^2 indicators for k predictors would not have been met.

Table 48: Trust items for Facebook Study

Trust type	Construct	Items
Inter-Human Trust	Competence "I believe Facebook is competent. It..."	"...is competent and effective in providing social networking facilities."
		"...performs its role of facilitating social networking very well."
		"is a capable and proficient social networking provider."
		"...is very knowledgeable about social networking."
	Integrity "I believe Facebook has integrity. It..."	"...is truthful in its dealings with me."
		"...is honest."
		"...keeps its commitments."
		"...is sincere and genuine."
	Benevolence "I believe Facebook is benevolent. It..."	"...acts in my best interest."
		"...does its best to help me if I need help."
		"...is interested in my well-being, not just its own."
Human-Machine Trust	Functionality "I believe Facebook is functional. It..."	"... has the functionality I need."
		"...has the features required for my social networking needs."
		"...has the ability to do what I want it to do."
		"...has the overall capabilities I need."
	Reliability "I believe Facebook is reliable. It..."	"...is a very reliable service."
		"...does not fail me."
		"...is extremely dependable."
		"...does not malfunction for me."
		"...provides error free results."
	Helpfulness "I believe Facebook is helpful. It..."	"...supplies my need for help through a help function."
		"...provides competent guidance (as needed) through a help function."
		"...provides whatever help I need."

With the exception of the loading of one of the Benevolence variables, all factor loadings were within the recommended cut-off limits (Field, 2009; Gefen & Straub, 2005).

Table 49: Factor Loadings, First Order Model, Study 4

	Func.	Comp.	Reliab.	Integ.	Helpf.	Benev.	ITU
Func_1	0.825						
Func_2	0.863						
Func_3	0.858						
Func_4	0.911						
Comp_1		0.863					
Comp_2		0.899					
Comp_3		0.889					
Comp_4		0.700					
Reliab_1			0.880				
Reliab_2			0.905				
Reliab_3			0.876				
Reliab_4			0.759				
Reliab_5			0.688				
Integ_1				0.919			
Integ_2				0.930			
Integ_3				0.888			
Integ_4				0.924			
Helpf_1					0.906		
Helpf_2					0.897		
Helpf_3					0.843		
Benev_1						0.775	
Benev_2						0.948	
Benev_3						0.470	
ITU_1							0.976
ITU_2							0.971
ITU_3							0.971

Table 50: Factor Correlations and AVE values, First Order Factor Model, Study 4

	Benev.	Comp.	Func.	Helpf.	ITU	Integ.	Reliab.
Benevolence	**0.757**	.230**	.248**	.500**	0.094	.456**	.317**
Competence		**0.842**	.620**	.315**	.476**	.248**	.481**
Functionality			**0.865**	.385**	.514**	.261**	.481**
Helpfulness				**0.882**	.235**	.475**	.391**
ITU					**0.973**	.166**	.280**
Integrity						**0.916**	.382**
Reliability							**0.826**

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

14.1.8.2 Invariance

An invariance test was performed on the model to determine whether a split in the sample would affect the model. Two subsamples of equal size were created randomly from the data available. The invariance tests based on the factors indicated that the model was invariant on construct level.

Table 51: Path differences, First Order Factor Model, Study 4

	Delta Pathways	Sig.
Benevolence -> ITU	0.080	0.255
Competence -> ITU	0.093	0.288
Functionality -> ITU	0.125	0.219
Helpfulness -> ITU	0.188	0.109
Integrity -> ITU	0.060	0.361
Reliability -> ITU	0.321	0.989

14.1.9 Second-order Factor Model

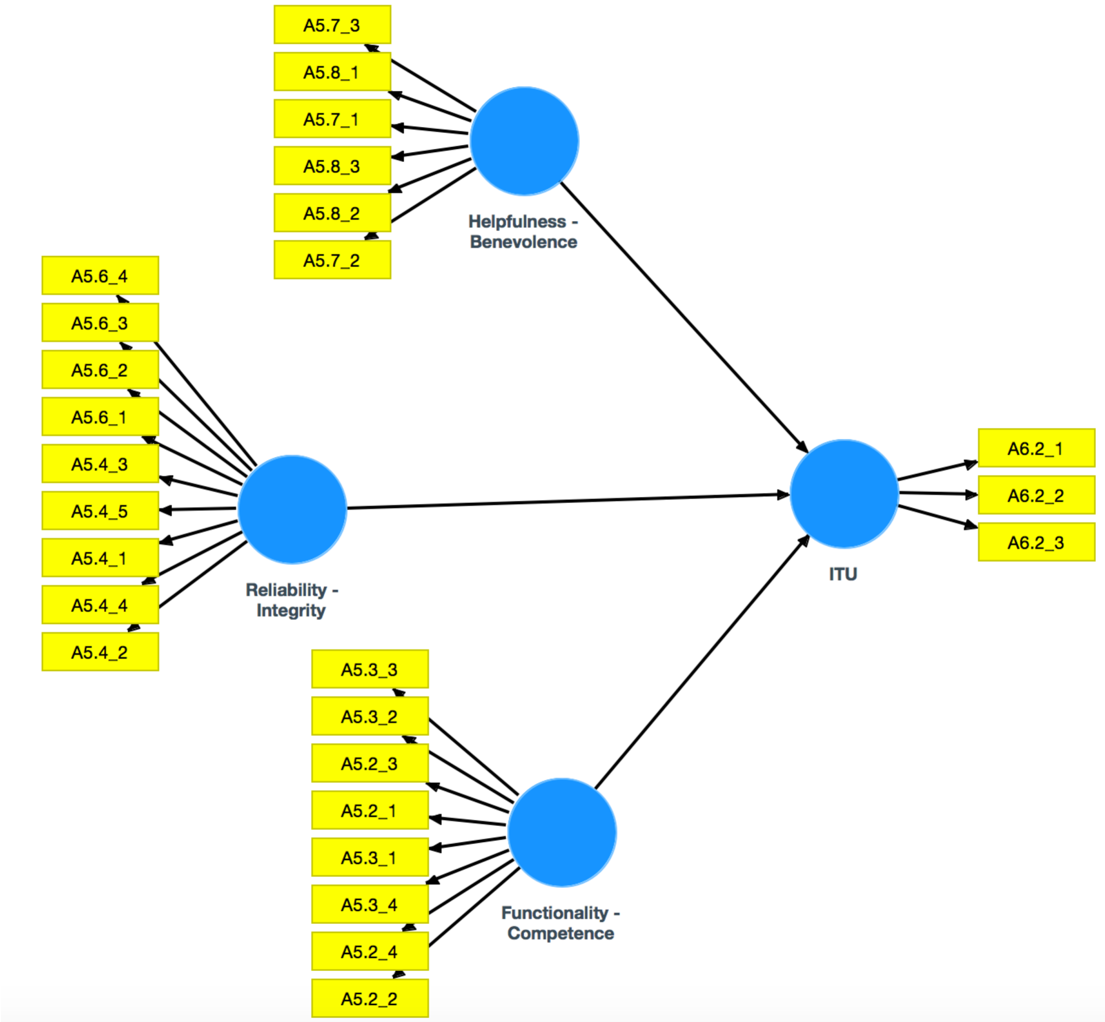

Figure 15: Second Order Factor Model for Trust variables in Facebook study (for illustration only)

In line with the analysis structure used by Lankton and McKnight (2011), a higher-level analysis in the form of a second-order factor model was computed. The AVE values and loadings can be found in Table 52.

Table 52: Factor Correlations and AVE values, Second Order Factor Model, Study 4

	Func_Comp	Helpf_Benev	ITU	Reliab_Integ
Func_Comp	**0.764**	0.396	0.559	0.508
Helpf_Benev		**0.734**	0.221	0.524
ITU			**0.973**	0.272
Reliab_Integ				**0.726**

Note: Values in **bold** are square roots of the factor related AVE values.

Table 53: Factor Loadings, Second Order Model, Study 4

	Functionality – Competence	Reliability – Integrity	Helpfulness – Benevolence	ITU
Func_1	0.742			
Func_2	0.815			
Func_3	0.790			
Func_4	0.838			
Comp_1	0.771			
Comp_2	0.778			
Comp_3	0.764			
Comp_4	0.589			
Reliab_1		0.757		
Reliab_2		0.794		
Reliab_3		0.776		
Reliab_4		0.657		
Reliab_5		0.616		
Integ_1		0.726		
Integ_2		0.722		
Integ_3		0.723		
Integ_4		0.746		
Helpf_1			0.893	
Helpf_2			0.885	
Helpf_3			0.848	
Benev_1			0.555	
Benev_2			0.669	
Benev_3			0.427	
ITU_1				0.976
ITU_2				0.971
ITU_3				0.971

14.1.9.1 Invariance

Based on two randomized subsamples from the data set of comparable size, test of difference were performed. Whilst on of the pathways (Helpfulness-Benevolence) achieved significance at p=.048, the model can overall be seen as invariant on construct level.

Table 54: Path invariance, Second Order Factor Model, Study 4

	Delta pathways	Sig.
Functionality - Competence -> ITU	0.162	0.073
Helpfulness - Benevolence -> ITU	0.279	0.048
Reliability - Integrity -> ITU	0.201	0.957

14.1.10 Comparison with results by Lankton and McKnight (2011)

14.1.10.1 First-order Factor Model:

Lankton and McKnight (2011), who first introduced the trust variables in this form, achieved similar structural equation modelling results for their model. The model was overall a good fit with very good results regarding the individual factor loadings, which were all well within the recommended cut-off points. Based on these findings, the model proposed by Lankton and McKnight (2011) can be regarded as confirmed for this sample. The closeness of the results is indicative of a very robust measure.

14.1.10.2 Second-Order Factor Model:

The second-order factor model was regarded to be as well fitting than the model in the study by Lankton and McKnight (2011). Overall, the factor structure proposed by Lankton and McKnight (2011) can be regarded as reliable and replicable.

14.1.11 Part 4: Regression analysis:

The models that were established in the confirmatory factor analysis were tested as structural models using PLS analysis procedures with bootstrapping. This analysis was run for both the first order and the second order factor model. All bootstrap samples were run with R=5000 iterations, as suggested by Hair et al. (2014), unless stated otherwise.

Table 55: Path coefficients for first order trust model on ITU, Study 4

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
Benevolence -> ITU	-0.082	-0.113	0.088	0.929	0.353	-0.271	0.075
Competence -> ITU	0.202	0.196	0.091	2.229	0.026	0.021	0.376
Functionality -> ITU	0.444	0.434	0.095	4.688	0.000	0.244	0.609
Helpfulness -> ITU	0.056	0.051	0.070	0.795	0.427	-0.087	0.189
Integrity -> ITU	0.046	0.068	0.068	0.677	0.498	-0.055	0.205
Reliability -> ITU	-0.060	-0.047	0.064	0.943	0.346	-0.169	0.078

The First Order model of trust variables accounted for 33.3% of the variance in the data (adj. R^2, R^2=.347), whilst the Second Order Factor model accounted for 31.0 % of the variance (adj. R^2, R^2=.317). The first order model had an SRMR of .070, indicating a good model fit for the composite model. For the common factor model, an SRMR of .095 was reported. This was still within the general window of good model fit, if not in the more conservative boundaries established by Bentler and Yuan (1999).

The second order factor model had an SRMR of .098 for the composite model, and an SRMR of .160 for the common factor model. These results indicated that whilst the composite model could be considered a good fit, the common factor model was outside of the .10 upper limit (Hair et al., 2014; compare Hu & Bentler, 1999).

Table 56: Path coefficients for second order trust model on ITU, Study 4

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
Functionality - Competence -> ITU	0.582	0.580	0.057	10.250	0.000	0.463	0.684
Helpfulness - Benevolence -> ITU	0.031	0.037	0.058	0.537	0.591	-0.081	0.145
Reliability - Integrity -> ITU	-0.069	-0.066	0.059	1.173	0.241	-0.181	0.050

14.1.12 Discussion:

The current study was for the most part a replication of the study published in 2011 by Lankton and McKnight. They assessed the link between interpersonal and technology trust with the behavioural intention to use social networks. Overall, the results of the two studies were comparable, with only minor differences. The studies were carried out with different sample sizes, which may have led to an underestimation in the original study, or an overestimation in the current study.

14.1.12.1 First- and second-order factor models

The 2011 paper by Lankton and McKnight was a great step forward in terms of the use of trust variables for interaction technology acceptance prediction. To confirm the factor structure proposed in this paper, the first- and second-order factor models used were tested in a similar setting. The first-order factor model had the trust constructs as the highest level of abstraction in terms of a latent or sum variable. It accounted for more variance than the second-order factor model. This was also the case when taking into consideration the adj. R^2 values, which would normally penalize the model based on complexity. The second-order model may be a reliable model to take into consideration when the overall number of variables exceeds the capability of the analysis in terms of an acceptable case-predictor ratio.

For both models the factor structure was confirmed. The models provided very well fitting solutions for the data set. Importantly, configural invariance was established for the second-factor model only indicating that the model fit is not based on particularities of the data set, but will also stand with different sub-sets of the sample.

The trust constructs might have a direct effect on the ITU in the overall TA models, but could also be mediated by other factors such as PEOU and PU.

However, it can be said that even with these limitations, both models indicated a good fit for the data set and stand as confirmed structures.

The amount of variance accounted for by the model is respectable. It is clearly indicative of the importance of these variables for TA modelling. Following from the findings of this study, the trust variables that were introduced by Lankton and McKnight (2011) can be seen as confirmed and should be included in TA modelling. Their structural integrity and the replicability of the structure in different samples indicated the robustness of these constructs. In terms of variance accounted for, the trust constructs accounted for just as much variance as would normally be expected from an entire TA model.

The previous three studies that focussed on E-Readers, TabletPCs and Computers showed that the trust variables did not cause any multicollinearity issues when added to a TA model such as the UTAUT (Venkatesh et al., 2003) or the LTAM. Multicollinearity would have indicated that the same variance that is normally accounted for by the TA model is also accounted for by the trust constructs. This was however not the case. Based on this, and the findings of this study regarding the trust factor structure, it can be concluded that the inclusion of the trust constructs by Lankton and McKnight (2011) has a profound impact on the amount of variance accounted for by a TA model. Future studies in the area of online social networks, testing the complete LTAM with the trust variables included, would help indicate how much more variance can be accounted for using the LTAM and the trust variables, rather than the UTAUT with trust variables, as done by Lankton and McKnight (2011).

The LTAM as a whole will, based on the results of this study, include all trust variables postulated by Lankton and McKnight (2011). They have been shown to be of high reliability, and to notably enhance the existing model.

14.2 Chapter 10: Study 5 - Blackboard and Technology Acceptance

14.2.1 Introduction:

At the core of this study was the use of e-learning technology to test the new model and its ability to account for variance with workplace technology and lifestyle technology. The UTAUT and especially the TAM have been used extensively in the area of e-learning in the past (Cheung & Vogel, 2013; Persico, Manca, & Pozzi, 2014; Roca, Chiu, & Martínez, 2006; Roca & Gagné, 2008; Šumak et al., 2011; Tarhini et al., 2013; van Raaij & Schepers, 2008; Yoo et al., 2012) and online learning related activities, such as the use of websites (van Schaik, 2009). Overall, the use of the UTAUT has however been far behind the use of the TAM in e-learning and education related areas; the UTAUT was used only for 4% of the studies surveyed by Šumak et al. (2011), with the TAM holding a share of 86%.

For this study it was hypothesized that the addition of the trust, social and cognitive variables would lead to a significant increase of variance accounted for compared to the UTAUT. This was shown in the previous studies to be the case when applied to non-work-related technology. This study was meant to connect the model back to the origins of technology acceptance modelling by taking into account two additional aspects that have been shown to be important in this area of research.

As discussed at an earlier point, objective measures of actual use have been used in very few studies so far, as the 'approximation of actual use' via the usage correlated 'Intention to Use' is the more common method and easier to accomplish (Turner et al., 2010).

Secondly, the inclusion of variables measuring cognitive ability as technology acceptance predictors was a new addition to existing TA models for workplace technology. This final study included the CANTAB tests regarding spatial working memory (SWM) and the WTAR (Wechsler-Test-of-Adult-Reading; Holdnack, 2001).

14.2.2 Aim

The aim of this study was to test whether the LTAM model, as the combination of UTAUT plus trust related variables, social variables, and cognitive ability measures established throughout the different previous studies, can account for as much variance as the UTAUT model when used on work-related technology. Based on research with lifestyle technology, the LTAM model has been shown to account for significantly more variance in certain settings than the UTAUT model.

Testing the model on an e-learning system was meant to show whether there are clear differences between the prediction models that can be used for utilitarian technology and lifestyle technology.

14.2.3 Methodology

Survey responses from an online sample of students at the University of Westminster were collected. In addition, the participants were asked to take part in cognitive ability tests based on the CANTAB testing system. Usage time of the system was recorded via the system's own monitoring facilities.

14.2.4 Sample

The overall sample of this study included 107 students. A complete study sample regarding Parts 1 and 2 of the research was obtained from 80 participants. Of these 80, a further 57 completed Part 3 of the study. For most of this analysis, the 80 cases available were used. In procedures that include the variables measured in Part 3 of the survey, 57 cases were used.

14.2.5 Materials and Equipment

14.2.5.1 CANTAB

Based on the results from Study 3 the CANTAB test SWM (Spatial Working Memory) and the WTAR were included alongside the LTAM. While the individual variables resulting from these measures did not account for significant amounts of variance regarding ITU in previous studies, they were theoretically closest to the differentiation between g(c) and g(f) in terms of general assessment of intelligence with more sophisticated measures.

14.2.5.2 Blackboard

The system used for this study was the online learning environment Blackboard. This system allows students to access course material and collaborate on coursework using integrated communication tools. Blackboard is used by the University of Westminster to distribute course material in digital form to the students based on their course and module enrolment. Therefore, the use of Blackboard can be seen as partially mandatory. Without a minimum level of interaction with the system, the students will not be able to successfully complete their course of study, as they would not have access to the relevant and assessment critical material. However, students still vary in their use of the system.

Blackboard automatically logs the user interaction data for students and staff alike, to be reviewed by the administrators and module leaders if required. Making use of this feature allowed monitoring the students' interactions with the system over the three time-points of this study. The students were aware that their data was being collected. Initially, the students were given the chance to participate without sharing any log-file data to earn credit points. The sharing option (opt-in) for this data was presented at a later stage for additional credit points. The students were made aware that the sharing of the log-files was in no shape or form linked to their performance assessments or their grades on modules / courses.

14.2.6 Protocol

14.2.6.1 Different time points of measurement

A repeated measures / longitudinal approach was taken for Study 5. This was due to the included measures of self-reported intention to use (t1), self-reported use (t2), and objectively measured actual use (t3).

Table 57: Test points for Study 5

Time points	T1	T2	T3
Tests / Measures	LTAM	Self Reported Actual Use SWM WTAR	Objectively Measured Use (can be obtained without the presence or involvement of the participants)
Aim	Obtain measure of self reported intention to use	Obtain measure of self reported actual use Obtain cognitive ability measures	Obtain objective measure of actual use

Consent forms were given to the participants at the three separate time points, covering the tasks and procedures that they are about to engage in at the particular time points. The tests were administered in a controlled environment, with exclusion of the online survey.

The intention to use the system was measured at the beginning of the semester, before the participants have had full exposure to the system in terms of using it for their everyday study activities for extended periods of time (t1). This ensured that the participants were able to give indications of intention to use the system without having had prolonged exposure to it and was considered to reduce bias.

The second measure (t2) was taken several weeks after the initial measure. At this point, the participants have had the opportunity to use the system to an extent of their own choice. However, a minimum amount of interaction with the system was required to progress with the course of study, i.e. accessing the online repository regarding course material. At this point in time, the participants also took part in the cognitive ability testing regarding the SWM and WTAR measures. Due to the relatively stable nature of these cognitive measures over time, the delay in taking these measurements from the participants was not considered a problem.

The third and final assessment (t3) was made several weeks after the second measurement. To obtain an objective measure of the actual use of the system, the built-in system analytics were used to provide individual usage statistics for the participants on 2 separate modules of the course they were studying. The model was tested based on the previously established variables, without any further changes in the overall model structure. Several regression-based analyses were run using PLS-SEM (Partial Least Squares Structural Equation Modelling) with bootstrapping.

14.2.7 Hypotheses:

Hypothesis 1: "Technology Trust will explain a significant amount of variance with regard to Technology Acceptance (operationalized as 'intention to use') of utilitarian technology."

Hypothesis 2: "Social Aspects of technology use will explain a significant amount of variance with regard to Technology Acceptance (operationalized as 'intention to use') of utilitarian technology."

Hypothesis 3: "Cognitive ability measures will explain a significant amount of variance with regard to Technology Acceptance (operationalized as 'intention to use') of utilitarian technology."

Hypothesis 4: "Technology Trust will explain a significant amount of variance with regard to Technology Acceptance (operationalized as 'actual use) of utilitarian technology."

Hypothesis 5: "Social Aspects of technology use will explain a significant amount of variance with regard to Technology Acceptance (operationalized as 'actual use') of utilitarian technology."

Hypothesis 6: "Cognitive ability measures will explain a significant amount of variance with regard to Technology Acceptance (operationalized as 'actual use') of utilitarian technology."

14.2.8 Analysis

This analysis section was split into seven separate parts. The first part is focused on the sample and demographics. In the second part, differences between the participants who completed all parts of the study, and the participants who dropped out were calculated. This was done to ensure that no measured factors or known latent factors were responsible for the drop out, which could have led to difficulties when using the data of both sub-samples.

Part 3 of this analysis focused on differences in 'actual use' scores between the modules that were observed. Differences in personal preference might have resulted in participants diverging from their normal use patterns of the technology, as they did not find the content of the module appealing to their interests or strengths. This informed the selection the source module of 'actual use' data.

In the fourth part of the analysis, mediation analyses were carried out for this sample. Part 5 focussed on regressions run on the data using the UTAUT model and the extension variables related to trust, social aspects and cognitive ability, predicting the self-reported intention to use (ITU). The sixth part of this analysis focused on the differences in variance explained between the UTAUT, all extension variables, and the LTAM model with regard to actual use of the technology. In the final part of the analysis, the LTAM model and the UTAUT model were compared regarding their performance on hedonic technology.

Regressions using the PLS method were run to determine the amount of variance accounted for in actual use, operationalized via the total number of accesses (page hits) on the system on one taught module. Comparisons were drawn between the LTAM and UTAUT model's performance regarding this type of technology.

Moderation analyses were not applicable to this study regarding experience levels or age differences, as all participants had the same amount of experience with the system, which was centrally managed, and were in a reasonable narrow age group. Mediation analyses were conducted regarding the potential mediation of Intention to Use between predictor variables and the Actual Use measures.

Analyses regarding the Fixed Effect Fallacy (Monk, 2004) as carried out in previous studies did also not apply, as the system used was identical for all participants.

14.2.9 Part 1: Sample and Demographics

Of the 80 students who completed Parts 1 and 2 of this research, 16.3% were male, and 83.7% were female. All participants indicated they resided in the UK, apart from one. Over half of the students indicated to have a High School or equivalent education (55.0%). One participant indicated that they held a Master's Degree, and another participant indicated to hold a Professional Degree (e.g. MD) or equivalent. All participants were students enrolled in Psychology degrees at the University of Westminster, London, UK. Furthermore, all students were in their first year of studies on their respective course. The mean age of the participants was 19.56 years (SD=3.19), with a minimum value of 18 years, and a maximum value of 34. Approximately 75% of the participants were between 18 and 19 years old.

14.2.10 Part 2: Comparison between continuation and drop-out

The participants who completed all three parts of the study were compared to the ones that did not complete the last part, to establish whether there are any significant differences between these subsamples. For this comparison, a filter variable and a MANOVA were used. Whilst the group sizes differ, this comparison is considered to be acceptable, even though the statistical power may be slightly reduced.

The MANOVA included five variables, drawn from cognitive ability measures as well as measures of 'Intention to Use'. Regarding cognitive ability variables, the overall score approximating general intelligence was used. This was alongside a variable representing the appropriateness of the strategy employed by the participant in solving the spatial-working memory tasks. From this task, another variable was used, covering the amount of errors made. Regarding 'Intention to Use', the ITU measures taken at time points 1 and 2 were used.

No statistical difference between these groups was found, with $F_{(5, 74)}=1.270$, $p=.286$; Wilk's $\Lambda=.921$, partial $\eta^2=.079$. Based on these results, it can be assumed that the reasons for the dropouts of the participants were located outside of the measured parameters of this study. The previous results gathered from the dropouts were therefore used in the overall analysis.

14.2.11 Part 3: Comparison between the modules

Log-files from two modules the participants were enrolled in were collected for actual-usage statistics. This included variables such as number of log-ins, time spent on the module and others (see Table 58). The modules Research Methods (ResM) and Doing Psychology (DPsy) were chosen, as they differed sufficiently in their content. Whilst Research Methods is a statistics heavy module, Doing Psychology is more historically and practically oriented. This was a precaution to ensure that the students' preferences with regard to their modules did not impact the usage statistics of the Blackboard system used for this study. It was hypothesized that students who dislike a module would try to engage with it as little as possible, thereby not showing their 'typical' usage behaviour.

The amount of Blackboard usage between modules can be seen as reasonably stable, taking into consideration that most sessions will require at least one recorded page access to access material, and that the numbers of sessions are equal or at least comparable.

Table 58: Actual Use variables collected via Log-Files

Module		**Actual Use Variables**					
		Total Number of page-hits	**Total number of Content Area Use (all areas)**	**Time spent using the system**	**Log-Ins within the first 14 days of access**	**Log-Ins within the first month of access**	**Log-Ins within the first 6 weeks of access**
Research Methods (ResM)	Mean	208.01	143.65	63.249	21.53	46.48	68.00
	SD	80.849	58.364	34.054	13.397	23.422	32.157
	N	80	80	80	80	80	80
Doing Psychology Doing Psychology (DPsy)	Mean	175.82	115.24	72.465	27.89	64.44	92.32
	SD	73.315	48.284	41.632	17.704	38.717	50.396
	N	71	71	71	71	71	71

The time effect in the form of measures for the 2-week, 4-week, and 6-week time points were measured as well. This was the case, as it was hypothesized that the usage patterns may differ between different time points; especially given the increased exposure to the system. These variables were included for completeness, but were considered unlikely to play an important role in the analysis at hand. Two paired samples t-tests were run with bootstrapping to determine potential differences between the total number of page hits between the modules, and the time spent on the module pages. A significant difference was found between the number of page hits on the Doing Psychology module and the Research Methods module $t=5.445$, $df=70$, $p<.001$. Bootstrapped results can be found in Table 59.

Table 59: Bootstrapped results, paired t-test on total number of access between modules, Study 2

	Bootstrapped Results		
	Sig. (2-tailed)	95% CI	
		Lower	Upper
ResM_TotalAccess - DPsy_TotalAccess	.001	21.270	47.691
ResM_Usertime – DPsy_Usertime	.006	-16.262	-3.276

Note: Results of bootstrapped analysis with R=1000, Mersenne Twister=2000000.

For the time spent by the users on the different module pages, a significant difference was reported, with t=-2.988, df=70, p=.004. The bootstrapped results are based on more randomized data files, balancing the distributions more evenly. The differences present were taken as indication for the conceptual differences and resulting different perceptions of the modules by the students.

To establish which of the log-file based usage variables would serve as the best measure of actual use, correlations between the different variables were run. With distributions close to a normal distribution curve, the variables lent themselves to the use of parametric correlations. The variable recording the total amount of site accesses per participant for the module Research Methods stood out. It showed significant correlations with all other usage variables (Table 60).

Nine participants were not enrolled in the Doing Psychology module, leading to a lack of data for these participants. For these reasons, the variable representing the overall number of page-hits for the module Research Methods was chosen as an indicator of actual use of the Blackboard system.

Table 60: Log-file variable correlations for actual use of Blackboard based on ResM Total Access numbers

		Actual Use Variables					
		Total Access	**AllContent Areas**	**Usertime**	**First 14days**	**Nov**	**First 6weeks**
ResM Total	**Pearson Correlation**	1	.943**	.275*	.453**	.577**	.609**
DPsy Total	**Pearson Correlation**	.782**	.757**	.280*	.585**	.601**	.667**

Note: * p<.05; ** p<.001

14.2.12 Part 4: Mediation Analysis:

A mediation analysis was run regarding the possible impact of the self-reported Intention to Use (ITU) technology, and objective measures of Actual Use. No mediation effect was found between the independent variables and the outcome variable ‘Actual Use’ based on ITU. The analysis results can be found in in Appendix 6.

Following this mediation analysis, a second mediation analysis was run regarding a potential mediation of the effect between the cognitive ability variables on ITU, based on Perceived Ease of Use. The full results of the mediation analysis can be found in Appendix 6. A mediation effect was found for the variable WTAR. Based on the K2 value, and the bootstrap intervals for the indirect effect not containing zero, it was assumed that there is a significant medium sized effect.

Table 61:Mediation Analysis, WTAR and PEOU, Study 5

	Effect	SE	t	p	LLCI	ULCI
Total effect	.0153	.0318	.4791	.6340	-.0487	.0793
Direct Effect	.0509	.0304	1.6778	.0999	-.0101	.1120
Indirect Effect	-.0357	.0167	-	-	-.0836	-.0114

Regarding the variable SWM_BetweenError, the mediation analysis was not exhaustively conclusive. Based on the BCa Bootstrap values and the k2 value, there a medium sized effect seems to exist in the data set. This was however not shown to be significant the Sobel test that was performed. It can therefore be concluded that whilst some mediation exists, this is not likely to be of significance in this data set.

No significant mediation effect was found to exist regarding the variable PEOU and the relationship between SWM_Strategy and ITU. As none of the BCa confidence intervals include zero, a certain degree of moderation can however not be ruled out.

14.2.13 Part 5: Regression analyses for ITU

Systematic iterations of the model extensions were run using PLS based modelling. The results of the comparisons between the 13 model iterations can be found in Table 63. In the following, the Hypotheses will be tested, introducing the different iterations of the model extension to the UTAUT. All models represented here were aimed at predicting Intention to Use a technology (ITU). The corresponding models focused on Actual Use measures can be found in the following chapter.

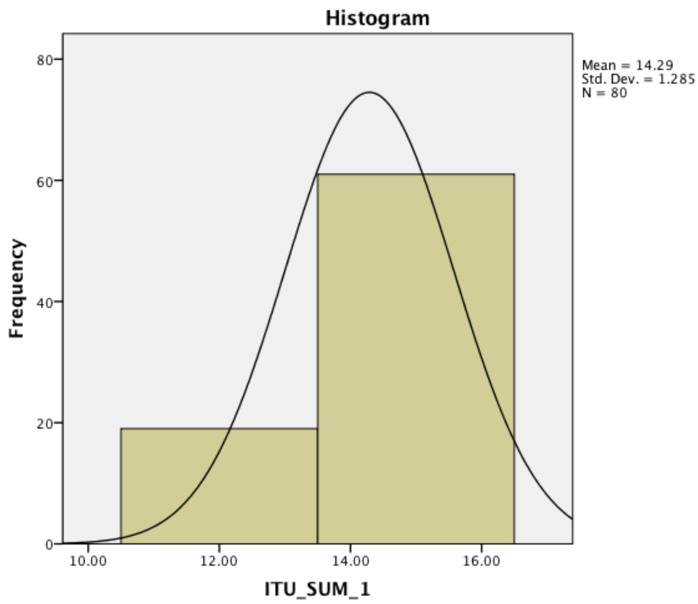

Figure 16: Distribution of ITU, Point 1 in Study 5

Time point 1 was chosen as the reference point regarding measures of ITU. This made the separate studies of this research comparable to each other and to previous research. Also, the participants had the least exposure to the system at time point 1, making it a more conservative measure. At later stages, participants had had several weeks or even months of exposure to the system, which might have affected the results of self-reported intention to use it. Furthermore, most TA research and TA oriented studies only feature one ITU measuring point, which is usually placed with the administration of all other measures and questionnaires. Using a different time point for direct comparison might have reduced comparability due to difference in technology exposure of the participants.

Table 62: Path Coefficients, UTAUT on ITU, Study 5

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> ITU	0.030	0.012	0.124	0.240	0.811	-0.215	0.297
ATT -> ITU	0.089	0.115	0.201	0.441	0.659	-0.343	0.454
CSE -> ITU	-0.108	-0.104	0.097	1.113	0.266	-0.296	0.088
FAC -> ITU	0.052	-0.028	0.168	0.311	0.756	-0.334	0.282
PEOU -> ITU	0.080	0.073	0.155	0.515	0.607	-0.212	0.409
PU -> ITU	0.172	0.175	0.148	1.159	0.247	-0.148	0.442
SI -> ITU	0.180	0.051	0.193	0.933	0.351	-0.290	0.339

Table 63: Model Comparisons for ITU, Study 5

Model	Base	Addition	R^2	adj. R^2	**Δ** R	F **Δ**	df1	df2	sig
1	UTAUT		.160	.077	0.160	1.959	7	72	0.073
2	UTAUT	plus Trust	.254	.105	0.094	1.239	6	66	0.298
3	UTAUT	plus SOC	.226	.112	0.066	1.762	3	69	0.162
4	UTAUT plus Trust	plus SOC	.320	.144	0.066	1.618	3	63	0.194
5	UTAUT plus SOC	plus Trust	.320	.144	0.094	1.221	6	63	0.308
6	UTAUT	plus COG	.191	.072	0.031	0.792	3	69	0.503
7	UTAUT plus Trust	plus COG	.274	.087	0.020	0.459	3	63	0.712
8	UTAUT plus COG	plus Trust	.274	.087	0.083	1.010	6	63	0.427
9	UTAUT plus SOC	plus COG	.248	.097	0.022	0.546	3	66	0.653
10	UTAUT plus COG	plus SOC	.248	.097	0.057	1.415	3	66	0.246
11	UTAUT plus Trust plus SOC	plus COG	.331	.116	0.011	0.241	3	60	0.867
12	UTAUT plus Trust plus COG	plus SOC	.331	.116	0.057	1.250	3	60	0.300
13	UTAUT plus SOC plus COG	plus Trust	.331	.116	0.083	0.918	6	60	0.452

Hypothesis 1: "Technology Trust will explain a significant amount of variance with regard to Technology Acceptance (operationalized as 'intention to use') of utilitarian technology."

The first model extensions to be tested were the trust variables. The addition of these variables led to a non-significant increase in R^2 from .160 (R^2; adj. R^2=.077) of the UTAUT to .254 (R^2; adj. R^2=.105) for the combination model, with F(6, 66)=1.239, p=.298. Path coefficients for the latter model can be found in Table 64.
In a further iteration the trust variables were added to a combination model of the UTAUT and social variables, leading to a non-significant increase in variance accounted for (F(6, 63)=1.221, p=.308). Similarly, the addition of trust variables to the UTAUT plus cognitive ability variables and the UTAUT plus social and cognitive ability variables were non-significant (Table 63).

Table 64: Path Coefficients, UTAUT plus Trust on ITU, Study 5

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> ITU	0.027	0.033	0.144	0.190	0.849	-0.242	0.326
ATT -> ITU	0.012	0.053	0.219	0.055	0.956	-0.396	0.439
Benevolence -> ITU	0.112	-0.080	0.224	0.501	0.616	-0.472	0.333
CSE -> ITU	-0.205	-0.211	0.125	1.648	0.100	-0.459	0.038
Competence -> ITU	-0.037	-0.083	0.199	0.183	0.854	-0.470	0.309
FAC -> ITU	0.030	-0.015	0.154	0.198	0.843	-0.317	0.276
Functionality -> ITU	0.235	0.289	0.231	1.014	0.311	-0.159	0.749
Helpfulness -> ITU	0.051	0.049	0.135	0.380	0.704	-0.225	0.312
Integrity -> ITU	0.098	0.140	0.126	0.776	0.438	-0.097	0.403
PEOU -> ITU	-0.051	-0.089	0.188	0.270	0.788	-0.448	0.301
PU -> ITU	0.161	0.176	0.149	1.078	0.281	-0.148	0.463
Reliability -> ITU	0.101	0.117	0.151	0.665	0.506	-0.195	0.411
SI -> ITU	0.128	0.030	0.162	0.791	0.429	-0.262	0.306

Overall, Hypothesis 1 was rejected. The trust variables did not add significantly to the UTAUT on its own or in any iteration with other model extensions.

Hypothesis 2: "Social Aspects of technology use will explain a significant amount of variance with regard to Technology Acceptance (operationalized as 'intention to use') of utilitarian technology."

The addition of social variables to the UTAUT model increased the overall amount of variance accounted for from 7.7% (adj. R^2; R^2=.160) to 11.2% (adj. R^2; R^2=.226). This increase was non-significant at $F_{(3, 69)}$=1.762, p=.162. Only the variable 'Image' was a significant predictor in the model.

Table 65: Path Coefficients, UTAUT plus Social Variables on ITU, Study 5

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> ITU	0.110	0.072	0.134	0.823	0.411	-0.189	0.337
ATT -> ITU	0.006	0.023	0.243	0.025	0.980	-0.503	0.411
CSE -> ITU	-0.100	-0.103	0.107	0.933	0.351	-0.311	0.105
FAC -> ITU	0.002	-0.029	0.138	0.015	0.988	-0.288	0.242
Image -> ITU	-0.263	-0.240	0.117	2.242	0.025	-0.463	0.027
PEOU -> ITU	0.062	0.057	0.178	0.348	0.728	-0.302	0.404
PU -> ITU	0.176	0.168	0.149	1.183	0.237	-0.137	0.455
Perceived Enjoyment -> ITU	0.163	0.166	0.184	0.883	0.377	-0.154	0.576
Reputation -> ITU	-0.035	-0.031	0.154	0.231	0.818	-0.358	0.244
SI -> ITU	0.196	0.084	0.195	1.007	0.314	-0.274	0.399

In a further iteration, the social variables were added to the UTAUT plus Trust variables, leading to a non-significant increase in variance accounted for ($F_{(3, 63)}$=1.618, p=.194). Similarly, the addition to Social variables to a model comprised of the UTAUT and cognitive ability variables, or the UTAUT plus trust related and cognitive ability variables were non-significant (Table 63). In the iteration of the UTAUT plus trust plus social variables, no predictor was significant (Table 63).

Table 66: Path Coefficients, UTAUT plus Trust plus Social variables on ITU, Study 5

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> ITU	0.133	0.101	0.168	0.791	0.429	-0.238	0.423
ATT -> ITU	0.025	0.026	0.254	0.097	0.922	-0.509	0.447
Benevolence -> ITU	0.062	-0.051	0.192	0.322	0.747	-0.413	0.317
CSE -> ITU	-0.188	-0.199	0.127	1.473	0.141	-0.461	0.048
Competence -> ITU	-0.080	-0.100	0.212	0.375	0.708	-0.512	0.305
FAC -> ITU	0.027	-0.016	0.145	0.189	0.850	-0.295	0.265
Functionality -> ITU	0.287	0.309	0.244	1.176	0.240	-0.152	0.800
Helpfulness -> ITU	0.085	0.090	0.150	0.568	0.570	-0.201	0.378
Image -> ITU	-0.217	-0.200	0.127	1.713	0.087	-0.441	0.068
Integrity -> ITU	0.101	0.135	0.128	0.788	0.431	-0.101	0.394
PEOU -> ITU	-0.042	-0.074	0.199	0.212	0.832	-0.452	0.324
PU -> ITU	0.194	0.192	0.157	1.236	0.217	-0.141	0.491
Perceived Enjoyment -> ITU	0.071	0.063	0.202	0.353	0.724	-0.309	0.510
Reliability -> ITU	0.131	0.149	0.168	0.781	0.435	-0.182	0.481
Reputation -> ITU	-0.187	-0.180	0.187	1.000	0.318	-0.554	0.193
SI -> ITU	0.137	0.096	0.162	0.844	0.399	-0.219	0.395

Overall, Hypothesis 2 was rejected. The addition of social variables did not add significantly to the amount of variance accounted for by the UTAUT. This was confirmed in the systematic model iterations with other model extensions.

Hypothesis 3: "Cognitive ability measures will explain a significant amount of variance with regard to Technology Acceptance (operationalized as 'intention to use') of utilitarian technology."

The addition of cognitive ability variables to the UTAUT led to an increase in variance accounted for from R^2=.160 (adj. R^2=.077) to R^2=.191 (adj. R^2=.072). This increase was non significant at $F_{(3, 69)}$=0.792, p=.503. In this iteration, no predictor variable was significant (Table 67).

In further iterations the cognitive ability variables were added to the UTAUT plus trust variables and the UTAUT plus social variables. Both led to a non-significant increase in variance accounted for, with $F_{(3, 63)}$=0.459, p=.712, and $F_{(3, 66)}$=0.546, p=.653, respectively. Further iterations with the UTAUT plus both trust and social variables led to similar non-significant results (Table 63).

Table 67: Path Coefficients, UTAUT plus Cognitive Variables on ITU Study 5

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> ITU	0.006	-0.008	0.140	0.045	0.964	-0.264	0.289
ATT -> ITU	0.136	0.147	0.209	0.651	0.515	-0.342	0.512
CSE -> ITU	-0.113	-0.106	0.101	1.112	0.266	-0.316	0.088
FAC -> ITU	0.014	-0.018	0.148	0.094	0.925	-0.314	0.251
PEOU -> ITU	0.070	0.060	0.168	0.415	0.678	-0.274	0.414
PU -> ITU	0.142	0.146	0.165	0.861	0.390	-0.209	0.458
SI -> ITU	0.139	0.037	0.181	0.768	0.443	-0.288	0.328
SWM BetwErrors -> ITU	0.133	0.125	0.144	0.925	0.355	-0.155	0.397
SWM Strategy -> ITU	-0.147	-0.153	0.121	1.219	0.223	-0.378	0.094
WTAR -> ITU	0.131	0.107	0.129	1.012	0.312	-0.153	0.348

14.2.14 Part 6: Regression analyses for ‘actual use’ variables

Following from the analysis of the model extensions and their predictive ability regarding self-reported intention to use a technology (ITU), the following analyses were aimed at the objective measures of actual use. A full overview of the model comparisons for actual use can be found in Table 68. The variable Intention to use was excluded form the set of predictors for these iterations. Table A 143 in Appendix 6 provides an overview of the same iterations run with the inclusion of ITU as a predictor variable.

Table 68: Model comparisons for Actual Use (excl. ITU), Study 5

Model	Base	Addition	R^2	adj. R^2	Δ R	F Δ	df1	df2	sig
1	UTAUT		0.185	0.105	0.185	2.335	6	72	0.033
2	UTAUT	plus Trust	0.309	0.171	0.124	1.765	6	66	0.120
3	UTAUT	plus SOC	0.348	0.252	0.163	5.167	3	69	0.003
4	UTAUT plus Trust	plus SOC	0.412	0.261	0.103	2.920	3	63	0.041
5	UTAUT plus SOC	plus Trust	0.412	0.261	0.064	0.096	6	63	0.999
6	UTAUT	plus COG	0.187	0.067	0.002	0.051	3	69	0.985
7	UTAUT plus Trust	plus COG	0.311	0.133	0.002	0.048	3	63	0.986
8	UTAUT plus COG	plus Trust	0.311	0.133	0.124	1.590	6	63	0.165
9	UTAUT plus SOC	plus COG	0.352	0.222	0.004	0.115	3	66	0.951
10	UTAUT plus COG	plus SOC	0.352	0.222	0.165	4.753	2	66	0.005
11	UTAUT plus Trust plus SOC	plus COG	0.414	0.226	0.002	0.050	3	60	0.985
12	UTAUT plus Trust plus COG	plus SOC	0.414	0.226	0.103	2.578	3	60	0.062
13	UTAUT plus SOC plus COG	plus Trust	0.414	0.226	0.062	0.829	6	60	0.552

Hypothesis 4: "Technology Trust will explain a significant amount of variance with regard to Technology Acceptance (operationalized as 'actual use) of utilitarian technology."

The addition of trust variables to the UTAUT aimed at Actual Use as the dependent variable led to an increase in the amount of variance accounted for from R^2=.185 (adj. R^2=.105) to R^2=.309 (adj. R^2=.171). This increase in variance accounted for was non-significant at $F_{(6, 66)}$=1.765, p=.120). Only the variable Attitude towards technology (ATT) was a significant predictor in this model. Path coefficients for this model can be found in Table 68.

Additions of the trust related variables to model composed of the UTAUT and social variables, the UTAUT and cognitive variables, or the UTAUT plus both social and cognitive ability variables led to non-significant increases in variance accounted for. Overall, Hypothesis 4 was rejected. Trust related variables did not add significantly to the amount of variance accounted for by the UTAUT individually, or with other model extensions present.

Table 69: Path Coefficients, UTAUT plus Trust on Actual Use, Study 5

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> Actual Use	-0.111	-0.069	0.158	0.705	0.481	-0.360	0.259
ATT -> Actual Use	0.326	0.288	0.167	1.955	0.051	-0.164	0.562
Benevolence -> Actual Use	-0.117	0.042	0.186	0.631	0.528	-0.301	0.417
CSE -> Actual Use	-0.126	-0.094	0.129	0.974	0.330	-0.351	0.165
Competence -> Actual Use	-0.002	-0.079	0.178	0.012	0.990	-0.433	0.285
FAC -> Actual Use	-0.032	0.013	0.168	0.192	0.848	-0.299	0.339
Functionality -> Actual Use	-0.300	-0.203	0.192	1.565	0.118	-0.582	0.190
Helpfulness -> Actual Use	-0.002	-0.034	0.206	0.008	0.994	-0.421	0.373
Integrity -> Actual Use	0.189	0.040	0.200	0.948	0.343	-0.365	0.378
PEOU -> Actual Use	0.031	0.054	0.173	0.178	0.859	-0.280	0.388
PU -> Actual Use	-0.031	-0.056	0.170	0.181	0.856	-0.397	0.268
Reliability -> Actual Use	-0.043	-0.080	0.181	0.235	0.814	-0.410	0.299
SI -> Actual Use	0.016	0.014	0.146	0.112	0.911	-0.289	0.278

Hypothesis 5: "Social Aspects of technology use will explain a significant amount of variance with regard to Technology Acceptance (operationalized as 'actual use') of utilitarian technology."

Social variables were added to the UTAUT and other model iterations with other model extensions in a systematic way. Adding the social variables to the UTAUT led to a significant increase in the amount of variance accounted for by the model from R^2=.185 (adj. R^2=.105) to R^2=.348 (adj. R^2=.252), with $F_{(3, 69)}$=5.167, p=.003. Reputation and Perceived Enjoyment were both significant predictors in this model., whilst none of the UTAUT predictors were significant.

Table 70: Path Coefficients, UTAUT plus Social Variables on Actual Use, Study 5

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> Actual Use	-0.040	-0.056	0.124	0.326	0.745	-0.295	0.194
ATT -> Actual Use	-0.033	-0.017	0.184	0.181	0.856	-0.418	0.308
CSE -> Actual Use	-0.131	-0.116	0.104	1.260	0.208	-0.312	0.092
FAC -> Actual Use	-0.190	0.035	0.222	0.855	0.392	-0.336	0.419
Image -> Actual Use	0.108	0.087	0.128	0.848	0.397	-0.184	0.320
PEOU -> Actual Use	-0.138	-0.111	0.156	0.887	0.375	-0.411	0.195
PU -> Actual Use	-0.028	-0.073	0.188	0.151	0.880	-0.429	0.267
Perceived Enjoyment -> Actual Use	0.517	0.442	0.192	2.697	0.007	0.089	0.849
Reputation -> Actual Use	-0.376	-0.309	0.158	2.379	0.017	-0.601	0.047
SI -> Actual Use	0.084	0.065	0.151	0.559	0.576	-0.256	0.321

Significant increases in variance were also found when the social variables were combined with other model extension. When added to the UTAUT plus Trust variables, the amount of variance accounted for was increase from R^2=.309 (adj. R^2=.171) to R^2=.412 (adj. R^2=.261), with $F_{(3, 63)=}$2.920, p=.041. The path coefficients for this model can be found in Table 71. Perceived Enjoyment was the only significant predictor in the model.

Table 71: Path Coefficients for UTAUT plus Trust plus Social variables on Actual Use, Study 5

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> Actual Use	-0.025	-0.043	0.134	0.184	0.854	-0.307	0.216
ATT -> Actual Use	-0.071	-0.054	0.195	0.361	0.718	-0.463	0.313
Benevolence -> Actual Use	-0.064	0.048	0.167	0.381	0.703	-0.254	0.388
CSE -> Actual Use	-0.107	-0.084	0.128	0.836	0.403	-0.337	0.166
Competence -> Actual Use	-0.098	-0.147	0.171	0.578	0.564	-0.499	0.178
FAC -> Actual Use	-0.067	0.029	0.165	0.409	0.683	-0.293	0.349
Functionality -> Actual Use	-0.228	-0.172	0.181	1.258	0.208	-0.532	0.174
Helpfulness -> Actual Use	0.030	-0.002	0.197	0.150	0.881	-0.390	0.382
Image -> Actual Use	0.045	0.040	0.139	0.326	0.744	-0.250	0.301
Integrity -> Actual Use	0.120	0.030	0.171	0.701	0.484	-0.327	0.329
PEOU -> Actual Use	-0.029	0.000	0.174	0.166	0.868	-0.335	0.327
PU -> Actual Use	-0.016	-0.071	0.180	0.089	0.929	-0.412	0.285
Perceived Enjoyment -> Actual Use	0.593	0.530	0.216	2.749	0.006	0.117	0.975
Reliability -> Actual Use	-0.058	-0.079	0.173	0.336	0.737	-0.405	0.280
Reputation -> Actual Use	-0.204	-0.145	0.163	1.245	0.213	-0.460	0.194
SI -> Actual Use	0.064	0.038	0.154	0.414	0.679	-0.283	0.335

Adding the social variables to A model comprised of the UTAUT and cognitive ability variables led to a further significant increase of variance accounted for ($F_{(3, 66)}$=4.753, p=.005). Similar results that were approaching significance, were achieved when comparing the UTAUT plus trust and cognitive ability variables with a model that additionally featured the social variables ($F_{(3, 60)}$=2.574, p=.062).

Overall, Hypothesis 5 was accepted. The addition of social variables to the UTAUT when aimed at Actual Use prediction led to a significant increase in variance accounted for. Similar results were found in nearly all iterations that included other model extensions.

Hypothesis 6: "Cognitive ability measures will explain a significant amount of variance with regard to Technology Acceptance (operationalized as 'actual use') of utilitarian technology."

Cognitive ability variables as an addition to the UTAUT led to a minimal increase in variance accounted for, from R^2=.185 (adj. R^2=.105) to R^2=.187 (adj. R^2=.067). This increase was non-significant with F(3, 66)= 0.051, p=.985. Similar results were found for all other iterations (Table 68).

Based on these results, Hypothesis 6 was rejected. Cognitive ability variables did not increase the amount of variance accounted for in objective measures of actual use by the UTAUT. This was also shown to be the case when combined with other model extensions such as trust or social variables.

Table 72: Path Coefficients, UTAUT plus Cognitive Variables on Actual Use, Study 5

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> Actual Use	-0.124	-0.083	0.168	0.741	0.459	-0.364	0.269
ATT -> Actual Use	0.348	0.281	0.173	2.011	0.044	-0.203	0.561
CSE -> Actual Use	-0.229	-0.191	0.114	2.005	0.045	-0.401	0.041
FAC -> Actual Use	-0.165	0.004	0.252	0.656	0.512	-0.403	0.432
PEOU -> Actual Use	-0.178	-0.112	0.169	1.054	0.292	-0.418	0.234
PU -> Actual Use	-0.072	-0.089	0.185	0.388	0.698	-0.443	0.265
SI -> Actual Use	0.065	0.056	0.160	0.408	0.683	-0.279	0.306
SWM BetweenErrors -> Actual Use	-0.007	-0.018	0.143	0.051	0.959	-0.309	0.253
SWM Strategy -> Actual Use	0.045	0.046	0.145	0.314	0.754	-0.238	0.328
WTAR -> Actual Use	0.010	0.004	0.099	0.102	0.919	-0.193	0.199

Table 73: Endogenous variables, UTAUT plus Cognitive ability variables on Actual Use, Study 5

	R Square	R Square adjusted	VIF	CA
ANX	0.435	0.351	1.694	0.794
ATT	0.206	0.196	1.770	0.757
Actual Use	-	-	-	1.000
CSE	0.082	0.046	1.087	1.000
FAC	0.525	0.499	1.123	0.386
PEOU	0.789	0.775	2.088	0.878
PU	0.697	0.671	1.514	0.792
SI	0.112	0.025	1.112	0.817
SWM BetweenErrors	0.091	-0.013	1.635	1.000
SWM Strategy	0.470	0.401	1.615	1.000
WTAR	0.224	0.110	1.207	1.000

14.2.15 Part 7: Comparison of amount of variance explained by the different models: LTAM vs. UTAUT

The final step of this analysis was the comparison between the models that were used to account for variance in this technology setting. The different models were compared based on their R^2 values, their adj. R^2 values, and the significance of the model.

Overall, the LTAM provided the best fit for the data. The adjusted R^2 for the LTAM is far larger than the adj. R^2 of the UTAUT. Also, the LTAM includes more predictors and is therefore penalized more by the R^2 adjustment. Measured by the R^2 value, the LTAM accounted for nearly up to 23% points more variance than the UTAUT. Furthermore, the LTAM model, with and without the inclusion of ITU, was the only model that achieved significance in this data set. The LTAM model significantly predicted actual use, whilst not predicting self-reported intention to use.

Table 74: Model comparison for Blackboard study

	Intention to use (Time point 1)		Actual Use (Number of total log-ins)		
Model	R^2	Sig.	R^2	adj. R^2	Sig.
LTAM	.331	.069	.414	.226	.006*
LTAM +ITU			.417	.216	.009*
UTAUT	.160	.404	.185	.105	.258
UTAUT + ITU			.188	.095	.317

14.2.15.1 Comparison between iterations with and without ITU as a predictor of Actual Use:

In the systematic iterations introduced above the variable ITU had been excluded as a predictor for Actual Use. Rerunning these iterations with ITU included as a predictor led to very similar results as stated above (see Table A 143, Appendix 6). Given that the mediation analysis at the beginning of this chapter had not indicated any significant effects of ITU on the other predictor variables in form of mediation towards Actual Use, the absence of significant differences in the inclusion of ITU as a predictor and its absence seemed logical.

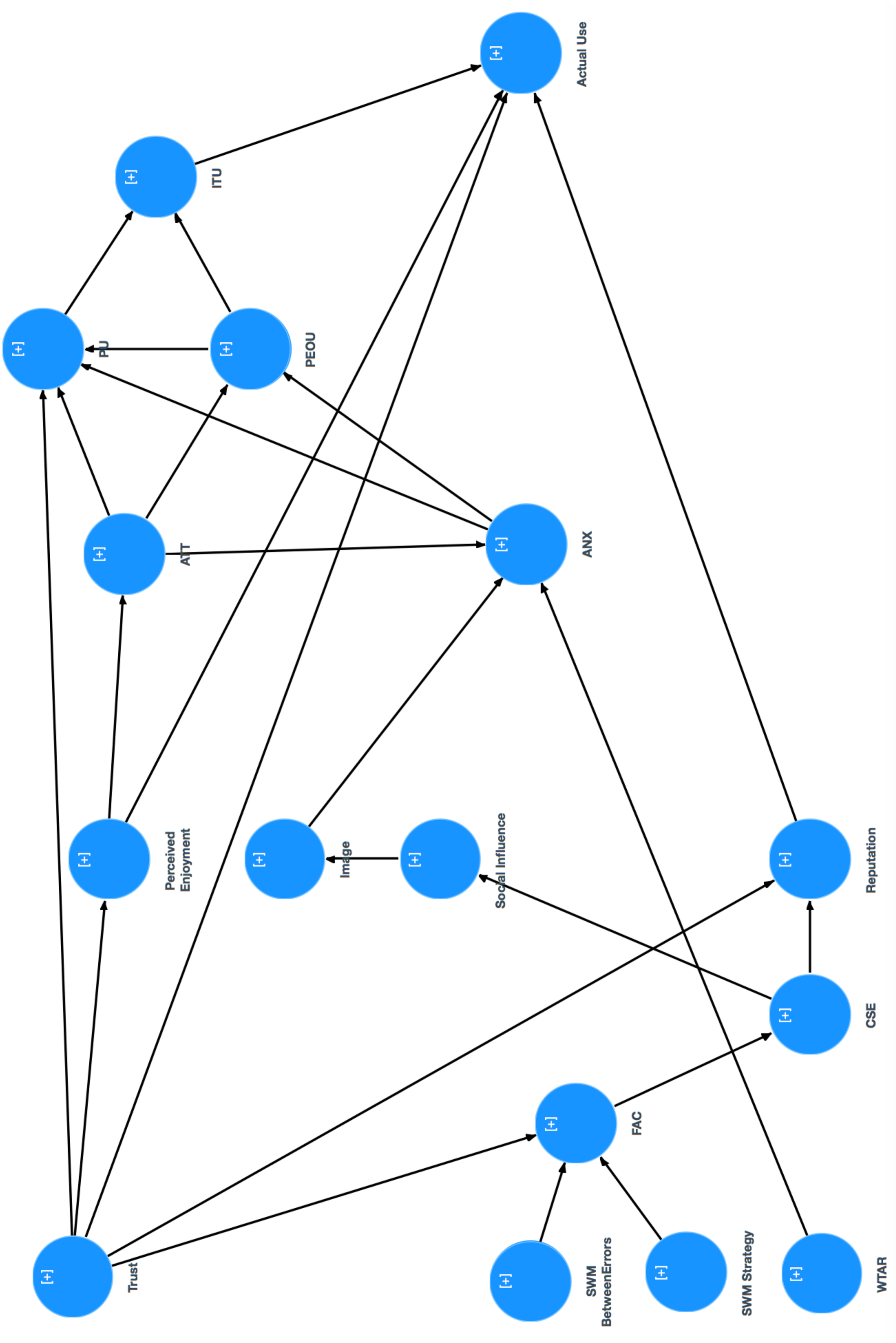

Figure 17: Structural Model with ITU

Figure 18: Path Coefficients for LTAM incl. ITU, Study 5

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> PEOU	-0.435	-0.439	0.080	5.455	0.000	-0.583	-0.274
ANX -> PU	-0.161	-0.154	0.140	1.149	0.251	-0.422	0.126
ATT -> ANX	-0.363	-0.356	0.122	2.974	0.003	-0.573	-0.087
ATT -> PEOU	0.489	0.478	0.088	5.531	0.000	0.295	0.637
ATT -> PU	0.411	0.413	0.140	2.924	0.003	0.144	0.688
CSE -> Reputation	0.187	0.208	0.094	1.985	0.047	0.021	0.388
CSE -> Social Influence	0.262	0.276	0.133	1.972	0.049	-0.040	0.496
FAC -> CSE	0.265	0.289	0.122	2.170	0.030	0.036	0.510
ITU -> Actual Use	-0.058	-0.058	0.117	0.497	0.619	-0.290	0.166
Image -> ANX	0.276	0.282	0.117	2.360	0.018	0.032	0.495
PEOU -> Actual Use	-0.018	-0.022	0.124	0.143	0.886	-0.269	0.223
PEOU -> ITU	0.184	0.184	0.118	1.561	0.119	-0.044	0.426
PEOU -> PU	0.124	0.114	0.124	1.004	0.315	-0.128	0.346
PU -> Actual Use	-0.022	-0.058	0.161	0.134	0.894	-0.363	0.255
PU -> ITU	0.194	0.196	0.142	1.367	0.172	-0.102	0.459
Perceived Enjoyment -> ATT	0.854	0.848	0.045	18.844	0.000	0.748	0.917
Perceived Enjoyment -> Actual Use	0.625	0.615	0.142	4.402	0.000	0.340	0.878
Reputation -> Actual Use	-0.281	-0.269	0.177	1.588	0.112	-0.607	0.105
SWM BetweenErrors -> FAC	-0.129	-0.122	0.141	0.915	0.360	-0.392	0.160
SWM Strategy -> FAC	0.415	0.401	0.135	3.068	0.002	0.121	0.646
Social Influence -> Image	0.411	0.420	0.102	4.027	0.000	0.208	0.596
Trust -> Actual Use	-0.325	-0.308	0.157	2.073	0.038	-0.619	0.004
Trust -> FAC	0.333	0.346	0.108	3.083	0.002	0.122	0.545
Trust -> PU	0.152	0.161	0.108	1.398	0.162	-0.060	0.378
Trust -> Perceived Enjoyment	0.542	0.541	0.112	4.829	0.000	0.285	0.722
Trust -> Reputation	0.602	0.601	0.078	7.753	0.000	0.437	0.748
WTAR -> ANX	-0.122	-0.112	0.105	1.167	0.243	-0.318	0.090

The overall amount of variance accounted for in the outcome variable Actual Use in the model was R^2=.323 (adj. R^2=.265). This model accounted for 13.5 percent-points more variance than the UTAUT in the non-bootstrapped sample.

14.2.16 Discussion

Overall, the LTAM was found to outperform the UTAUT model for use with utilitarian technology. Following the previous studies on lifestyle technology, this study showed that the LTAM in its final configuration is also applicable to utilitarian technology. The performance increase was mainly due to the inclusion of the social constructs.

14.2.16.1 Trust

Similarities were found between the Trust construct related results of this study and the previously carried out studies. For both hedonic and utilitarian technology the functionality of a service or a device seems to impact on the self-reported intention to use. Likewise, the trust component 'Reliability' was shown in previous studies to be a significant predictor of technology acceptance.

Differences between the findings of this study and the previous studies may be linked to the nature of the technology, namely Blackboard being a utilitarian system. Furthermore, the interaction with this system was only a partially voluntary setting. Students were required to engage at least to a minimal extent with the system to be able to successfully complete coursework and pass their modules.

This should be considered for future research in the light of studies such as the non-voluntary TabletPC usage study carried out by El-Gayar et al. (2011).

14.2.16.2 Cognitive Ability

None of the cognitive ability related variables were significant in the final model. The only significant addition had been the WTAR variable in the direct comparison with the UTAUT. This raises the question whether this may be related to the overall layout of the system, possibly leading to a positive or negative ceiling effect. Another possible reason for this would be the mandatory use of the system to at least a certain extend.

Further research in this area with larger sample sizes might provide further insights into the role of compact cognitive ability measures in technology acceptance modelling for utilitarian systems.

14.2.16.3 Importance of Enjoyment: Perceived Enjoyment as a significant factor in TA

The importance of Perceived Enjoyment (PEnj) as a predictor in a utilitarian setting was significant for this research. Approximations and representations of the Perceived Enjoyment construct can be found in different UTAUT iterations and the TAM3. Regarding E-Learning technology, Šumak et al. (2011) confirmed the importance of the construct Attitude towards Use (ATU) for the prediction of ITU. This was especially the case for students and teachers, where the effect sizes ranged from medium to large (Šumak et al., 2011). This finding was confirmed in Study 5, with the related construct ATT (Attitude toward Technology) being a significant predictor in the UTAUT model.

As outlined previously, ATU is closely related to PEnj, and shows partial construct overlap. In Study 5, PEnj was a significant predictor of Intention to Use the Blackboard system in the LTAM model. PEnj was rated as considerably more significant than ATT in this study.

Contrasting to this, the UTAUT construct Attitude Toward Technology, was not found to be a significant predictor in the first two studies of this research. This opens up the question, whether the Perceived Enjoyment of using a lifestyle technology is regarded by the users as a prerequisite and therefore fixed variable with little explanatory power. As users might not expect utilitarian technology to be entertaining or enjoyable to use, this might allow for enjoyable aspects of these systems to have a larger impact. The importance of PEnj does also make sense from a theoretical point of view. A higher degree of Perceived Enjoyment when interacting with a technology seems logical to increase the likelihood of a person to be willing to engage with it again.

Lin and Lu (2011) found that so-called 'critical incidents' when using e-learning technology can have notable impact on a person's intention of interacting with it again. PEnj or the overall focus on it throughout the interaction could be seen as the main differentiating factor between hedonic and utilitarian technology.

14.2.16.4 Unification of utilitarian and hedonic viewpoints – a starting point

The Blackboard study showed clearly that the LTAM model does not only predict the use of hedonic and lifestyle technology such as E-Readers and online social networks. It also predicts the use of utilitarian systems. The difference between the amounts of variance accounted for by the UTAUT model and the LTAM are considerable. Here, it has to be taken into consideration that the LTAM is far more complex than the UTAUT in terms of number of predictors. This will, mathematically, lead to a larger penalty or adjustment from the R^2 value to the adj. R^2 values.

This final study showed that the LTAM model is not only a viable extension to the UTAUT model with regard to hedonic or lifestyle technology. It can be seen as an expansion of the UTAUT in general terms; for application in workplace related or hedonic technology acceptance settings. This expansion also covers cognitive ability variables in a form, which is far less resource-intensive than previously used approaches (see Czaja et al., 2006).

In the following chapter, the LTAM model as established throughout the five studies will be discussed. This will include model formalization, a definition of relationships between the components, and future research opportunities based on the findings presented.

14.3 Summary of Part 4:

The fourth study of this research clearly showed that the constructs introduced by Lankton and McKnight (2011) were reproducible and valid. Trust variables alone explained a large amount of variance in the data set.

The final study, focused on the Blackboard technology, confirmed the findings reported for all previous studies in this research. The LTAM model is not only useable for hedonic and utilitarian technology interaction, but outperforms the original UTAUT in all settings tested to date.

A core finding was the importance of the variable Perceived Enjoyment, which fits the differentiation framework between utilitarian and hedonic technology acceptance. The amount of enjoyment the users get from using a technology significantly predicts their intention to use the technology, and their actual use.

In Part 5, the overall findings are discussed. The LTAM model as established in the five studies is presented in its entirety, and future research suggestions are be made.

15 Part 5: Model Discussion and Conclusion

Previous chapters covered aspects of hedonic and utilitarian technology, cognitive ability measures, trust variables and the implications for different technologies. This led to the development of the LTAM. In the following, the final model is introduced. Future research suggestions are made in order to aid the development of the model.

15.1 Chapter 11: Discussion

This research led to the development of a lifestyle technology acceptance model, the LTAM. The LTAM can be regarded as an extension of the UTAUT. All variables that were added to the model were tested in more than one setting, some in replications of the original studies from the relevant literature. The amount of variance accounted for by the model was increased, whilst the number of additional constructs added was kept as low as possible.

The LTAM is based on the UTAUT model (Venkatesh et al., 2003), and in part on the work of Lankton and McKnight (2011), Heerink et al. (2010), Yang and Yoo (2006) and Czaja et al (2006). Additions were made to the initial UTAUT model in stages, based on the results of the individual studies. Having been developed for utilitarian technology, the UTAUT had not been used extensively in non-work related settings. The acceptable, if limited, applicability of the UTAUT to lifestyle technology was shown in Studies 1 (E-Readers) and 2 (TabletPCs), where it was included in full. This also served as a base for comparison for the model extensions.

The additions that were made to the UTAUT in Study 1 were confirmed as a working model in Study 2. This was based on a different type of lifestyle technology (TabletPCs). It showed clearly that the newly established model extensions not only accounted for more variance than the UTAUT, but also applied to different types of lifestyle technology. This is important for generalizability and mitigates potential over-fitting of the model to a particular technology.

Following from the work by Czaja et al. (2006), cognitive ability variables were added to the model in Study 3 (Computers). This led to an increase in variance accounted for. Also, it became clear that only a small part of the measures suggested by Czaja et al. (2006) had an impact on the model fit. The combination of more time-efficient testing methods and the inclusion of interaction variables allowed the composition of a more streamlined model with comparatively fewer predictors. Lower predictor numbers made it possible to run more advanced analysis procedures such as SEM and SEM based CFAs on smaller sample sizes without major issues of unique solutions and matrix singularity.

Adding to the UTAUT based on ‘trust’ related attributes increased the amount of variance explained by the model significantly in some iterations / studies. The usability of the trust variables was confirmed in Study 4. This was a partial replication of the initial study featuring the development of the trust constructs (Lankton & McKnight, 2011).

The model, which at that point significantly different and significantly better performing than the UTAUT, was then tested on utilitarian technology (Study 5). Tests on this type of technology were necessary to show that the LTAM model is not restricted to usage with lifestyle technology. Furthermore, it showed that the LTAM outperformed the UTAUT model in a setting, which should have favoured the UTAUT. The workplace and work-related environments with utilitarian technology were the grounds on which the UTAUT was developed.

15.1.1 The Lifestyle Technology Acceptance Model, LTAM

The UTAUT model (Venkatesh et al., 2003) still forms the core of the LTAM model. The LTAM should therefore be regarded as an extension of the UTAUT, rather than a replacement. The new model includes the trust variables first introduced by Lankton and McKnight (2011), and cognitive variables that have not been used in conjunction with TA research before. The LTAM not only accounts for a higher amount of variance as the UTAUT. It does so reliably across all sorts of lifestyle technology. It also partially outperformed the longitudinal studies outlined by Venkatesh et al. (2003). The LTAM does not match the amounts of variance accounted for by the model built by Yen et al. (2010), however, this combination of TTF and TAM has yet to be tested in a hedonic technology use setting.

Benefits of the LTAM compared to previous iterations of the UTAUT and TAM are manifold. Firstly, the LTAM, whilst not being much more complex than the UTAUT, accounts for larger amounts of variance. Increases in variance explained without over-complication of the model or significant increase in participant workload can be regarded as an improvement.

Secondly, the introduction of the trust variables into the model has brought specific benefits. The trust split regarding human and machine trust allows researchers to assess differences between humanoid attributes and functions of the technology. The possibility of this differentiation may be very useful in the future for prototyping and assessment of existing technology. The trust variables also accounted for significant amounts of variance in the model. The most noteworthy case here was the fact that the trust variables alone accounted for more variance in the ITU for some of the technologies tested than did the entire UTAUT model.

Thirdly, the cognitive variables that were added to the model were effective and efficient in terms of TA assessment. They accounted for significant amounts of variance in the samples they were used in; whilst being of much shorter duration and resulting in far less participant workload than previously used measures. The focusing on actual measures of general intelligence via executive functioning was shown to be an effective yet far more efficient approach compared to the model proposed by Czaja et al. (2006). This will hopefully lead to the inclusion of cognitive ability measures in more TA research, given that the amount of effort and resources required to do so in the LTAM are notably smaller than in any previous configuration.

The LTAM model as it stands at the end of this research is comprised of 20 separate constructs, including ITU. New regression paths were established with the addition of new constructs to the original UTAUT core. Computer Anxiety was accounted for by Image of the technology and Trust variables. Trust variables also showed an effect on Computer Self-Efficacy and Reputation of the technology.

Cognitive variables that were added to the model showed no direct effects on ITU. The effects on ITU are likely to be mediated through either Perceived Usefulness or Perceived Ease of Use, as was found in Study 3.

The placement of the cognitive ability variables in the final model was based on the results of relatively small scaled modelling. Future research might be able to confirm the exact positioning and loadings of these constructs in the model based on larger scale samples.

Perceived Enjoyment played a significant role in the model. It is not predicted by any of the other aspects, but showed many paths of influence on other predictor variables.

Figure 19: LTAM model, final configuration, excl. ITUFigure 19 shows the full model as it was established using SEM. These results are based on the final study (Study 5) regarding utilitarian technology. The model is however identical to the model established in earlier studies of this research.

Further large-scale sample research will be required to identify potential common latent factors. It can be hypothesised that the identification of such factors would lead to a significant improvement of overall TA modelling.

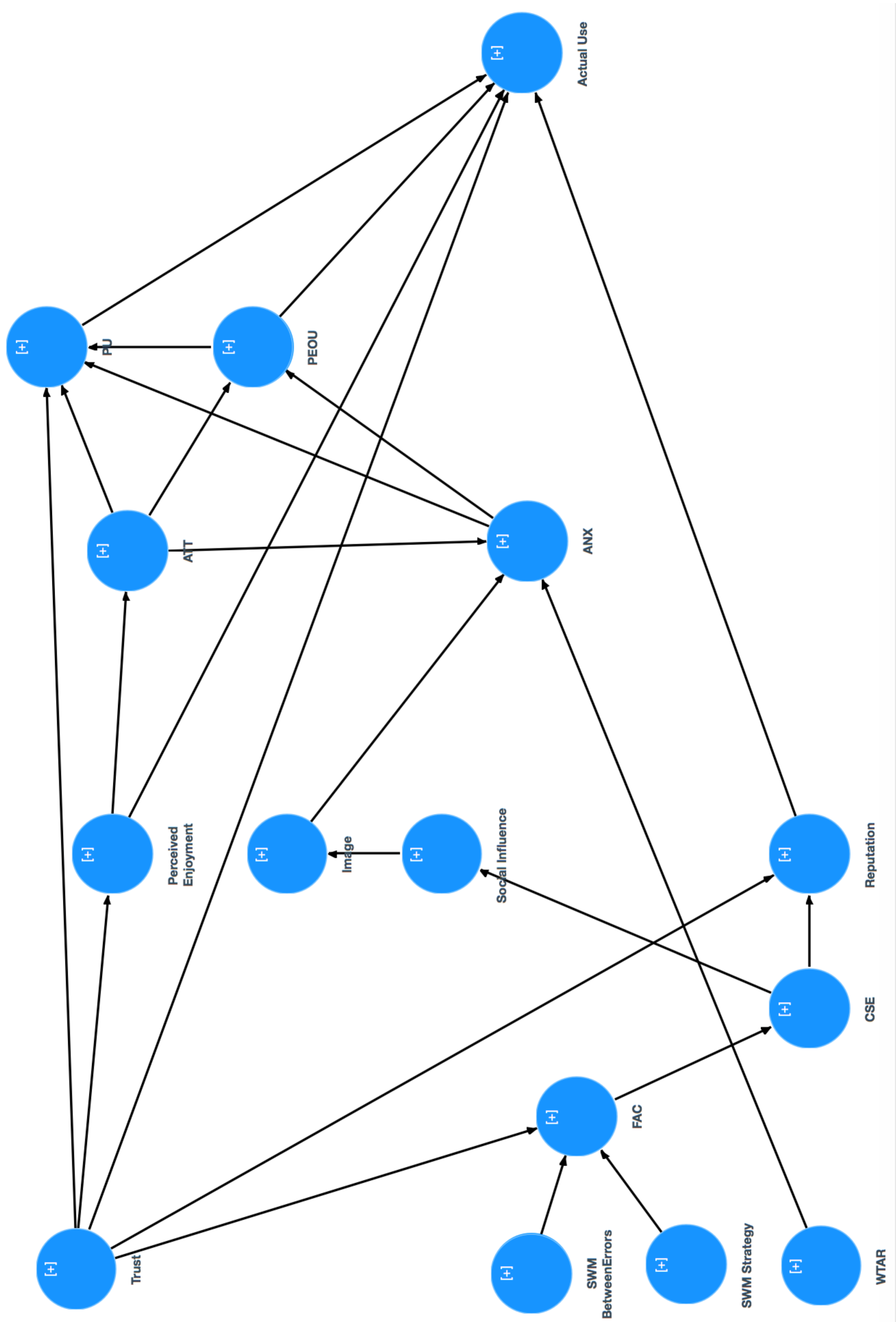

Figure 19: LTAM model, final configuration, excl. ITU

15.1.2 The LTAM applies to hedonic and utilitarian technology alike

As stated above, the results of this research showed clearly that the LTAM could be used of hedonic and utilitarian technology. In the first four studies of this research, the LTAM was used to predict lifestyle technology acceptance via the self-reported ITU (Intention to Use).

There are many different types of technology and different viewpoints as to what makes and defines a technology. In this research, a unified stance was taken: technology in term of services, devices, gadgets and interfaces should all be regarded as the same, at least when thinking about Technology Acceptance. Since existing TA models have been applied to a multitude of settings and platforms, the development of the new model for lifestyle technology had to be tested on more than one service, device or platform.

Multiple studies were carried out with different types of lifestyle and utilitarian technology to test for effects on the model based on the differences in technology. In the first two studies, the model was tested on two lifestyle technologies: one a specialized single-function device (Study 1: E-Reader), the other a versatile multi-function device (Study 2: TabletPC). The analysis showed that the differences and impact on the model were not just marginal. The additions improved the model significantly in the different conditions. Likewise, the use of the classic computer / PC as a target technology indicated that the LTAM is a better predictive model than the UTAUT. This was the case even though it was this particular technology that the UTAUT was initially developed for and tested on (Venkatesh et al., 2003).

The first attempt at unifying the research models used in technology acceptance research was undertaken by Venkatesh et al. in 2003. The resulting UTAUT was a great success. The studies carried out within this research have shown that using trust related variables and cognitive ability measures could extend the UTAUT even further. These extensions are neither particularly time consuming in the testing of participants, nor are they resource intensive.

The newly established LTAM model also excels in the same way for non-voluntary settings and utilitarian technology, as it does for hedonic use of technology. Given these improvements, it no longer seems necessary to separate the two fields of research when choosing a model.

Taking into consideration recent developments of technology and usage of such devices, this separation could also become more and more difficult. This is due to the overlap in hedonic and utilitarian use of the same technology in different settings. TabletPCs have become more available and relevant apps can make them very productive and very entertaining devices. The business perspective of social networking and the use of such platforms are now ever present and are likely to blur the lines between hedonic and utilitarian use even further.

15.1.3 Adding trust variables to the UTAUT increased the variance accounted for significantly for most studies / technologies

The trust variables, initially tested on online social networks by Lankton and McKnight (2011), accounted for large amounts of variance. Testing the impact of these variables was important for several reasons.

Firstly, this application of the trust variables in a large data set confirmed the proposed factor structure of Lankton and McKnight (2011). Secondly, this study confirmed that the LTAM variables, including the trust variables, are applicable to online services and devices alike. This demonstrates that the differences between services, such as online platform, and devices, such as E-Readers, are not as important as initially assumed.

Overall, this can be regarded as an important step forward in terms of lifestyle technology acceptance modelling. It opens up the possibility to create a non-goal-oriented model for different areas of work and also across different interfaces and usage parameters.

Emerging from this research is the importance of the trust variables for successful prediction of lifestyle technology use. Based on the results that were gained from Study 2 (TabletPCs) and Study 4 (Facebook), Trust was included in the model as a direct and indirect predictor of ITU.

An underlying feeling of trust in a device, service or overall technology is likely to facilitate uptake via Perceived Usefulness of the technology. Trust can be hypothesized to affect expectations that are linked to the technology itself and its use. It may act as a priming factor for these more subjective measures.

It was tested in Study 2 whether the differences between technologies also manifested in significantly different scores regarding technology trust. The mean trust levels were not found to be significantly different between E-Readers and TabletPCs. Given these results, it can be assumed that the devices are overall perceived as similar in terms of how much users trust them. This however is based on the merging of the inter-human and human-technology relationship based trust variables.

Originally, the trust variables were split into groups (Lankton & McKnight, 2011). However, they were considered to be part of the same overall construct. Only trust variables that were of the human-technology interaction type showed significant differences between device / technology classes in this research. Overall, this may indicate that future technology acceptance research may find better results by merely concentrating on the technology based trust aspects ’functionality’, ‘reliability’, and ‘helpfulness’.

Lankton and McKnight (2011) tested their model on student populations; a common practice in TA research. In Study 3, the trust variables were applied to a setting with a far wider age range. Confirming the trust variables as valid measures even for different age groups is an important step in the overall inclusion of these variables in TA research to come. Given the demographic changes that have to be anticipated for the near future, the confirmation of the work of Lankton and McKnight (2011) will be important for future research.

In Study 4 (Facebook) a significant amount of variance in ITU was accounted for by trust variables alone. The amount of variance explained here was de facto of a magnitude that would normally expected when a complete TA model is used. Being able to account for similar amounts of variance using only trust variables highlights the importance of this construct to lifestyle technology acceptance.

15.1.4 Trust variables suggested by Lankton and McKnight were confirmed in a replication study

The trust variables suggested by Lankton and McKnight (2011) were confirmed in a study closely mirroring the original publication. In Study 4, the trust variables were extracted as factors in a first- and second-order factor model for a student population regarding the use of online social networks. Applying the first-order model to the data of Study 1 (E-Readers) showed a better prediction than the second-order model. This was due to only some of the trust sub-constructs loading significantly in the model. It could be assumed that different types of technology facilitate different types of trust relationships and expectations to be entered into by the users.

The inclusion of trust aspects in the predictive models has led to an increase of variance accounted for. However, it has become clear in the loading associated with some of the sub-components of trust, such as benevolence, that not all factors load equally well. This is conceptually most likely linked with the perceived applicability of these factors to certain types of technology, or technology in general.

The inter-human interaction based aspects of the trust construct are, by definition, human attributes. Therefore they would most likely only be seen fully applicable to technology that directly mimics human attributes or is actually perceived as having human characteristics. These characteristics might be as far reaching as having a personality or a sort of individual level of agency and autonomy of thought, which would be required in order to completely fulfil the premise of benevolence, for example.

Without autonomy of thought and agency in decision making, it would be difficult to imagine a technology truly taking into account the needs of the user and having the users best interests ‘at heart’. For the technology existing and being in common use at the time of writing, this autonomy does not apply, potentially reducing the face-value relevance of human-based trust attributes in the modelling.

It was however shown by Lankton and McKnight (2011) as well as Wu et al. (2014), that all trust aspects play an important role in the prediction of technology acceptance for online social networks. Wu et al. (2014) in particular focussed on the role of benevolence, which can be seen as one of the most human specific attributes of the trust concept. In this study it was shown that the addition of benevolence trust to the UTAUT model for online social networking prediction (operationalized as ITU), led to a significant increase in the amount of variance accounted for (R^2 change=.24, p<.001). It was argued that this aspect of trust links directly to a generally more ‘caring’ nature of the interaction, which has been shown to improve the interaction outcome in sales and service environments in previous research (Corbitt et al., 2003; Gefen, 2000; Gefen et al., 2003; Gefen & Straub, 2004; Kim et al., 2008).

During the testing of participants for the studies discussed in this thesis, several participants remarked on the seemingly paradoxical items on the questionnaires related to benevolence. Especially with regard to E-Reader technology and TabletPCs, these questions seemed to be non-applicable in the eyes of the participants. This might in turn lead to the predictive ability of this particular sub-factor of the trust construct being rather poor, compared to other aspects.

Taking into account the low level of AI (artificial intelligence) that is involved in the human-machine interaction of these devices – disregarding simple functionalities here – this seems logical.

However, linking back to the studies that led to the inclusion of social and trust variables, such as the work of Heerink et al. (2010), the technologies that are currently being developed and researched are partially of a different ‘social quality’. Thinking about robots designed as conversational partners and companions, a clear link between the necessary artificial intelligence and logic algorithms for a successful interaction and the trust variables can be seen.

If a robot or robotic companion technology is not being perceived as having human-like attributes, it could be considered a failure in terms of its original purpose. If these prerequisites are however met, the human interaction partner with this technology might be inclined to project human trust attributes onto the technology, and assess it on a more human-like scale.

Given that this sort of technology is currently being researched and developed, there is a clear argument to include these factors in current and future technology acceptance models. Whilst they might not fully load on currently available technology, they may well load on technology that will be available in the very near future.

15.1.5 Cognitive ability variables increased amount of variance accounted for in lifestyle technology use

In Chapter 7, the cognitive aspects of technology acceptance were discussed. Cognitive performance plays an important role in technology use and acceptance, as was highlighted by the introduction of the circular relationship presented in Figure 18. Differences in the age groups that were part of the design of Study 3 indicated that the inclusion of cognitive variables in TA measures is warranted.

Cognitive ability measures significantly improved the model in Study 3 (Computers). Contrasting to this, they did not account for significant amounts of variance with regard to actual use of utilitarian technology in Study 5 (BlackBoard). The variable that might be responsible for this difference includes the type of technology and demographic differences in the samples.

Hedonic technology acceptance might be linked to general cognitive ability, with higher levels of ability promoting larger interest and interaction possibilities with the technology.

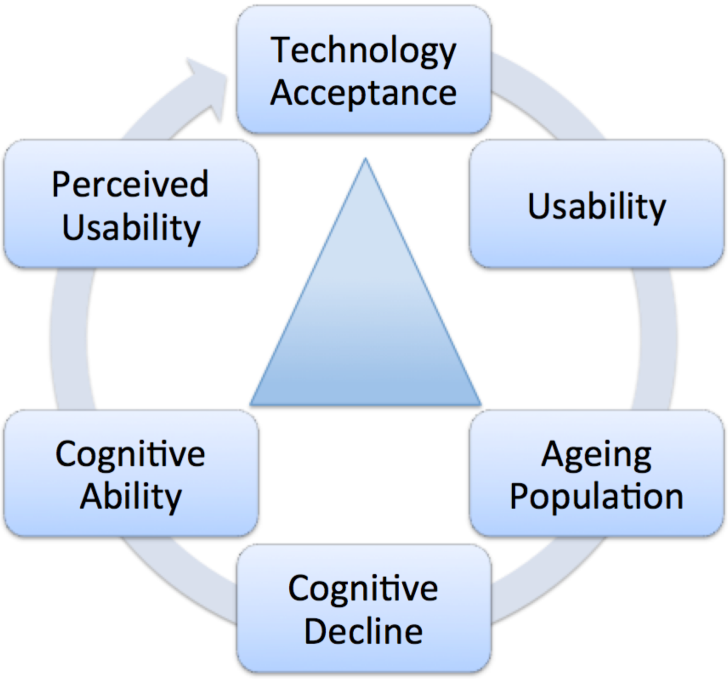

Figure 20: Relationship between Cognitive Ability, TA and Ageing

In Study 3, which featured different age groups, age was not a significant predictor of Technology Acceptance; cognitive ability related variables however were significant. This is interesting, given the relationship between cognitive ability and age via the route of expected cognitive decline. It is not clear whether the earlier inclusion of age as a mediating factor for TA, as done in the UTAUT (Venkatesh et al., 2003), was a weaker approximation of cognitive ability via a covariate. Furthermore, given the amount of variance accounted for by cognitive ability measures as used in this research, and the small amount of time it takes for these measures to be administered during a testing session, these measures could easily become a new constant in TA modelling.

In terms of the placement of the cognitive ability variables in the LTAM, the study sample was not large enough for results to be entirely conclusive. However, the positioning of the variables in the model based on the SEM is in line with the theoretical background of the variables and findings reported in previous research.

In their 2006 paper, Czaja et al. measured fluid and crystallized intelligence as approximations of cognitive ability. These measures were included in their structural model for the prediction of TA. However, the model that was built was relatively specialized, as very few commonly used variables were used (see Figure 21). This made any comparisons with existing research difficult, as mediating effects of commonly used factors could not be assessed or taken into consideration in the model building process.

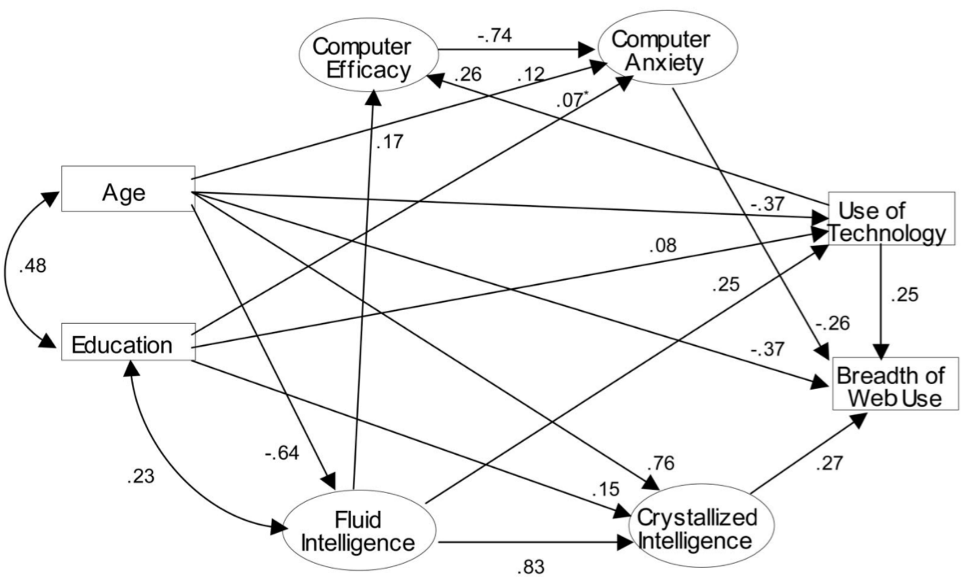

Figure 21: Final structural model based by Czaja et al. (2006, p.348)

This model indicated a mediation of Fluid Intelligence via Crystallized Intelligence, but only Fluid Intelligence had a direct effect on technology use. The LTAM differs from this approach for a number of reasons.

The cognitive ability measures included in the research leading to the development of the LTAM did not purely approximate Fluid or Crystallized Intelligence as such. The measures used were designed to approximate cognitive ability via executive functioning, an aspect of brain activity linked with cognitive performance and facets of intelligence, as outlined in Chapter 6 and Chapter 7. Therefore, the cognitive ability variables included in the LTAM are not entirely comparable to the variables used in the Czaja et al. (2006) model. Secondly, whilst the data undoubtedly supported the development of the Czaja et al. (2006) model, it does not seem appropriate to apply similar structures to the LTAM.

Theoretically, a direct effect of Fluid Intelligence on TA may be sound. New functions and interaction patterns in terms of problem solving and task completion are likely to be facilitated by levels of Fluid Intelligence. Furthermore, an individual's level of Crystallized Intelligence could impact on the breadth of use in terms of the areas that the technology is used in or for.

In contrast, overall executive functioning as per CANTAB, and intelligence as per WTAR should not reasonably be assumed to have perfectly isolated effects. For this reason a direct effect of both constructs on the ITU could be hypothesized. This would have to be tested in future research with a larger sample, as it could not be established in the current research.

The core endogenous variables Perceived Ease of Use and Perceived Usefulness were not included in the model created by Czaja et al. (2006). It is hypothesized that the CANTAB variables and the WTAR results would not be loading onto ITU directly. This is especially the case when linking the existence of these variables in the LTAM with the point made above regarding the effects of Fluid and Crystallized Intelligence. They may also have direct effects on the ITU. Given the amount of variance that is still available in the model but remains unaccounted for, this scenario seems likely. Based on the reasons stated above, in combination with the preliminary analysis reported alongside Study 5 (Blackboard), the cognitive ability variables were included as indirect effects in the final version of the LTAM, loading onto Facilitating Conditions and Computer Anxiety.

Comparing this arrangement of factors with the findings of previous research that were highlighted in Chapter 1, it is striking to see the absence of direct effects of the cognitive ability constructs on either core factor of the TAM. Referring back to the TAM 3 (Venkatesh & Bala, 2008), no overlap between these two constructs was assumed. Venkatesh (2000) hypothesized that no predictor in the model should be loading on both core factors. Such effects would, also according to Venkatesh and Bala (2008) be outweighed by other direct or mediated effects. This is the case in this proposed setup for the cognitive variables in the LTAM, as all predictors only load on one of the core constructs, and each has an additional direct effect on ITU, outweighing other regression paths. The non-overlap paradigm in this case may still stand, but there seems to be a predictive pathway between the two core variables, indicating connectedness of the two.

In the SEM for the configuration in Figure 19, the full LTAM model, the connections depicted are theoretically appropriate and create a statistically well-fitting model. In combination with the ease of use and brevity of the measures used in this research, the CANTAB system and the WTAR should be used more widely in TA research in future, especially on larger scale samples.

The very broad and extensive tests performed by Czaja et al. (2006) made a valuable contribution to TA research. It however seems reasonable to continue with a more focused approach. Using the cognitive ability variables introduced in the LTAM gives the researcher direct approximations of executive functioning and premorbid intelligence, and also allows for a strong and reliable link in the model.

It is important to differentiate between the cognitive aspects that were measured in this research and the Czaja et al. (2006) model. As shown in this research, there are differences between the scores with regard to the WTAR and the SWM, which were the only significant predictors of this category. Future research might find causes for other cognitive variables not being significant predictors of TA here, whilst being good predictors in the study by Czaja et al. (2006).

Possible reasons for the other cognitive ability measures not being good predictors include the type of tasks carried out with the tested technology. For example, the Rapid Visual Perception test (RVP) approximates one aspect of executive functioning. However, the tasks that the users would most likely perform on the tested devices would not require such rapid processing of visual information. Likewise, the SOC (Stockings of Cambridge) test, which was included in the test battery, differs from the most common tasks performed on the devices. Whilst users may sort data and work on different applications simultaneously, a complex planning of actions to be made during the interaction is unlikely to occur in actual use. Therefore, the results of the test may indicate different performance levels that were not relevant for the assessment of intention to use the technology.

15.1.6 Cognitive ability measures can be made more efficient and focused

The cognitive ability measures used in previous research were reasonably accurate in their measurements but very time consuming. High participant workload can inhibit the uptake of TA research, as the resources required for such testing are substantial. The introduction of the CANTAB system to TA can be considered a significant improvement.

Firstly, the CANTAB system and test battery not only approximates cognitive functioning. It can also directly measure actual performance with a high level of accuracy. Secondly, the time required for the test preparation and the actual testing is considerably shorter compared to previous methods of measurement. Full test runs can be completed within 45 minutes. Thirdly, the data readout can be adjusted for the specific requirements of the study. This can be done post data collection, which facilitates any adjustments necessary to the data for analysis. In terms of requirements for complex modelling, this can be regarded as a major advantage over previously used systems. Reducing entry barriers to the field of TA research is likely to play an important role in the future. Given the sample sizes required for meaningful data analysis and complex modelling procedures, any reduction in participant workload and testing time can be considered a major improvement.

15.1.7 Inclusion of Cognitive Ability Variables

In the following, the impact of the placement of the cognitive ability variables will be discussed. Whilst the variables were significant predictors in Study 3, this was not the case in Study 5. The final placement of the variables should be established in future research via a larger sample.

15.1.7.1 Spatial Working Memory Strategy

Based on findings from the Computer related and Blackboard related studies, the strategy score for spatial working memory was considered most likely to load on Perceived Ease of Use, Facilitating Conditions, and directly on Intention to Use. In a hypothetical example, this would mean that a person, who struggles to utilize strategies successfully to remember where items are located, might find complex visual user interfaces not easy to use and might benefit from assistance in terms of peer or expert support. This would specially apply to software like Blackboard, which offers a multitude of features, or TabletPCs, which utilize specific arrangements of complex visual menu structures.

15.1.7.2 Spatial Working Memory Error Rate

The Error Rate for spatial working memory performance is hypothesized to load directly on Intention to Use, as well as on Perceived Ease of Use and Facilitating Conditions. Given another hypothetical example, a user is likely to perceive a technology as not easy to use, if their error rate when attempting to locate relevant interaction features with the technology keeps them from progression towards goal achievement. This could potentially compromise the user's view of the usefulness of the system as well, based largely on the interference of their error rate with the design and complexity of the system. The user might therefore rate peer or expert support as more desirable.

15.1.7.3 Intelligence (WTAR)

Intelligence as approximated by the WTAR was seen to load highest on Anxiety. The participants' levels of intelligence will therefore be important in terms of influencing their perceived level of anxiety when interacting with the technology.

15.1.8 Perceived Enjoyment as a significant predictor for use of utilitarian technology use

One of the additions which features in the LTAM model is the construct Perceived Enjoyment. This construct has been shown throughout the studies to perform well as a predictor, leading to the inclusion of it in the final LTAM model. Perceived Enjoyment was initially introduced into the TAM3 as an additional variable to make the TAM more applicable to different uses of technology and different motivational backgrounds for interactions (Venkatesh & Bala, 2008). However, even in the earlier models built by Davis et al. (1992), it was highlighted that Perceived Enjoyment plays a major role in predicting workplace technology use (see Bruner II & Kumar, 2005). Perceived Enjoyment was used in a more simplified approximation under the construct name Attitudes to Technology in the UTAUT (Venkatesh et al., 2003). Usefulness was still found to be a better predictor in terms of overall TA though. This was not found to be an accurate description of the BlackBoard study. In this case, Perceived Enjoyment was a far more important predictor than Usefulness.

Comparing this to the work of Bruner II and Kumar (2005), connections can be found in terms of the effect of hedonic factors even in utilitarian circumstances:

> However, the fact that the hedonic component had a more important effect on attitudes than the utilitarian component in a study that encouraged goal-directed behaviour suggests that the role of a hedonic component would, if anything, have only increased if a hedonic task had been included in the experiment (Bruner II & Kumar, 2005, p.557).

This is a major component in the way that technology acceptance will be modelled and perceived on a more theoretical perspective.

Perceived Enjoyment a user experiences has a significant impact on the likelihood of him / her using the technology in the future. As this applies to workplace and lifestyle settings, technology can be designed differently. A next research step from this perspective would be studies to clarify what exactly it is that makes technology be perceived as being 'enjoyable to use' by the users.

Lifestyle or hedonic-use technology might lend themselves as good starting points for this research, as they are by definition designed to be perceived as enjoyable to use. A technology that is seemingly easy to use may generally be perceived as being more useful. Expenditure made in terms of learning related effort and energy is then automatically seen in a better ratio to the potential results of the interaction.

15.1.9 Social variables confirmed as having a significant impact on the UTAUT

It had been anticipated that social interaction related variables would play a role in technology acceptance prediction for lifestyle technology. This was however not the case for all types of technology tested. The technology that had been used in previous studies, as for example by Heerink et al. (2010), was far more directly interaction-oriented than the technology that is commonly referred to as lifestyle technology. Electronic agents designed for conversations and robots designed for physical interactions are arguably more involved in terms of interaction than TabletPCs.

However, the interaction between users and online social networking technology can be seen as a nearly human-to-human interaction; a point that was shown by the users rating Facebook highly on inter-human trust attributes.

15.1.10 Personality factors and their impact on TA modelling

Personality was hypothesized to play an important role in technology acceptance based on different personality types approaching new settings differently. This was captured by Bruner II and Kumar (2005):

> Although handheld devices may be less easy to use than a desktop, they may provide greater intrinsic motivation to consumers, as the relative novelty and mobility of a handheld device will result in an element of discovery associated with their usage. (Bruner II & Kumar, 2005, p.555).

This element of discovery was seen as a possible basis for potential differences between personality types and technology acceptance. However, the studies did not show any significant impact of personality factors on the models. This lack of significance across multiple platforms may be associated with the shortness of the duration that a new technology is actually perceived by the user as a 'novelty'. It seems reasonable to assume that personality might have an impact on the TA perceptions during the very first encounter with a new technology.

Any aspects affecting overall TA might then however fade, as the novelty of the technology rapidly wears off. This would be in line with the previously made argument regarding technology eco-systems. If people are used to interacting with a particular eco-system or operating system, then the perceived novelty may be even less relevant and prominent in their perception. Personality factors may play a more important role in assessments of technostress and technophobia.

A question here may be how technostress and technophobia may be linked to TA, especially with regard to, or via, personality factors. In the studies regarding computers and Blackboard, a personality questionnaire was included in the surveys. Based on the results from the analyses conducted (both exploratory and confirmatory), these were not included in the final LTAM model. The personality related variables did not add significantly to the model, regardless of the technology they were applied to.

It was hypothesized that individual differences would play an important role in the way that people perceive technology and would therefore affect their intention to interact with it. This could however not be shown in the studies carried out. Whilst such an effect might be found in future studies, variables related to individual differences were excluded from the LTAM.

Overall, the amount of variance accounted for by the trust related variables alone was considerable. This was especially the case regarding the online social network related study. By defining trust as a factor for TA, Lankton and McKnight (2011) provided a new framework for social aspects of technology acceptance research that can be regarded as a milestone in terms of bringing classical TA modelling and lifestyle technology closer together.

In terms of the trust variables, the differences between the tested technologies, services and gadgets or devices became more obvious. The single-function device (E-Reader; Study 1), the multi-function device (TabletPC; Study 2), and the standard information technology (Computer; Study 3) were all rated rather low on inter-human trust constructs, this was not the case for the online social network (Facebook; Study 4). There was seemingly a difference in the perception of the different technologies, which prompted the participants to rate Facebook more highly on human attributes than other technologies.

Further research is needed to determine whether the participants viewed the technology as a barrier between them and the people they were interacting with, thereby making the rating more applicable to the people themselves.

Another possibility would be that the participants perceived the technology to be more human-like as it is a direct mediator between humans, rather than a provider of services or a tool designed to solve a problem or complete a set task.

Considering that interactions with Facebook have no defined or pre-set 'goal' state which can be achieved or distinct 'end points' of problems that are solved, the type of interaction that is being promoted might be perceived more humanoid than interactions with other device. Were this to be the case, one could imagine the impact on interface and interaction design this finding could potentially have. Future research will hopefully shed further light on this phenomenon.

15.1.11 Actual Use versus Intention To Use

Most published TA research is focused on associated predictors of actual use, such as behavioural intention to use a technology, rather than actual use data. This was mostly due to the difficulty of obtaining user data for system interaction. Related difficulties include the problem of not being able to determine whether a person is using a system or is merely logged on to the system with the interface being in idle mode. In addition, especially with regard to earlier studies, tracking options were not widely included in software, thereby making it nearly impossible to reliably track usage without direct observation.

In Study 5 (Blackboard), the system was set up in a way to allow the researchers to record and then compare the usage data of the individual participants. However, this did not lead to the expected results, as the predictor variables did not predict actual use and but self-reported ITU. This highlights the point made by Turner et al. (2010), that the models that have been tested so far in the literature have not actually assessed whether they predict actual use, or an intention that is only weakly linked to objective measures of actual use.

Given the data presented for the studies in this research the connection between the two variables 'intention to use' and 'actual use' need to be pulled into question again. In previous research (Turner et al., 2010) it has been shown that the correlation between the two variables is approximately r=.7, depending on the research context. Due to the fact that many studies have so far not measured the actual use of a technology, this value has become an underlying assumption of technology acceptance modelling.

However, this research has shown that the amount of variance accounted for actual use is much higher for some technologies (Blackboard) than it is for the intention to use. This was an unexpected finding, as it is normally assumed that the amount of variance accounted for in intention to use would be higher than for actual use. Explanations for this might be found in the possibility that 'intention to use' is an overly abstract or 'emotionally' or 'cognitively' biased representation, which is no longer aligned with the predictive factors that lead to actual use of a technology.

It could be argued that the choices that are experienced by the user as being made rationally are not in fact linked to the rational or objective reasoning behind the use of a technology.

It also has to be taken into consideration that the actual use of the system in this instance was only partially voluntary. Therefore the drivers that might have been the underlying cause for the extended use of the system, such as aiming for higher grades or higher general academic achievement, are potentially not represented fully in the model. A counterargument to this would however be that in this case the variables perceived usefulness and perceived ease of use should have predicted the actual use more accurately.

This lead to the question whether Behavioural intention data need to be collected, when measures of actual use are available. Overall, it could be argued, based on the findings of Turner et al. (2010), Straub et al. (1995), and the research at hand that there is no need to collect such information. Given the considerably weak relationship between the self-reported intention to use technology and objective measures of technology use, ITU as a predictor of use seems obsolete.

A reason for including the ITU variables is however exactly the discrepancy between the variance accounted for in the objective measures of use and the ITU. This indicates the existence of latent factors, both, in the model and in real-life technology use that have not been captured sufficiently to allow for accurate prediction of both outcome variables. Consequentially, the ITU variables do not map onto actual use directly, potentially indicating either a separate latent factor or a mediation / moderation that has not been taken into account in the relationship between ITU and actual use. It is possible that a stage or factor exists that either comes in between 'intention' and 'action', or that a factor exists that moderates this relationship. Possible options could be the voluntariness of the use or less utilitarian aspects such as aesthetics (van Schaik, 2009) and personal preferences. Looking back at the original TAM (Davis, 1989) and UTAUT (Venkatesh et al., 2003) models, the connection between intention to use and actual use, as hypothesized in the model, is a direct one, without mediation. Whilst the number of mediation and moderation effects in the UTAUT (Venkatesh et al., 2003) especially has attracted criticism in the past (van Raaij & Schepers, 2008), this might however be a very important addition in terms of a moderation or mediation effect which will benefit other models derived from the TAM (Davis, 1989) as well. Even the newer TAM 3 (Venkatesh & Bala, 2008) does not propose a moderation or mediation effect between Intention to Use and actual use, although the weakness of the link has been noted in past research.

In a newer iteration of the models by van Schaik (2009), direct effects on actual use variables have been included. This can be seen as an important step of addressing the issue of the weak relationship between ITU and actual use variables; especially of objective actual use measures. Van Raaij and Schepers (2008) had previously aimed to establish a direct link of social norms on actual use but were not successful.

The research model by van Schaik (2009) featured the construct Facilitating Conditions as a direct predictor of actual use, with the relationship including moderating effects by Age and Experience, which should be explored further in future research.

Many current research studies addressing technology acceptance, especially in an academic setting ((Ngai, Poon, & Chan, 2007; Saadé & Bahli, 2005; van Raaij & Schepers, 2008)), have however, as pointed out by van Schaik (2009), not included both outcome measures (ITU and actual use), thereby not allowing for analysis of this important relationship.

In this light it would be recommended for future research to assess intention to use as well as objective measures of use in order to allow more in depth analysis of the relationship and the potential factors that influence it.

15.1.12 Assessing technology with technology

A question important for TA research is whether the study of technology acceptance via technology-based assessments can be seen as a confounding factor. Study 3 included the LTAM questionnaire in paper form. However, testing people on the touch screen computer should not have a major impact on the results. The MOT pre-screened the participants, ensuring that no participant had difficulties in interacting with the system per se. A dislike for the system could be seen as no different to a dislike of paper questionnaires, with which people may have far more unpleasant experiences.

15.1.13 Analysis procedures and complex modelling in TA

Recent developments in TA research included a widespread use of SEM modelling techniques and complex analyses. The use of SEM in this research showed the benefits of tracking the impact of the individual constructs and variables throughout the model. Given the complexity of the modern models, compared to the initial TAM, this feature is likely to become crucial in further development of TA models.

SEM and related analysis procedures require a larger number of data than more basic forms of analysis. This is likely to have an impact on the overall sampling strategies that will have to be employed in future TA research.

Bootstrapping can be used to minimize negative sampling effects on the analyses in multiple linear regressions. However, it does unfortunately not have comparable effects in SEM procedures. Due to the underlying calculations it may in fact lead to over-pronounced sampling related errors.

15.1.14 Future Development and Research

Based on the findings of this research different strands of future research can be envisioned. With regard to cognitive ability testing and interaction with technology, research from other fields could be taken into consideration for combinations with technology acceptance models.

15.1.15 Different Premises for TA modelling

The differentiation between hedonic and utilitarian technology has, as outlined before, become more difficult due to the nature of the technology in use today and the lifestyle changes that have taken place in the developed world in recent years. The emergence of the Internet, especially its availability on mobile devices has changed the way in which people interact with technology. It can now be integrated into everyday activities much more, and requires less of a spatial or time-related commitment on part of the user.

With this in mind, the development of technology acceptance modelling and its applicability to current and future technology needs to be reviewed. The models originally developed for the prediction of technology interaction were built on the premise that users make a clear choice to interact with technology. This decision had to be made taking into account the investment necessary to interact with a technology in terms of time, monetary aspects and even available space. Current technology does not circumvent these issues, but is more integrated into existing behavioural patterns; although it could be argued that behavioural patterns for current technology users have emerged based on the interaction with technology.

Rather than having to use specific stand-alone programs, hardware or services, everything is now far more connected and integrated into the same devices that are used for other aspects of personal or work life via apps.

Taking these changes into consideration leads to the question in how far the changes to lifestyle and technology interaction that have taken place in recent years have undermined the premises of technology acceptance modelling.

Given that the usage of new technology has far fewer interaction costs in terms of time, physical space requirements, and interaction complexity due to the nature of app interaction, uptake and abandonment of technology is far easier for users of services.

In terms of gadgets, which require more monetary investment than apps for example, the 'lifestyle' factor technology is a prominent aspect that will have affected the applicability of technology acceptance models. As most technology designed today is built on the premise that Internet connectivity is available and that the user will want to integrate the usage of this technology into their daily routines and mobile lifestyle, the behavioural changes in order to make allowances in routines for use of such technologies are far fewer than with the technology that the initial TAM models were built on.

Furthermore, a digital divide can be found between different user and non-user groups. This encompasses the fact that users differ in the amount to which they use the technology that is being investigated. Overall, Technology Acceptance Models were developed form a point of view where technology served a distinct purpose and was a goal-oriented interaction (Davis, 1989; Davis et al., 1989).

The use of the technology available today, and the predominance of technology in everyday lives, such as the use of the Internet, indicates that these premises can no longer be taken for granted. People are interacting with technology in a less task-focussed way, as the technology and the lifestyle they were designed to support merge into one interaction.

A core driver in the development of the TAM (Davis, 1989) was the fact that workplace technology was not used to its full extent, thereby not making best use of the considerable investments of the company in the systems. Venkatesh and Davis (2000) highlighted that the problem of "underutilized systems' (p.186) was still at the core of the development of technology acceptance models. This premise is not necessarily true anymore in terms of the use of technology in the lifestyle sector, which is partially defined by the use of this technology.

Referring back to Sun and Zhang (2006) and Yoo et al. (2012) the premise for use of technology in the lifestyle sector in general can be reframed as attitude and enjoyment driven.

From the perspective of the user, the key question might then be how the technology should be designed and what the factors are that need to be addressed in order to make the interactions more successful and rewarding for the users; potentially supporting the underlying attitudes already formed. Contrasting to this, it could still be argued that the premise of under-used systems exists from the perspective of the technology providers, who are interested in a steady increase of technology uptake and market share expansion.

This overall shifts the focus of technology acceptance modelling from the stakeholders point of view from a dichotomous 'use' versus 'non-use' differentiation to a more quantifiable 'amount of actual use'. This actual use is particularly important for technology providers given he revenue steams that are attached to continuous use of a product that is 'integrated' in a technological eco-system. The Amazon Kindle E-Readers for example are a way of promoting the purchase of more e-books, making it a key aim to increase the amount of use per user. This is of particular economical importance as the price per unit in terms of storage, production and delivery of an e-book for the provider is vanishingly small compared to a printed copy, making it highly profitable. Similar connections can be found with online services, which generate revenue via ad-views per page. Looking at the use of Blackboard in an educational context, it might in the future become a viable alternative for universities to operate a system with similar functionalities which is however more integrated to 'sticky', i.e. high usage and user retention, systems such as Facebook. This would not only be likely to increase the amount of use ,but might also allow the education facilities to make use of the income generating ad-steams that are commonly embedded in such systems.

Concluding from this, a revision of technology acceptance modelling might be necessary in order to adapt the existing models to meet this change in perception and focus of use. The existing models, such as the UTAUT, and the newer iterations, such as the LTAM, are still useful for this type of modelling, as they still account for variance in the usage data.

The key challenge will be to match the amount of variance accounted for in the amount of actual use that has in the past been achieved with older models testing for behavioural intention.

15.1.16 Placement of cognitive ability measures in the LTAM

It was outlined before that the positioning of the cognitive variables in the model was done based on both theoretical, and statistical approaches. This positioning will have to be examined with data sets of larger size in the future. This will hopefully give a more solid impression of the exact position and links of the variables in the model.

Cognitive ability measures used in studies to assess the TA or ITU ratings for single-function and multi-function devices, such as E-Readers and TabletPCs, would also be of interest. Such research would lend itself to comparisons in terms of the amount of variance accounted for by cognitive ability measures alone regarding different technologies. It would be expected that the cognitive ability measures would generally account for a significant amount of variance in the model, whilst the interface and complexity of the technology might be an influencing factor. This could be seen as a cognitive ability extension of Monk's (2004) Fixed Effect Fallacy regarding the product that is being evaluated.

15.1.17 Perceived Enjoyment: how to define fun?

The addition and performance of the Perceived Enjoyment construct has been a major factor in the completion of the LTAM model. This factor was crucial in the final study of this research, bridging the gap between lifestyle oriented and workplace technology. Going back to TabletPC related studies Bruner II and Kumar (2005) noted that perceived ease of use should be linked with Perceived Enjoyment. This was based on the assumption that any device or system that is perceived as being easier to use would also be more fun for the user to interact with. The definition of the underlying aspects of perceived enjoyment and the practical implications will have to be explored in more detail in future studies to come.

15.1.18 Task-Technology-Fit

The Task-Technology-Fit model has shown impressive results in terms of the amount of variance explained when combined with the UTAUT model. Given the complexity of the devices and services offered by the technologies that were tested in this research, this combination was not attempted. Such a combination would require clear definitions of the task and the technological input in terms of goal achievement in order to function in a predictive model. Taking into account this complexity, comparative studies that holistically assess task technology fit in combination with the LTAM extension of the UTAUT might not be feasible. This is especially relevant to multi-function lifestyle technology, as such an assessment would be required for every app installed or potentially installable on a device to be specified and assessed. However, it is hypothesized that such research, if possible, could improve the amount of variance explained even further.

15.1.19 Personality and Technology Acceptance

In the current research it was not possible to establish a link between personality aspects and technology acceptance. This might have been due to the limited amount of information generated by the shortened personality assessment tool. In future research, the combination of the LTAM model with full-length personality measures might lead to different results, and offer more insight into this area.

15.1.20 Network Externalities

The area of network externalities (NE) and their impact on technology acceptance modelling is going to be of interest for future research (see Katz & Shapiro, 1985; Kim & Lee, 2007; Lin & Lu, 2011; Zhou & Lu, 2010). This will especially be the case with regard to online social networks and networked technology. Future research might have to find a way of statistically incorporating network externalities in technology acceptance models in order to utilize potential explanatory power of this aspect of use.

The measuring of NE in form of a survey construct with specialized items may be feasible, leading to the inclusion of the resulting scores as either a mediating factor or direct-effect actor in the model. In addition, the inclusion of the score as a regression weight might be an option, leading to a reduction of complexity of the structural model, thereby yielding more reliable and robust results.

15.1.21 Inclusive and specialized approaches for Technology Acceptance Research

This research has shown that technology acceptance research is not as unified as expected in terms of applicability to different technologies. The UTAUT (Venkatesh, et al., 2003) was an enormous step forward towards a unification of the different strands or research that were prominent in this field at the time.

Having a single theory to approach the subject matter with was very helpful. The LTAM showed that a single model could work for more than one side of the utilitarian / hedonic technologies divide. In this light, future studies should focus on testing new models and their respective extensions on more than one type of technology as a standard methodology.

16 Chapter 12: Conclusions

The historical divide between hedonic and utilitarian technology use arose because utilitarian technology acceptance models did not perform as well with hedonic technology as they did with work-place-related systems.

This research has shown that technology acceptance models can span different technologies and bridge the gap between hedonic and utilitarian technology. Building on the UTAUT (Venkatesh et al., 2003), the LTAM model has performed notably better than its predecessor in most of the studies carried out. Bridging the gap between hedonic and utilitarian technology acceptance was possible due to the addition of new factors to existing TA models. The two core additions made were trust related variables and cognitive ability measures.

The addition of the trust variables identified by Lankton and McKnight (2011) was very beneficial to the model. These trust variables, when applied to hedonic use settings such as online social networks, accounted for as much variance on their own as complete utilitarian models. This embedded 'trust' as a core factor in the LTAM model.

Compared to previous models, the assessments of cognitive ability via executive functioning were streamlined and made more time efficient, focussing on actual measures rather than approximations. This allowed for more concise yet more reliable assessments of cognitive ability in TA modelling.

The related issue of age was shown not to be a restrictor for the applicability of the model. Being a covariant of executive functioning, the CANTAB measures were much better predictors of Intention to Use. This will be beneficial for creating and profiling technology usable for the ageing population.

The LTAM addresses the problem of age and general ability related cognitive differences in users and the impact of this on perceived enjoyment of interacting with technology. Given the general hedonic nature of lifestyle technology, perceived enjoyment is a core aspect of technology acceptance, as was shown in this research. The LTAM gives researchers and designers the option to choose from different pathways of influencing users' intention to use, for example via altering the trust-building aspects of the system, or making it more accessible in terms of cognitive load.

16.1.1 Implications for Practice

16.1.1.1 Student Population: E-Learning Environments and Trust

The final structure of the LTAM, as derived from the TabletPC data set, clearly highlights the importance of trust for interactions with technology. Furthermore, it was shown that Perceived Enjoyment is a core factor in the prediction of E-Learning environments (Blackboard study). Perceived Enjoyment is a factor that was predicted by Trust. Academic staff can use this new information to enhance the uptake of an E-Learning environment by students. By making the system seem more trustworthy to students, the users are more likely to find the system enjoyable to use – which will lead to an increase in the students' intention to use the system.

Given that systems can very often only be customized to a limited extent in terms of making it more enjoyable to use, trust related perceptions offer a viable alternative as a point of intervention. Trust related 'campaigning' for the system would furthermore not involve any system changes, thereby potentially avoiding costly research into, and carrying out of customizations with unknown effect on the users.

16.1.1.2 Older Population: Computer Use and Cognitive Ability

Given the hypothetical placement of the cognitive ability variables as outlined above, clear implications for practice regarding the use of technology by older members of society can be envisioned.

In interactions with technology, any age related reduction in cognitive ability will affect technology acceptance. When designing technology for the use of older adults, a reduction of complexity in terms of workload on spatial working memory and requirements of intellectual capacity would enhance users' acceptance of technology into their lifestyle – whether utilitarian or hedonic.

The LTAM model can be applied for research in the workplace and lifestyle technology areas for all age groups. It includes cognitive ability measures that can be administered quickly and with little participant workload. Using these very sensitive measures allows more accurate predictions of technology acceptance for all age groups, with age related cognitive decline being assessed directly rather than approximated via age. This will, if utilized in design and research settings, lead to the development of more accessible technology for all user groups. Age, cognitive ability and Perceived Enjoyment can be taken into consideration with more accurate predictions, allowing designers to match technology to user needs.

The impact that lifestyle technology has on today's society is especially prominent with regard to connectedness, computer facilitated interactions, and a sense of belonging. Keeping older users and users with particular cognitive ability difficulties or needs connected with lifestyle technology and thereby society will be a key challenge of TA research. The LTAM model provides a first stepping-stone in this direction.

"It's still magic, even if you know how it's done."

— Terry Pratchett, A Hat Full of Sky

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16.2 Appendices

Appendix 1: Published Material

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Associations between schizotypy and belief in conspiracist ideation

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ABSTRACT

Previous studies have reported associations between conspiracist ideation and domain-level facets of schizotypy, but less is known about associations with lower-order facets. In the present study, 447 adults completed measures of conspiracist ideation and the Schizotypal Personality Questionnaire (SPQ), consisting of nine subscales grouped into four domains. Results of a multiple regression showed that two domains of the SPQ significantly predicted conspiracist ideation, but multicollinearity was a limiting factor. In a second regression, we found that the subscales of Odd Beliefs or Magical Thinking and Ideas of Reference significantly predicted conspiracist ideation, without any multicollinearity constraints. We interpret these results as implicating two specific lower-order facets of schizotypy in belief in conspiracy theories. We further contrast the present results with previous studies indicating associations between conspiracist ideation and paranormal beliefs.

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1. Introduction

A conspiracy theory usually refers to a subset of false narratives in which the ultimate cause of an event is believed to be due to a malevolent plot by multiple actors working together (Swami & Furnham, 2014). Studies have suggested that belief in conspiracy theories are widespread (e.g., Goertzel, 1994), which is of concern because they have the potential to sow civic discord and public mistrust (Swami & Coles, 2010). In response, a new psychology of conspiracy theories has developed over the past several years, incorporating multiple perspectives spanning cognitive to differential psychology (for reviews, see Swami & Coles, 2010; Swami & Furnham, 2014).

A key focus of this work has been to problematise the traditional view that conspiracist ideation is the product of individual or collective psychopathology. Rather, conspiracy theories are now viewed as a subset of false beliefs that help individuals make sense of phenomena that are incomprehensible or beyond one's control (Swami & Furnham, 2014); that is, they are rational attempts to deal with the psychological feelings triggered by complex phenomena. Even so, this perspective does not rule out the possibility that conspiracist ideation, measured as a differential trait, will be associated with psychopathological indices, particularly those that point to underlying paranoia or delusional thinking (Swami et al., 2011).

In support of this perspective, researchers have recently begun examining associations between conspiracist ideation and traits such as paranoid ideation, superstitious beliefs, magical ideation, and belief in the paranormal (Brotherton, French, & Pickering, 2013; Bruder, Haffke, Neave, Nouripanah, & Imhoff, 2013; Darwin, Neave, & Holmes, 2011; Stieger, Gumhalter, Tran, Voracek, & Swami, 2013; Swami et al., 2011). In addition, three studies have reported significant associations between conspiracist ideation and schizotypal personality disposition (Bruder et al., 2013; Darwin et al., 2011; Swami et al., 2013). Schizotypy is believed to refer to one's proneness to schizophrenia and holds that there is a continuum of cognitive, perceptual, and affective characteristics and experiences ranging from normal dissociative states to extreme states (Claridge, 1997). In explanation, it has been suggested that the relationship is a function of schizotypal individuals being more open to arguments in support of conspiracy theories as a result of their suspiciousness of others (Darwin et al., 2011).

A potential constraint on this explanation, however, has been the limited way in which schizotypy has been measured in earlier studies. Thus, Swami et al. (2013) reported that scores on the Unusual Experiences subscale of the Oxford-Liverpool Inventory of Feelings and Experiences (O-LIFE; Mason, Claridge, & Jackson, 1995) significant and positively predicted conspiracist ideation. Conversely, two other studies have reported significant associations between conspiracist ideation and three domains of

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schizotypy measured on the Schizotypal Personality Questionnaire-Brief (SPQ-B), namely Cognitive-Perceptual Deficit, Interpersonal Deficit, and Disorganisation; Bruder et al., 2013; Darwin et al., 2011). There are, however, questions concerning the reliability of the SPQ-B (Axelrod, Grilo, Sanislow, & McGlashan, 2001), as well as the factorial validity of the three-factor model of schizotypy (Compton, Goulding, Bakeman, & McClure-Tone, 2009). Moreover, use of domain-level dimensions may obscure associations between conspiracist ideation and lower-level schizotypal traits.

In the present study, we sought to extend the available literature by examining associations between conspiracist ideation and schizotypy, as measured by the full form of the SPQ, consisting of nine subscales grouped into four domains. Doing so allowed us to examine associations between conspiracist ideation and domain schizotypy, as well as lower-level subscales of the SPQ. In terms of the latter, two prime candidates for associations with conspiracist ideation are (i) Paranoid Ideation/Suspiciousness, which would reflect the role of distrust of others, particularly those in authority, in conspiracist ideation (Darwin et al., 2011; Swami, Chamorro-Premuzic, & Furnham, 2010), and; (ii) Odd Beliefs or Magical Thinking, which would be consistent with previous reports of associations between conspiracist ideation and paranormal beliefs (Bruder et al., 2013; Darwin et al., 2011; Swami et al., 2011, 2013).

2. Method

2.1. Participants

The participants of this study were an online, international sample of 346 women and 101 men, who ranged in age from 18 to 68 ($M = 23.17$, $SD = 7.87$). Most participants were from the United States of America (49.1%) and the United Kingdom (36.4%), with the remainder of the sample consisting of various nations (14.5%). The sample consisted of 72% who had completed at least some college, with 98.4% completing high school.

2.2. Measures

2.2.1. Conspiracist ideation

The Belief in Conspiracy Theories Inventory (BCTI; Swami et al., 2010, 2011) was used to measure general conspiracist ideation. The BCTI is a 15-item measure that describes a range of internationally-recognisable conspiracy theories, which are rated for agreement on a 9-point scale (1 = *Completely false*, 9 = *Completely true*). An overall score is computed as the mean of all items and higher scores on this scale reflect greater conspiracist ideation. Previous work has shown that the scale is one-dimensional, has good internal consistency (Swami et al., 2010, 2011), and correlates very strongly with a non-event-based, generic measure of conspiracist ideation (Brotherton et al., 2013). In the present study, Cronbach's alpha for this scale was .92.

2.2.2. Schizotypy

We used the 74-item Schizotypal Personality Questionnaire (SPQ; Raine, 1991), which was designed to measure all nine diagnostic criteria for schizotypal personality disorder. Each 'yes' response counts as one point and nine subscale scores were computed as the total score for all items associated with each subscale. Table 1 shows Cronbach's alpha coefficients for the nine subscales in the present sample, which is in line with the findings of Compton et al. (2009). Scores for domains were derived by the summation of subscale scores. In the original development of the SPQ, Raine (1991) proposed a three-domain structure; more recently, however, Compton et al. (2009) reported that a four-domain model had better fit indices. In the present study, therefore, we computed domain scores based on the four-domain model (see Table 1; Stefanis et al., 2004).

Table 1
Internal consistency reliabilities (Cronbach's α) of the Schizotypal Personality Questionnaire subscales.

Subscale	Items	α
Odd Beliefs or Magical Thinking[1]	7	.77
Unusual Perceptual Experiences[1]	9	.74
Ideas of Reference[2]	9	.80
Paranoid Ideation/Suspiciousness[2/3]	8	.80
Excessive Social Anxiety[2/3]	8	.81
No Close Friends[3]	9	.80
Constricted Affect[3]	8	.76
Odd or Eccentric Behaviour[4]	7	.86
Odd Speech[4]	9	.80

Note. Domain: [1]Cognitive-perceptual, [2]Paranoid, [3]Negative, [4]Disorganised (Stefanis et al., 2004).

2.2.3. Demographics

Participants provided their demographic details consisting of age, sex, country of residence, education, and ethnicity.

2.3. Procedure

Ethics approval was obtained from the relevant university ethics committee.

The survey was launched in March 2012 and ran until January 2014. Survey dissemination was undertaken via multiple routes. On the one hand, the internal Research Participation Scheme at the University of Westminster was used. This scheme gives course credit to students who participate in research undertaken by members of staff. No monetary incentives were offered to the participants for completion of the survey. On the other hand, the survey was advertised at university-associated online platforms, primarily for institutions in the USA and UK. The participants gave a dual-consent; prior to and post-survey.

3. Results

Descriptive statistics for all variables included in the present study are reported in Table 2. An independent-samples *t*-test showed that there was no significant difference in conspiracist ideation between women ($M = 3.82$, $SD = 1.60$) and men ($M = 3.83$, $SD = 1.73$), $t(444) = 0.05$, $p = .963$, $d < .01$, so the sample was combined for all further analyses. Inter-scale correlations between conspiracist ideation and the SPQ domains and subscales, respectively, are reported in Table 2. As can be seen, greater conspiracist ideation was significantly associated with higher scores on three SPQ domains (Cognitive-Perceptual, Paranoid, and Negative). In addition, greater conspiracist ideation was significantly associated with higher scores on six of the nine SPQ subscales.

To examine the predictive power of schizotypy, we computed two separate multiple linear regressions using the Enter method. In the first regression, we entered conspiracist ideation as the criterion variable and all SPQ domains as predictor variables. Results showed that the regression was significant, $F(4, 446) = 16.24$, $p < .001$, Adj. $R^2 = .12$. As can be seen in Table 3, Cognitive-Perceptual and Disorganised emerged as significant predictors of conspiracist ideation, although multicollinearity was a limiting issue. In the second regression, we entered conspiracist ideation as the criterion variable and all SPQ subscales as predictor variables. The regression was again significant, $F(9, 446) = 8.75$, $p < .001$, Adj. $R^2 = .14$. Regression coefficients are reported in Table 4 and, as can be seen, the only significant predictors of conspiracist ideation

Table 2
Descriptive statistics and inter-scale correlations between conspiracist ideation and schizotypy.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(1) Conspiracist ideation		.22**	.32**	.23**	.14*	.09	.32**	.25**	.28**	.24**	.03	.10*	.10*	.08	.08
(2) Total SPQ			.79**	.91**	.91**	.84**	.58**	.79**	.77**	.81**	.65**	.74**	.76**	.72**	.78**
(3) CgP domain				.66**	.55**	.60**	.86**	.90**	.67**	.60**	.35**	.41**	.42**	.54**	.55**
(4) Pn domain					.87**	.62**	.46**	.67**	.86**	.87**	.74**	.60**	.61**	.50**	.62**
(5) Neg domain						.65**	.37**	.57**	.59**	.78**	.78**	.86**	.85**	.53**	.63**
(6) Ds domain							.39**	.65**	.55**	.57**	.43**	.53**	.60**	.89**	.91**
(7) OBMT								.53**	.51**	.41**	.21**	.29**	.29**	.37**	.34**
(8) UPE									.65**	.62**	.39**	.42**	.44**	.56**	.60**
(9) IOR										.72**	.39**	.39**	.42**	.45**	.53**
(10) PI											.43**	.55**	.57**	.48**	.53**
(11) ESA												.54**	.52**	.32**	.45**
(12) NCF													.73**	.46**	.48**
(13) CA														.49**	.58**
(14) OEB															.62**
(15) OS															
M	3.81	24.09	3.99	9.68	11.24	5.72	1.53	2.46	3.13	2.68	3.87	2.60	2.09	2.30	3.42
SD	1.63	15.48	3.54	6.20	7.67	4.43	1.87	2.18	2.65	2.36	2.54	2.47	2.04	2.35	2.56

Note. SPQ = Schizotypal Personality Questionnaire, CgP = Cognitive-Perceptual, Pn = Paranoid, Neg = Negative, Ds = Disorganised, OMBT = Odd Beliefs or Magical Thinking, UPE = Unusual Perceptual Experiences, IOR = Ideas of Reference, PI = Paranoid Ideation/Suspiciousness, ESA = Excessive Social Anxiety, NCF = No Close Friends, CA = Constricted Affect, OEB = Odd or Eccentric Beliefs, OS = Odd Speech.

* $p < .01$.

** $p < .001$.

Table 3
Regression coefficients for the regression predicting conspiracist ideation with SPQ domains entered as predictors.

	B	*SE*	*β*	*t*	*p*	Tolerance	VIF
Cognitive–Perceptual	.17	.03	.36	5.74	<.001	.50	2.02
Paranoid	.05	.03	.19	.189	.060	.20	4.91
Negative	−.02	.02	−.10	−1.02	.307	.23	4.40
Disorganised	−.07	.02	−.18	−2.90	.004	.49	2.03

were Odd Beliefs or Magical Thinking and Ideas of Reference. Multicollinearity was not a limiting issue in this regression.

4. Discussion

Our results support previous work (Bruder et al., 2013; Darwin et al., 2011; Swami et al., 2013) showing a robust association between conspiracist ideation and schizotypy. However, we believe that previous findings need to be interpreted with caution: previous studies have not considered multicollinearity between SPQ domains as a limiting factor. In our study, although we found that two SPQ domains significantly predicted conspiracist ideation, multicollinearity meant that conclusions about individual predictors should be treated with caution. Nevertheless, the general conclusion that schizotypy is associated with conspiracist ideation was supported in the present work.

When examining SPQ subscales, Odd Beliefs or Magical Thinking (OBMT) emerged as the strongest predictor of conspiracist ideation. This subscale and its parent domain have been shown to be associated with paranormal beliefs (e.g., Genovese, 2005; Hergovich, Schott, & Arendasy, 2008), which in turn are associated with conspiracist ideation (Bruder et al., 2013;Darwin et al., 2011; Stieger et al., 2013; Swami et al., 2011). Swami et al. (2011) proposed that the latter association may reflect the fact that both conspiracist ideation and paranormal beliefs require a rejection of official mechanisms of information generation and expert opinion. That is, and consistent with the present results, it would seem that differential traits that lead an individual to hold unusual beliefs may also lead them to assimilate conspiracy theories.

What is to some extent unclear, however, is whether OBMT and paranormal beliefs are different concepts. Hergovich et al. (2008) showed that some aspects of paranormal beliefs (e.g., belief in precognition, psi, witchcraft, and spiritualism) were predicted very well by schizotypy, but other facts such as superstition were not. This would seem consistent with the finding that conspiracist ideation is associated with paranormal, but not superstitious, beliefs (Swami et al., 2011). It is possible that individuals who score highly on OBMT and/or paranormal beliefs subscribe to larger delusional systems (Houran, Irwin, & Lange, 2001) that make it more likely that they will adopt conspiracy theories. Conversely, and as argued by Swami et al. (2011), it is possible that conspiracy theories fill a need for control that individuals who score highly on paranormal beliefs or OBMT might seek.

Our results also showed that Ideas of Reference (IOR) emerged as a significant, albeit relatively weak, predictor of conspiracist

Table 4
Regression coefficients for the regression predicting conspiracist ideation with SPQ subscales entered as predictors.

	B	*SE*	*β*	*t*	*p*	Tolerance	VIF
Ideas of Reference	.09	.04	.15	2.03	.043	.68	1.63
Paranoid	−.06	.04	−.10	−1.77	.077	.63	1.58
Odd Beliefs/Magical Thinking	.21	.05	.24	4.37	<.001	.66	1.51
Unusual Perceptual Experiences	.08	.05	.10	1.46	.14	.68	1.47
Odd/Eccentric Behaviour	−.07	.04	−.10	−1.67	.097	.63	1.60
No Close Friends	−.01	.05	−.01	−0.16	.872	.70	1.44
Odd Speech	−.07	.04	−.11	−1.60	.110	.75	1.31
Constricted Affect	.03	.06	.04	0.57	.571	.68	1.65
Suspiciousness	.08	.05	.11	1.52	.129	.60	1.74

ideation. In general, this finding is consistent with previous work reporting significant associations between conspiracist ideation and paranoia (Darwin et al., 2011; Grzesiak-Feldman & Ejsmont, 2008). Even so, our finding is important because Paranoid Ideation/Suspiciousness did not significantly predict conspiracist ideation in the present sample. That is, it seems that it is the specific concept of IOR, rather than suspiciousness of others, that may build up into a complex conspiracy theory related to the self. Given the finding that conspiracy theories are monological (Goertzel, 1994; Swami et al., 2010), it is plausible that those theories in relation to the self-assist in the assimilation of conspiracy theories related to much larger events.

We acknowledge a number of limitations with our study. First, because we did not include measures other than the BCTI and SPQ, we are unable to examine any possible measurement overlap with constructs omitted from the present work. For example, in future work, it would be useful to concurrently examine the predictive power of variables such as the OBMT and paranormal beliefs in relation to conspiracist ideation. Second, although the reliance on an online recruitment strategy ensured a relatively large sample, our participants are unlikely to be representative of any one nation or community. Finally, although our interpretation of our data is consistent with current theorising (Swami & Furnham, 2014), causal inferences should be treated with caution because of the cross-sectional nature of our data.

Overall, the present results extend earlier work in implicating OBMT and, to a lesser extent IOR, as the primary factors associated with conspiracist ideation. These results may prove useful for scholars seeking ways to reduce the influence of conspiracy theories. For example, Swami et al. (2013) have suggested that promoting analytic over intuitive thinking may be a useful means of attenuating the impact of conspiracy theories. Certainly, the present results suggest that that may be a line of research worth pursuing. More broadly, it would be useful to examine the efficacy of intervention trials aimed at treating prodromal syndromes in relation to reducing belief in conspiracy theories.

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16.3 Appendix 2: Study 1

Study 1: Factor Analysis

Table A 1: Outer factor loadings, Study 1, E-Readers

	ANX	Benev.	ITU	Comp.	CSE	Exp.	FAC	Funct.
ANX_1	.731							
ANX_2	.781							
ANX_3	.780							
ANX_5	.757							
BENEV_1		.910						
BENEV_2		.862						
BENEV_3		.905						
BI___ITU_1			.964					
BI___ITU_2			.971					
BI___ITU_3			.972					
COMP_1				.856				
COMP_2				.903				
COMP_3				.916				
COMP_4				.689				
CSE_1					.730			
CSE_2					.855			
CSE_3					.823			
CSE_4					.894			
Exp						1.000		
FC___PEC_1							.409	
FC___PEC_1.0							.843	
FC___PEC_2							.556	
FC___PEC_3							.696	
FUNC_1								.889
FUNC_2								.830
FUNC_3								.878
FUNC_4								.904

(Note: continued on next page)

Table A 1: Outer factor loadings, Study , E-Readers (continued)

	Helpf.	Image	Integ.	PEnj	ATT	PEOU	PU	Rel.	Rep.	SI
HELPF_1	.918									
HELPF_2	.914									
HELPF_3	.787									
IMG_1		.901								
IMG_2		.953								
IMG_3		.893								
INTEG_1			.953							
INTEG_2			.966							
INTEG_3			.956							
INTEG_4			.957							
PENJ_1				.893						
PENJ_2				.879						
PENJ_4				.789						
PEnj_5_R				.677						
PENJ_3					.849					
PEOU_1.0					.874					
PEOU_2.0					.878					
PEOU_3.0					.828					
PEOU_1						.540				
PEOU_2						.886				
PEOU_3						.877				
PEOU_4						.861				
PU_1							.874			
PU_2							.906			
PU_3							.884			
PU_5							.844			
RELIAB_1								.869		
RELIAB_2								.874		
RELIAB_3								.813		
RELIAB_4								.884		
RELIAB_5								.847		
REP_1									.898	
REP_2									.902	
REP_3									.914	
REP_4									.850	
SI___SN_1										.858
SI___SN_2										.866
SI___SN_3										.836

Table A 2: Factor correlations and AVE values for Study 1, E-Readers

	ANX	ATT	Benev	CSE	Comp	Exp.	Fac	Func	Helpf	ITU
ANX	**0.763**	-.143*	-0.013	-.148*	-.335**	.187**	-.345**	-.302**	-.201**	-.261**
ATT		**0.857**	.343**	.139*	.310**	-.293**	.351**	.611**	.509**	.527**
Benev			**0.893**	.210**	.349**	0.009	.193**	.316**	.517**	.159*
CSE				**0.828**	.228**	-0.059	.209**	.223**	.223**	.144*
Comp					**0.846**	-.199**	.347**	.500**	.457**	.279**
Exp.						**1.000**	-.313**	-.367**	-.151*	-.402**
Fac							**0.646**	.408**	.316**	.378**
Func								**0.876**	.525**	.377**
Helpf									**0.875**	.217**
ITU										**0.969**

Note: Values in **bold** represent the square root of the factor related Average Extracted Variance (AVE) value.
Table continued on next page.

Table A 2: Factor correlations and AVE values for Study 1, E-Readers (continued)

	SQRT AVE	Image	Integ	PEOU	PU	PEnj	Reliab	Rep	SI
ANX	**0.763**	0.12	-0.034	-.356**	-0.012	-.185**	-.302**	-.181**	0.032
ATT	**0.857**	.321**	.345**	.177**	.695**	.795**	.451**	.357**	.395**
Benev	**0.893**	.260**	.627**	.132*	.295**	.262**	.286**	0.091	.247**
CSE	**0.828**	0.122	.166*	0.094	0.065	.193**	0.059	0.100	0.079
Comp	**0.846**	-0.035	.294**	.348**	.179**	.367**	.422**	.260**	.167*
Exp.	**1.000**	-0.009	-0.116	-.237**	-.183**	-.288**	-.308**	-.355**	-.210**
Fac	**0.646**	0.056	.228**	.308**	.230**	.343**	.418**	.326**	.210**
Func	**0.876**	.145*	.365**	.257**	.442**	.564**	.493**	.306**	.307**
Helpf	**0.875**	0.079	.422**	.243**	.341**	.433**	.392**	.233**	.224**
ITU	**0.969**	.273**	.237**	.240**	.333**	.523**	.322**	.383**	.345**
Image		**0.916**	.178**	-0.043	.244**	.301**	.169*	0.021	.376**
Integ			**0.958**	.196**	.318**	.295**	.306**	0.107	.287**
PEOU				**0.804**	0.023	.194**	.315**	.245**	0.071
PU					**0.877**	.573**	.276**	.177**	.374**
PEnj						**0.814**	.461**	.335**	.357**
Reliab							**0.858**	.337**	.283**
Rep								**0.891**	.345**
SI									**0.819**

Note: Values in **bold** represent the square root of the factor related Average Extracted Variance (AVE) value.

Study 1: Moderation Analysis Table

Table A 3: Moderation Analysis Results, Study 1

	beta	SE	t	sig.	LLCI	ULCI	Rsquared
Constant	15.109	3.330	4.537	0.001	8.546	21.671	
Experience	-4.242	2.166	-2.005	0.046	-8.612	-0.073	
CSE	-0.034	0.242	-0.140	0.889	-0.511	0.444	
Interaction	0.115	0.158	0.731	0.466	-0.196	0.426	
							0.163
Constant	18.769	2.634	7.126	0.001	13.578	23.961	
Experience	-4.209	1.583	-2.658	0.008	-7.329	-1.098	
ANX	-0.506	0.290	-1.743	0.083	-1.078	0.066	
Interaction	0.189	0.170	1.110	0.268	-0.146	0.523	
							0.178
Constant	16.883	5.923	2.850	0.005	5.209	28.557	
Experience	-6.579	3.385	-1.944	0.053	-13.250	0.092	
FAC	-0.176	0.419	-0.420	0.675	-1.002	0.650	
Interaction	0.289	0.241	1.196	0.233	-0.187	0.764	
							0.176
	beta	SE	t	sig.	LLCI	ULCI	Rsquared
Constant	8.902	2.798	3.192	0.002	3.405	14.399	
Experience	-1.465	1.668	-0.878	0.381	-4.752	1.822	
SI	0.469	0.220	2.131	0.034	0.035	0.903	
Interaction	-0.076	0.139	-0.549	0.584	-0.350	0.198	
							0.242
Constant	-4.281	2.314	-1.850	0.066	-8.841	0.279	
Experience	4.095	1.419	2.886	0.004	1.298	6.891	
ATT	1.203	0.144	8.338	0.001	0.918	1.487	
Interaction	-0.403	0.092	-4.363	0.001	-0.584	-0.221	
							0.409
Constant	6.982	5.636	1.239	0.217	-4.126	18.090	
Experience	-0.572	3.250	-0.176	0.861	-6.976	5.833	
PEOU	0.439	0.332	1.323	0.187	-0.215	1.093	
Interaction	-0.117	0.194	-0.605	0.546	-0.500	0.265	
							0.174
	beta	SE	t	sig.	LLCI	ULCI	Rsquared
Constant	6.979	3.519	1.981	0.049	0.034	13.907	
Experience	-0.467	1.984	-0.235	0.814	-4.377	3.444	
PU	0.537	0.242	2.222	0.027	0.061	1.013	
Interaction	-0.142	0.139	-1.021	0.308	-0.416	0.132	
							0.240
Constant	3.107	5.048	0.616	0.539	-6.841	13.056	
Experience	1.708	2.831	0.603	0.547	-3.873	7.288	
Functionality	0.719	0.317	2.271	0.024	0.095	1.343	
Interaction	-0.261	0.184	-1.413	0.159	-0.624	0.103	
							0.206

Table A 3: Moderation Analysis Results, Study 1 (continued)

	beta	SE	t	sig.	LLCI	ULCI	Rsquared
Constant	10.803	7.213	1.498	0.136	-3.414	15.020	
Experience	-2.755	3.912	-0.704	0.482	-10.465	4.956	
Competence	0.233	0.462	0.504	0.615	-0.678	1.144	
Interaction	0.015	0.253	0.060	0.953	-0.484	0.514	
							0.178
Constant	15.995	4.059	3.940	0.001	7.994	23.996	
Experience	-6.249	2.416	-2.587	0.010	-11.010	-1.488	
Reliability	-0.118	0.230	-0.512	0.609	-0.572	0.336	
Interaction	0.239	0.140	1.701	0.090	-0.038	0.515	
							0.201
Constant	15.524	2.352	6.601	0.001	10.889	20.159	
Experience	-5.152	1.481	-3.480	0.001	-8.070	-2.234	
Integrity	-0.087	0.200	-0.437	0.663	-0.481	0.306	
Interaction	0.214	0.123	1.734	0.084	-0.029	0.457	
							0.215
	beta	SE	t	sig.	LLCI	ULCI	Rsquared
Constant	15.446	3.309	4.668	0.001	8.925	21.968	
Experience	-5.019	2.121	-2.367	0.019	-9.199	-0.840	
Helpfulness	-0.094	0.315	-0.297	0.767	-0.714	0.527	
Interaction	0.238	0.205	1.162	0.247	-0.166	0.641	
							0.175
Constant	13.378	3.082	4.341	0.001	7.303	19.452	
Experience	-3.428	1.810	-1.890	0.060	-6.995	0.139	
Benevolence	0.144	0.342	0.421	0.674	-0.530	0.818	
Interaction	0.081	0.200	0.406	0.685	-0.313	0.476	
							0.185
Constant	5.663	5.581	1.015	0.311	-5.336	16.662	
Experience	-0.257	3.157	-0.081	0.935	-6.479	5.965	
Reputation	0.525	0.347	1.512	0.132	-0.160	1.210	
Interaction	-0.120	0.201	-0.597	0.551	-0.517	0.277	
							0.203
	beta	SE	t	sig.	LLCI	ULCI	Rsquared
Constant	12.825	2.756	4.653	0.001	7.393	18.257	
Experience	-3.495	1.534	-2.279	0.024	-6.519	-0.472	
Image	0.256	0.353	0.725	0.469	-0.440	0.953	
Interaction	0.103	0.194	0.530	0.597	-0.280	0.485	
							0.249
Constant	-0.037	2.442	-0.015	0.988	-4.850	4.776	
Experience	1.625	1.631	0.996	0.320	-1.590	4.839	
PercEnjoy.	0.953	0.154	6.172	0.001	0.649	1.258	
Interaction	-0.250	0.110	-2.270	0.024	-0.467	-0.033	
							0.375

UTAUT

Table A 4: Path Coefficients, UTAUT, Study1

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> ITU	-0.074	-0.086	0.065	1.130	0.259	-0.220	0.038
ATT -> ITU	0.754	0.721	0.269	2.807	0.005	0.315	1.264
CSE -> ITU	0.017	0.026	0.059	0.293	0.769	-0.105	0.131
Experience -> ITU	0.178	0.158	0.310	0.574	0.566	-0.270	0.783
FAC -> ITU	0.107	0.117	0.067	1.597	0.110	-0.016	0.245
Interaction Effect: Experience (Product Indicator) -> ATT -> ITU	-0.195	-0.177	0.164	1.195	0.232	-0.515	0.046
PEOU -> ITU	0.053	0.069	0.060	0.895	0.371	-0.045	0.189
PU -> ITU	-0.079	-0.091	0.079	1.001	0.317	-0.247	0.062
SI -> ITU	0.173	0.163	0.060	2.887	0.004	0.050	0.287

Table 75: R squared values, UTAUT, Study 1

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ITU (R^2)	0.448	0.474	0.048	9.292	0.000	0.379	0.566
ITU (adj. R^2)	0.425	0.452	0.050	8.444	0.000	0.353	0.547

Table A 5: Endogenous Variables, UTAUT, Study 1

	R Square	R Square adjusted	VIF	CA
ANX	0.283	0.252	1.319	0.764
ATT	0.024	0.020	9.408	0.880
CSE	0.068	0.059	1.082	0.848
Experience	0.115	0.103	11.520	1.000
FAC	0.506	0.497	1.451	0.299
ITU	0.458	0.445	-	0.935
Interaction Effect: Experience (Product Indicator) -> ATT	1.066	1.068	14.689	0.815
PEOU	0.263	0.239	1.266	0.902
PU	0.606	0.591	2.391	0.833
SI	0.294	0.264	1.277	0.967

UTAUT + Trust

Table A 6: Path Coefficients, UATUT plus Trust, Study 1

	Original Sample (O)	Sample Mean (M)	SE	t	sig	CI Low	CI Up
ANX -> ITU	-0.107	-0.117	0.067	1.615	0.107	-0.253	0.008
ATT -> ITU	0.985	0.897	0.283	3.482	0.001	0.457	1.462
Benevolence -> ITU	-0.003	-0.006	0.075	0.036	0.972	-0.153	0.143
CSE -> ITU	0.039	0.042	0.058	0.672	0.501	-0.085	0.153
Competence -> ITU	0.038	0.045	0.065	0.583	0.560	-0.076	0.176
Experience -> ITU	0.276	0.194	0.320	0.862	0.389	-0.264	0.832
FAC -> ITU	0.133	0.139	0.067	1.990	0.047	0.010	0.265
Functionality -> ITU	-0.129	-0.115	0.082	1.584	0.113	-0.268	0.051
Helpfulness -> ITU	-0.218	-0.200	0.066	3.285	0.001	-0.326	-0.069
Integrity -> ITU	0.167	0.153	0.069	2.415	0.016	0.019	0.294
Interaction Effect: Experience (Product Indicator) -> ATT -> ITU	-0.260	-0.208	0.168	1.553	0.121	-0.552	0.020
PEOU -> ITU	0.063	0.087	0.059	1.069	0.285	-0.031	0.202
PU -> ITU	-0.084	-0.101	0.075	1.111	0.267	-0.248	0.042
Reliability -> ITU	-0.057	-0.074	0.064	0.897	0.370	-0.198	0.052
SI -> ITU	0.169	0.166	0.059	2.861	0.004	0.054	0.285

Table A 7: R squared values, UTAUT plus Trust, Study 1

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ITU (R^2)	0.501	0.531	0.045	11.027	0.000	0.444	0.617
ITU (adj. R^2)	0.464	0.497	0.049	9.525	0.000	0.403	0.589

Table A 8: Endogenous variables, UTAUT plus Trust, Study 1

	R Square	R Square adjusted	VIF	CA
ANX	0.330	0.281	1.424	0.764
ATT	0.027	0.023	10.649	0.880
Benevolence	0.181	0.174	2.271	0.875
CSE	0.115	0.103	1.164	0.848
Competence	0.342	0.330	1.699	0.865
Experience	0.130	0.110	12.354	1.000
FAC	0.542	0.529	1.496	0.299
Functionality	0.632	0.620	2.172	0.899
Helpfulness	0.629	0.615	1.961	0.847
ITU	0.530	0.510		0.970
Integrity	0.572	0.552	1.995	0.935
Interaction Effect: Experience (Product Indicator) -> ATT	-	-	15.782	0.815
PEOU	0.314	0.275	1.391	0.902
PU	0.619	0.595	2.447	0.911
Reliability	0.497	0.462	1.784	0.833
SI	0.338	0.289	1.321	0.967

UTAUT + Social Variables

Table A 9: Path Coefficients, UTAUT plus Social Variables, Study 1

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> ITU	-0.083	-0.096	0.066	1.256	0.209	-0.231	0.031
ATT -> ITU	0.733	0.673	0.275	2.665	0.008	0.258	1.212
CSE -> ITU	-0.002	0.007	0.059	0.041	0.967	-0.116	0.120
Experience -> ITU	0.258	0.197	0.316	0.818	0.413	-0.243	0.812
FAC -> ITU	0.113	0.117	0.065	1.738	0.082	-0.012	0.241
Image -> ITU	0.172	0.158	0.059	2.926	0.003	0.041	0.272
Interaction Effect: Experience (Product Indicator) -> ATT -> ITU	-0.240	-0.199	0.165	1.453	0.146	-0.517	0.021
PEOU -> ITU	0.046	0.065	0.059	0.769	0.442	-0.056	0.179
PU -> ITU	-0.047	-0.061	0.082	0.572	0.567	-0.226	0.098
Reputation -> ITU	0.091	0.086	0.066	1.371	0.170	-0.043	0.217
SI -> ITU	0.100	0.098	0.066	1.502	0.133	-0.034	0.227

Table A 10: R squared values, UTAUT plus Social Variables, Study 1

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ITU (R^2)	0.473	0.500	0.050	9.503	0.000	0.401	0.595
ITU (adj. R^2)	0.445	0.474	0.052	8.497	0.000	0.369	0.574

Table A 11: Endogenous variables, UTAUT plus Social Variables, Study 1

	R Square	R Square adjusted	VIF	CA
ANX	0.291	0.246	1.338	0.764
ATT	0.024	0.019	9.453	0.880
CSE	0.066	0.057	1.103	0.848
Experience	0.115	0.103	11.786	1.000
FAC	0.508	0.499	1.467	0.299
ITU	-	-	-	0.967
Image	0.300	0.281	1.409	0.904
PEOU	0.265	0.237	15.088	0.935
PU	0.609	0.592	1.276	0.815
Reputation	0.237	0.200	2.442	0.902
SI	0.457	0.429	1.432	0.914

UTAUT + Trust + Social Variables

Table A 12: Path Coefficients, UTAUT plus Trust plus Social Variables, Study 1

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> ITU	-0.106	-0.111	0.066	1.603	0.109	-0.239	0.017
ATT -> ITU	0.654	0.547	0.273	2.393	0.017	0.110	1.164
Benevolence -> ITU	-0.031	-0.025	0.070	0.443	0.657	-0.158	0.112
CSE -> ITU	0.008	0.014	0.056	0.137	0.891	-0.105	0.118
Competence -> ITU	0.050	0.056	0.064	0.779	0.436	-0.064	0.183
Experience -> ITU	0.130	0.047	0.276	0.468	0.639	-0.368	0.675
FAC -> ITU	0.147	0.152	0.061	2.416	0.016	0.032	0.271
Functionality -> ITU	-0.112	-0.106	0.081	1.376	0.169	-0.260	0.058
Helpfulness -> ITU	-0.179	-0.172	0.064	2.788	0.005	-0.305	-0.049
Image -> ITU	0.147	0.140	0.061	2.416	0.016	0.021	0.256
Integrity -> ITU	0.179	0.165	0.068	2.645	0.008	0.034	0.296
Interaction Effect: Experience (Product Indicator) -> ATT -> ITU	-0.159	-0.108	0.152	1.045	0.296	-0.463	0.122
Interaction Effect: Experience (Product Indicator) -> Perceived Enjoyment -> ITU	-0.293	-0.325	0.189	1.549	0.122	-0.675	0.070
PEOU -> ITU	0.062	0.077	0.058	1.060	0.289	-0.035	0.188
PU -> ITU	-0.061	-0.074	0.080	0.758	0.449	-0.236	0.077
Perceived Enjoyment -> ITU	0.114	0.147	0.103	1.106	0.269	-0.066	0.346
Reliability -> ITU	-0.070	-0.081	0.060	1.169	0.243	-0.202	0.037
Reputation -> ITU	0.083	0.078	0.065	1.281	0.200	-0.051	0.202
SI -> ITU	0.087	0.093	0.064	1.365	0.172	-0.034	0.219

Table A 13: R squared values, UTAUT plus Trust plus Social Variables, Study 1

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ITU (R^2)	0.531	0.575	0.043	12.423	0.000	0.491	0.657
ITU (Adj. R^2)	0.487	0.535	0.047	10.404	0.000	0.442	0.625

Table A 14: Endogenous variables, UTAUT plus Trust plus Social Variables, Study 1

	R Square	R Square adjusted	VIF	CA
ANX	0.334	0.272	1.435	0.764
ATT	0.028	0.023	2.342	0.880
Benevolence	0.181	0.174	2.352	0.875
CSE	0.117	0.105	1.210	1.000
Competence	0.339	0.327	1.767	0.865
Experience	0.128	0.108	6.892	1.000
FAC	0.532	0.519	1.545	0.299
Functionality	0.619	0.607	2.238	0.899
Helpfulness	0.625	0.611	2.034	0.847
ITU	0.473	0.451	-	-
Image	0.364	0.334	1.552	0.967
Integrity	0.567	0.544	2.020	0.904
Interaction Effect: Experience -> ATT	-	-	23.421	0.970
Interaction Effect: Experience -> Perceived Enjoyment	-	-	1.501	0.935
PEOU	0.322	0.276	1.419	0.820
PU	0.636	0.609	2.516	0.815
Perceived Enjoyment	0.865	0.855	4.441	0.902
Reliability	0.505	0.464	1.793	0.828
Reputation	0.273	0.208	1.478	0.911
SI	0.498	0.450	1.629	0.914

16.4 Appendix 3: Study 2

Study 2: Factor Analysis

Table A 15: Outer factor loadings, Study 2, TabletPCs

	ANX	Benev.	ITU	Comp.	CSE	Exp.	FAC	Func.	Helpf.
ANX_1	.781								
ANX_2	.730								
ANX_3	.859								
ANX_5	.826								
BENEV_1		.923							
BENEV_2		.890							
BENEV_3		.834							
BI___ITU_1			.976						
BI___ITU_2			.970						
BI___ITU_3			.975						
COMP_1				.917					
COMP_2				.940					
COMP_3				.932					
COMP_4				.877					
CSE_1					.975				
CSE_2					.097				
CSE_3					.072				
CSE_4					.333				
Exp						1.000			
FC___PEC_1							.328		
FC___PEC_1.0							.867		
FC___PEC_2							.374		
FC___PEC_3							.834		
FUNC_1								.927	
FUNC_2								.858	
FUNC_3								.942	
FUNC_4								.912	
HELPF_1									.943
HELPF_2									.931
HELPF_3									.773

(Note: continued on next page)

Table A 15: Outer factor loadings, Study 2, TabletPCs (continued)

	Image	Integ	PEnj	ATT	PEOU	PU	Rel.	Rep.	SI
IMG_1	.959								
IMG_2	.933								
IMG_3	.776								
INTEG_1		.940							
INTEG_2		.958							
INTEG_3		.948							
INTEG_4		.921							
PENJ_1			.925						
PENJ_2			.872						
PENJ_4			.857						
PEnj_5_R			.737						
PENJ_3				.847					
PEOU_1.0				.897					
PEOU_2.0				.904					
PEOU_3.0				.789					
PEOU_1					.753				
PEOU_2					.895				
PEOU_3					.896				
PEOU_4					.914				
PU_1						.887			
PU_2						.858			
PU_3						.824			
PU_5						.870			
RELIAB_1							.868		
RELIAB_2							.915		
RELIAB_3							.867		
RELIAB_4							.874		
RELIAB_5							.821		
REP_1								.915	
REP_2								.944	
REP_3								.909	
REP_4								.932	
SI___SN_1									.811
SI___SN_2									.861
SI___SN_3									.858
SI___SN_4									.824

Table A 16: Factor correlations and AVE values for Study 2, TabletPCs

	Anx	ATT	Benev	CSE	Comp	Exp.	Fac	Funct	Helpf	ITU
Anx	**.801**	-.402**	.095	-.344**	-.324**	.151	-.361**	-.267**	-.053	-.333**
ATT		**.860**	.300**	.349**	.595**	-.235**	.435**	.594**	.420**	.683**
Benev			**.883**	.078	.348**	-.094	.135	.296**	.480**	.256**
CSE				**.519**	.264**	-.196*	.391**	.291**	.210**	.326**
Comp					**.917**	-.143	.429**	.791**	.502**	.509**
Exp.						**1.000**	-.134	-.095	-.106	-.283**
Fac							**.651**	.410**	.295**	.392**
Funct								**.911**	.574**	.530**
Helpf									**.886**	.369**
ITU										**.974**

Note: Values in **bold** represent the square root of the factor related Average Extracted Variance (AVE) value.
Table continued on next page.

Table A 16: Factor correlations and AVE values for Study 2, TabletPCs (continued)

	SQRT AVE	Image	Integ	PEOU	PU	PEnj	Reliab	Rep	SI
Anx	**.801**	.091	-.037	-.506**	-.151	-.428**	-.250**	-.342**	.083
ATT	**.860**	.183*	.391**	.507**	.666**	.757**	.501**	.550**	.326**
Benev	**.883**	.206**	.577**	.135	.325**	.341**	.452**	.216**	.373**
CSE	**.519**	.044	.158*	.426**	.249**	.291**	.185*	.204**	.117
Comp	**.917**	.077	.341**	.373**	.533**	.643**	.597**	.568**	.150
Exp.	**1.000**	.001	-.087	-.197*	-.228**	-.114	-.180*	-.179*	-.213**
Fac	**.651**	-.064	.287**	.410**	.294**	.389**	.331**	.361**	.054
Funct	**.911**	.187*	.414**	.335**	.592**	.590**	.554**	.527**	.198**
Helpf	**.886**	.190*	.441**	.262**	.435**	.384**	.565**	.424**	.260**
ITU	**.974**	.133	.396**	.413**	.485**	.589**	.407**	.537**	.299**
Image		**.893**	.243**	-.016	.158*	.157*	.196*	.123	.441**
Integ			**.942**	.222**	.268**	.404**	.427**	.276**	.336**
PEOU				**.867**	.301**	.404**	.324**	.429**	.087
PU					**.860**	.552**	.447**	.409**	.330**
PEnj						**.850**	.488**	.543**	.206**
Reliab							**.869**	.395**	.301**
Rep								**.925**	.237**
SI									**.839**

Note: Values in **bold** represent the square root of the factor related Average Extracted Variance (AVE) value.

Table A 17: Multi-Group Analysis, Factor loadings and invariance, Study 2

	Outer Loadings-diff (|Random1 - Random2 |)	p-Value (Random1 vs Random2)		Outer Loadings-diff (|Random1 - Random2 |)	p-Value (Random1 vs Random2)
ANX_1 <- ANX	0.213	0.206	INTEG_2 <- Integrity	0.021	0.828
ANX_2 <- ANX	0.452	0.077	INTEG_3 <- Integrity	0.012	0.469
ANX_3 <- ANX	0.164	0.281	INTEG_4 <- Integrity	0.031	0.304
ANX_5 <- ANX	0.134	0.785	PENJ_1 <- Perceived Enjoyment	0.013	0.375
BENEV_1 <- Benevolence	0.007	0.669	PENJ_2 <- Perceived Enjoyment	0.043	0.283
BENEV_2 <- Benevolence	0.015	0.562	PENJ_3 <- ATT	0.113	0.969
BENEV_3 <- Benevolence	0.063	0.382	PENJ_4 <- Perceived Enjoyment	0.068	0.890
BI___ITU_1 <- ITU	0.007	0.685	PEOU_1 <- PEOU	0.133	0.091
BI___ITU_2 <- ITU	0.015	0.249	PEOU_1.0 <- ATT	0.034	0.821
BI___ITU_3 <- ITU	0.012	0.770	PEOU_2 <- PEOU	0.020	0.343
COMP_1 <- Competence	0.000	0.528	PEOU_2.0 <- ATT	0.042	0.877
COMP_2 <- Competence	0.036	0.922	PEOU_3 <- PEOU	0.060	0.143
COMP_3 <- Competence	0.012	0.366	PEOU_3.0 <- ATT	0.060	0.830
COMP_4 <- Competence	0.041	0.742	PEOU_4 <- PEOU	0.000	0.478
CSE_1 <- CSE	0.024	0.619	PEnj_5_Recode <- Perceived Enjoyment	0.168	0.182
CSE_2 <- CSE	0.323	0.747	PU_1 <- PU	0.022	0.736
CSE_3 <- CSE	0.142	0.620	PU_2 <- PU	0.067	0.865

Continued overleaf.

Table A 17: Multi-Group Analysis, Factor loadings and invariance, Study 2 (continued)

	Outer Loadings-diff (|Random1 - Random2 |)	p-Value (Random1 vs Random2)		Outer Loadings-diff (|Random1 - Random2 |)	p-Value (Random1 vs Random2)
CSE_4 <- CSE	0.065	0.452	**PU_3 <- PU**	0.035	0.309
FC___PEC_1 <- FAC	0.184	0.686	**PU_5 <- PU**	0.048	0.116
FC___PEC_1.0 <- FAC	0.035	0.661	**RELIAB_1 <- Reliability**	0.001	0.620
FC___PEC_2 <- FAC	0.025	0.533	**RELIAB_2 <- Reliability**	0.024	0.860
FC___PEC_3 <- FAC	0.073	0.384	**RELIAB_3 <- Reliability**	0.021	0.751
FUNC_1 <- Functionality	0.042	0.938	**RELIAB_4 <- Reliability**	0.003	0.641
FUNC_2 <- Functionality	0.000	0.522	**RELIAB_5 <- Reliability**	0.023	0.550
FUNC_3 <- Functionality	0.039	0.968	**REP_1 <- Reputation**	0.003	0.541
FUNC_4 <- Functionality	0.055	0.940	**REP_2 <- Reputation**	0.049	0.064
HELPF_1 <- Helpfulness	0.002	0.514	**REP_3 <- Reputation**	0.054	0.163
HELPF_2 <- Helpfulness	0.026	0.786	**REP_4 <- Reputation**	0.019	0.256
HELPF_3 <- Helpfulness	0.045	0.362	**SI___SN_1 <- SI**	0.162	0.871
IMG_1 <- Image	1.096	0.998	**SI___SN_2 <- SI**	0.160	0.934
IMG_2 <- Image	0.892	0.996	**SI___SN_3 <- SI**	0.014	0.407
IMG_3 <- Image	0.326	0.966	**SI___SN_4 <- SI**	0.079	0.161
INTEG_1 <- Integrity	0.038	0.864			

Study 2: Moderation Analysis

Table A 18: Moderation Analyses for Study 2, TabletPCs

	beta	SE	t	sig.	LLCI	ULCI	Rsquared
Constant	6.044	4.825	1.253	0.212	-3.483	15.571	
Experience	3.942	4.463	0.883	0.378	-4.870	12.754	
CSE	0.601	0.354	1.701	0.091	-0.097	1.299	
Interaction	-0.431	0.332	-1.299	0.196	-1.087	0.224	
							0.132
Constant	18.183	2.448	7.429	0.001	13.350	23.016	
Experience	-3.598	2.148	-1.675	0.096	-7.839	0.644	
ANX	-0.414	0.259	-1.602	0.111	-0.925	0.097	
Interaction	0.168	0.217	0.770	0.442	-0.262	0.597	
							0.165
Constant	10.895	5.824	1.871	0.063	-0.606	22.396	
Experience	-1.656	5.395	-0.307	0.759	-12.310	8.997	
FAC	0.268	0.418	0.642	0.522	-0.556	1.093	
Interaction	-0.035	0.390	-0.091	0.928	-0.804	0.734	
							0.136
	beta	SE	t	sig.	LLCI	ULCI	Rsquared
Constant	14.743	2.756	5.349	0.001	9.301	20.186	
Experience	-4.148	2.417	-1.716	0.088	-8.920	0.625	
SI	-0.071	0.256	-0.277	0.782	-0.575	0.434	
Interaction	0.224	0.233	0.961	0.338	-0.236	0.685	
							0.158
Constant	4.711	2.837	1.661	0.099	-0.891	10.313	
Experience	-1.364	2.159	-0.632	0.529	-5.627	2.900	
ATT	0.557	0.176	3.161	0.002	0.209	0.904	
Interaction	0.023	0.138	0.164	0.870	-0.250	0.296	
							0.493
Constant	6.575	4.988	1.318	0.189	-3.274	16.425	
Experience	-0.400	3.961	-0.101	0.920	-8.221	7.420	
PEOU	0.453	0.296	1.532	0.128	-0.131	1.036	
Interaction	-0.088	0.242	-0.363	0.717	-0.566	0.390	
							0.245
	beta	SE	t	sig.	LLCI	ULCI	Rsquared
Constant	8.606	3.391	2.538	0.012	1.911	15.300	
Experience	-2.028	2.552	-0.795	0.428	-7.067	3.011	
PU	0.353	0.222	1.592	0.113	-0.085	0.792	
Interaction	0.041	0.173	0.236	0.814	-0.301	0.383	
							0.311
Constant	9.601	2.813	3.414	0.001	4.048	15.155	
Experience	-3.051	2.014	-1.515	0.132	-7.028	0.926	
Functionality	0.301	0.184	1.639	0.103	-0.062	0.664	
Interaction	0.088	0.138	0.635	0.526	-0.185	0.360	
							0.373

Table A 18: Moderation Analyses for Study 2, TabletPCs (continued)

	beta	SE	t	sig.	LLCI	ULCI	Rsquared
Constant	7.691	3.591	2.142	0.034	0.600	14.782	
Experience	-2.558	2.957	-0.865	0.388	-8.396	3.281	
Competence	0.414	0.236	1.757	0.081	-0.051	0.880	
Interaction	0.052	0.201	0.259	0.796	-0.345	0.449	
							0.353
Constant	12.682	3.301	3.842	0.002	6.165	19.199	
Experience	-4.455	2.741	-1.625	0.106	-9.867	0.958	
Reliability	0.078	0.200	0.388	0.699	-0.318	0.473	
Interaction	0.170	0.174	0.976	0.331	-0.174	0.515	
							0.265
Constant	14.712	3.385	4.346	0.001	8.028	21.396	
Experience	-6.251	2.589	-2.414	0.017	-11.363	-1.138	
Integrity	-0.042	0.263	-0.159	0.874	-0.560	0.477	
Interaction	0.360	0.207	1.737	0.084	-0.049	0.769	
							0.267
	beta	SE	t	sig.	LLCI	ULCI	Rsquared
Constant	14.479	3.007	4.815	0.001	8.541	20.417	
Experience	-6.396	2.033	-3.147	0.002	-10.409	-2.383	
Helpfulness	-0.031	0.267	-0.114	0.909	-0.558	0.497	
Interaction	0.440	0.186	2.366	0.019	0.073	0.806	
							0.280
Constant	16.016	3.254	4.922	0.001	9.590	22.441	
Experience	-5.595	2.650	-2.112	0.036	-10.827	-0.363	
Benevolence	-0.188	0.336	-0.559	0.577	-0.851	0.475	
Interaction	0.408	0.276	1.477	0.142	-0.138	0.953	
							0.189
Constant	3.516	3.894	0.903	0.368	-4.173	11.205	
Experience	0.846	3.068	0.276	0.783	-5.212	6.904	
Reputation	0.648	0.245	2.643	0.009	0.164	1.133	
Interaction	-0.161	0.204	-0.787	0.432	-0.564	0.242	
							0.275
	beta	SE	t	sig.	LLCI	ULCI	Rsquared
Constant	13.552	2.605	5.202	0.001	8.408	18.695	
Experience	-1.939	2.385	-0.813	0.417	-6.648	2.769	
Image	0.127	0.298	0.427	0.670	-0.461	0.715	
Interaction	-0.032	0.271	-0.118	0.906	-0.568	0.504	
							0.107
Constant	3.361	2.905	1.157	0.249	-2.376	9.098	
Experience	-0.269	2.061	-0.131	0.896	-4.338	3.800	
PercEnjoy.	0.679	0.181	3.747	0.000	0.321	1.037	
Interaction	-0.083	0.131	-0.638	0.524	-0.341	0.174	
							0.433

UTAUT

Table A 19: Path Coefficients, UTAUT, Study 2

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> ITU	-0.054	-0.062	0.070	0.777	0.437	-0.203	0.075
ATT -> ITU	0.511	0.496	0.094	5.460	0.000	0.303	0.672
CSE -> ITU	0.009	0.015	0.063	0.140	0.888	-0.111	0.141
Experience -> ITU	-0.122	-0.119	0.066	1.849	0.065	-0.248	0.010
FAC -> ITU	0.074	0.089	0.065	1.133	0.257	-0.034	0.219
PEOU -> ITU	0.045	0.032	0.082	0.546	0.585	-0.129	0.194
PU -> ITU	0.063	0.064	0.080	0.777	0.437	-0.091	0.226
SI -> ITU	0.081	0.089	0.064	1.272	0.204	-0.029	0.222

Table A 20: R squared values, UTAUT, Study 2

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ITU (R^2)	0.516	0.541	0.056	9.129	0.000	0.426	0.652
ITU (adj. R^2)	0.491	0.518	0.059	8.281	0.000	0.397	0.635

Table A 21: Endogenous variables, UTAUT, Study 2

	R Square	R Square adjusted	VIF	CA
ANX	0.374	0.338	1.566	0.817
ATT	0.154	0.149	2.823	0.882
CSE	0.190	0.180	1.303	0.696
Experience	0.090	0.074	1.124	1.000
FAC	0.576	0.566	1.505	0.401
ITU	-	-	-	0.972
PEOU	0.571	0.555	1.838	0.888
PU	0.716	0.704	2.254	0.884
SI	0.319	0.285	1.275	0.865

UTAUT + Trust

Table A 22: Path coefficients, UTAUT plus Trust, Study 2

	Original Sample (O)	Sampl e Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> ITU	-0.065	-0.073	0.073	0.894	0.372	-0.223	0.066
ATT -> ITU	0.369	0.361	0.097	3.796	0.000	0.166	0.548
Benevolence -> ITU	-0.068	-0.053	0.085	0.801	0.423	-0.220	0.119
CSE -> ITU	0.008	0.013	0.064	0.121	0.904	-0.113	0.140
Competence -> ITU	0.160	0.156	0.104	1.532	0.126	-0.045	0.363
Experience -> ITU	-0.121	-0.116	0.066	1.837	0.066	-0.244	0.015
FAC -> ITU	0.029	0.045	0.072	0.405	0.686	-0.099	0.183
Functionality -> ITU	0.024	0.016	0.108	0.225	0.822	-0.189	0.237
Helpfulness -> ITU	0.067	0.068	0.078	0.860	0.390	-0.089	0.223
Integrity -> ITU	0.121	0.120	0.076	1.605	0.109	-0.027	0.268
Interaction Effect: Experience (Product Indicator) -> Helpfulness -> ITU	0.329	0.308	0.203	1.619	0.106	-0.110	0.700
PEOU -> ITU	0.065	0.052	0.077	0.847	0.397	-0.100	0.198
PU -> ITU	0.026	0.028	0.086	0.306	0.760	-0.140	0.202
Reliability -> ITU	-0.041	-0.042	0.090	0.451	0.652	-0.221	0.132
SI -> ITU	0.087	0.088	0.064	1.349	0.178	-0.036	0.219

Table A 23: R squared values, UTAUT plus Trust, Study 2

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ITU (R^2)	0.557	0.598	0.055	10.196	0.000	0.485	0.703
ITU (adj. R^2)	0.514	0.558	0.060	8.552	0.000	0.435	0.674

Table A 24: Endogenous Variables, UTAUT plus Trust, Study 2

	R Square	R Square adjusted	VIF	CA
ANX	0.441	0.386	1.725	0.817
ATT	0.154	0.149	3.343	0.882
Benevolence	0.240	0.231	2.141	0.859
CSE	0.154	0.138	1.328	0.696
Competence	0.479	0.466	3.049	0.937
Experience	0.094	0.066	1.166	1.000
FAC	0.560	0.543	1.606	0.401
Functionality	0.744	0.733	3.678	0.931
Helpfulness	0.607	0.587	2.192	0.863
ITU	-	-	-	0.972
Integrity	0.581	0.555	2.096	0.958
Interaction Effect: Experience (Product Indicator) -> Helpfulness	-	-	1.158	0.863
PEOU	0.807	0.792	1.967	0.888
PU	0.038	-0.041	2.671	0.884
Reliability	0.335	0.274	2.334	0.920
SI	0.982	0.276	1.422	0.865
			1.422	0.865

UTAUT + Social Variables

Table A 25: Path Coefficients, UTAUT plus Social Variables, Study 2

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> ITU	-0.012	-0.019	0.074	0.158	0.874	-0.161	0.128
ATT -> ITU	0.396	0.379	0.112	3.545	0.000	0.156	0.602
CSE -> ITU	0.023	0.018	0.076	0.299	0.765	-0.139	0.157
Experience -> ITU	-0.114	-0.109	0.066	1.711	0.087	-0.239	0.022
FAC -> ITU	0.048	0.067	0.066	0.732	0.464	-0.056	0.200
Image -> ITU	-0.046	-0.039	0.072	0.637	0.524	-0.204	0.096
PEOU -> ITU	0.029	0.014	0.084	0.342	0.733	-0.145	0.176
PU -> ITU	0.045	0.044	0.080	0.569	0.569	-0.107	0.204
Perceived Enjoyment -> ITU	0.119	0.119	0.109	1.096	0.273	-0.096	0.335
Reputation -> ITU	0.154	0.157	0.072	2.157	0.031	0.016	0.305
SI -> ITU	0.077	0.084	0.072	1.071	0.284	-0.053	0.226

Table A 26: R squared values, UTAUT plus Social Variables, Study 2

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ITU (R^2)	0.541	0.575	0.056	9.595	0.000	0.460	0.682
ITU (Adj. R^2)	0.509	0.545	0.060	8.427	0.000	0.422	0.660

Table A 27: Endogenous variables, UTAUT plus Social Variables, Study 2

	R Square	R Square adjusted	VIF	CA
ANX	0.450	0.403	1.659	0.817
ATT	0.154	0.149	4.908	0.882
CSE	0.126	0.115	1.311	0.696
Experience	0.088	0.071	1.146	1.000
FAC	0.527	0.515	1.533	0.401
ITU	-	-	-	0.972
Image	0.121	0.088	1.334	0.892
PEOU	0.571	0.552	1.866	0.888
PU	0.713	0.698	2.297	0.884
Perceived Enjoyment	0.950	0.947	3.864	0.871
Reputation	0.381	0.342	1.432	0.944
SI	0.560	0.529	1.604	0.865

UTAUT + Trust + Social Variables

Table A 28: Path coefficients, UTAUT plus Trust plus Social Variables, Study 2

	Original Sample (O)	Sampl e Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> ITU	-0.038	-0.046	0.078	0.492	0.623	-0.201	0.105
ATT -> ITU	0.347	0.337	0.114	3.037	0.002	0.113	0.567
Benevolence -> ITU	-0.070	-0.058	0.084	0.832	0.405	-0.224	0.108
CSE -> ITU	0.019	0.014	0.073	0.261	0.794	-0.134	0.153
Competence -> ITU	0.096	0.086	0.110	0.871	0.384	-0.130	0.299
Experience -> ITU	-0.105	-0.100	0.068	1.554	0.120	-0.233	0.035
FAC -> ITU	0.018	0.038	0.071	0.258	0.797	-0.106	0.176
Functionality -> ITU	0.018	0.006	0.107	0.166	0.868	-0.199	0.224
Helpfulness -> ITU	0.048	0.042	0.078	0.620	0.535	-0.109	0.195
Image -> ITU	-0.045	-0.036	0.077	0.584	0.559	-0.206	0.103
Integrity -> ITU	0.118	0.120	0.073	1.614	0.107	-0.027	0.263
Interaction Effect: Experience -> Helpfulness -> ITU	0.371	0.353	0.215	1.724	0.085	-0.099	0.768
PEOU -> ITU	0.052	0.037	0.078	0.668	0.504	-0.120	0.191
PU -> ITU	0.042	0.045	0.086	0.487	0.627	-0.115	0.226
Perceived Enjoyment -> ITU	0.032	0.033	0.119	0.269	0.788	-0.197	0.273
Reliability -> ITU	-0.025	-0.024	0.094	0.262	0.793	-0.206	0.173
Reputation -> ITU	0.131	0.138	0.074	1.766	0.078	-0.011	0.286
SI -> ITU	0.083	0.083	0.071	1.179	0.238	-0.048	0.230

Table A 29: R squared values, UTAUT plus Trust plus Social Variables, Study 2

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ITU (R^2)	0.569	0.618	0.054	10.476	0.000	0.503	0.718
ITU (adj. R^2)	0.517	0.572	0.061	8.491	0.000	0.443	0.683

Table A 30: Endogenous variables, UTAUT plus Trust plus Social Variables, Study 2

	R Square	R Square adjusted	VIF	CA
ANX	0.515	0.453	1.879	0.817
ATT	0.154	0.149	5.089	0.882
Benevolence	0.239	0.229	2.178	0.859
CSE	0.122	0.105	1.340	0.696
Competence	0.479	0.466	3.445	0.937
Experience	0.093	0.065	1.195	1.000
FAC	0.539	0.521	1.623	0.401
Functionality	0.745	0.734	3.744	0.931
Helpfulness	0.602	0.582	2.222	0.863
ITU	-	-	-	0.972
Image	0.173	0.120	1.366	0.892
Integrity	0.582	0.553	2.121	0.958
PEOU	0.623	0.591	1.207	0.863
PU	0.775	0.754	1.996	0.888
Perceived Enjoyment	0.976	0.974	2.726	0.884
Reliability	0.650	0.613	4.493	0.871
Reputation	0.483	0.425	2.365	0.920
SI	0.670	0.630	1.765	0.944
			1.736	0.865

16.5 Appendix 4: Study 3

Table A 31: Variables available for the CANTAB measures used

Measure	Variables
Motion Orientation Task (MOT)	MotMeanLatency
	MOTMeanError
Rapid Visual Perception (RVP)	RVPProbabilityoffalsealarm
	RVPProbabilityofhit
	RVPProbabilityofhitBlocks1to7
	RVPMeanlatency
	RVPTotalcorrectrejections
	RVPTotalfalsealarms
	RVPTotalhits
	RVPTotalhitsBlocks1to7
	RVPTotalmisses
	RVPTotalmissesBlocks1to7
	RVPA
	RVPB
Spatial Working Memory (SWM)	SWMBetweenerrors
	SWMBetweenerrors4boxes
	SWMBetweenerrors4to10boxes
	SWMDoubleerrors
	SWMDoubleerrors4boxes
	SWMDoubleerrors4to10boxes
	SWMStrategy
	SWMStrategy4to10boxes
	SWMMeantimetofirstresponse
	SWMMeantimetolastresponse
	SWMMeantokensearchpreparationtime
	SWMTotalerrors
	SWMTotalerrors4boxes
	SWMTotalerrors4to10boxes
	SWMWithinerrors
	SWMWithinerrors4boxes
	SWMWithinerrors4to10boxes

Table A 32: Variables available for the CANTAB measures used (continued)

Measure	Variables
Stockings of Cambridge (SOC)	SOCMeaninitialthinkingtime2moves
	SOCMeansubsequentthinkingtime2moves
	SOCProblemssolvedinminimummoves
	SOCMeaninitialthinkingtime3moves
	SOCMeanmoves3moves
	SOCMeansubsequentthinkingtime3moves
	SOCProblemssolvedinminimummoves3moves
	SOCMeaninitialthinkingtime4moves
	SOCMeanmoves4moves
	SOCMeansubsequentthinkingtime4moves
	SOCProblemssolvedinminimummoves4moves
	SOCMeaninitialthinkingtime5moves
	SOCMeanmoves5moves
	SOCMeansubsequentthinkingtime5moves
	SOCProblemssolvedinminimummoves5moves

Mediation Analyses:

Table A 33: Mediation Analyses: PEOU as a mediator of the Effect of Cognitive Variables on ITU, Study 3

WTAR Direct (NoMed): 0.068 Direct W/ Med: 0.197 IV to Med Beta: -0.317 Med to DV Beta: 0.405 IV to Med SE: 0.111 Med to DV SE: 0.143 ***Sobel test statistic:*** **-2.01096774** ***One-tailed probability:*** **0.02216443** ***Two-tailed probability:*** **0.04432886**	SWM_BetweenErrors Direct (NoMed): -0.259 Direct W/ Med:-0.161 IV to Med Beta: -0.340 Med to DV Beta: 0.288 IV to Med SE: 0.116 Med to DV SE: 0.151 ***Sobel test statistic:*** **-1.59862409** ***One-tailed probability:*** **0.05495208** ***Two-tailed probability:*** **0.10990415**
SWM_Strategy Direct (NoMed): -0.252 Direct W/ Med: -0.168 IV to Med Beta: -0.286 Med to DV Beta: 0.295 IV to Med SE: 0.116 Med to DV SE: 0.138 ***Sobel test statistic:*** **-1.61513063** ***One-tailed probability:*** **0.05314120** ***Two-tailed probability:*** **0.10628241**	

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Table A 34: Path coefficients, UTAUT, Study 3

	Original Sample (O)	Sampl e Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> ITU	0.130	0.145	0.179	0.724	0.469	-0.194	0.520
ATT -> ITU	-0.210	-0.205	0.188	1.118	0.264	-0.581	0.164
Age -> ITU	0.235	0.237	0.189	1.238	0.216	-0.132	0.613
CSE -> ITU	0.077	0.073	0.148	0.523	0.601	-0.225	0.361
FAC -> ITU	0.229	0.205	0.251	0.911	0.362	-0.326	0.649
PEOU -> ITU	0.240	0.253	0.182	1.320	0.187	-0.111	0.618
PU -> ITU	0.061	0.055	0.129	0.470	0.639	-0.194	0.313
SI -> ITU	0.130	0.145	0.179	0.724	0.469	-0.194	0.520

Table 76: R squared values, UTAUT, Study 3

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ITU (R^2)	0.241	0.327	0.108	2.224	0.026	0.132	0.554
ITU (adj. R^2)	0.117	0.218	0.126	0.929	0.353	-0.010	0.482

Table A 35: Endogenous variables, UTAUT, Study 3

	R Square	R Square adjusted	VIF	CA
ANX	0.645	0.578	2.891	0.884
ATT	0.497	0.486	2.771	0.809
Age	0.243	0.212	2.564	1.000
CSE	0.174	0.121	1.509	1.000
FAC	0.704	0.678	1.706	0.156
ITU	-	-		1.000
PEOU	0.829	0.806	3.434	0.897
PU	0.699	0.650	1.877	0.799
SI	0.547	0.461	1.631	0.756

UTAUT + Trust

Table A 36: Path coefficients, UTAUT plus Trust, Study 3

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> ITU	0.377	0.310	0.261	1.446	0.148	-0.241	0.809
ATT -> ITU	0.057	0.064	0.246	0.230	0.818	-0.410	0.562
Age -> ITU	-0.337	-0.269	0.286	1.179	0.239	-0.867	0.286
Benevolence -> ITU	-0.252	-0.228	0.205	1.225	0.221	-0.612	0.206
CSE -> ITU	-0.139	-0.153	0.243	0.573	0.567	-0.612	0.327
Competence -> ITU	0.045	0.037	0.247	0.183	0.855	-0.473	0.495
FAC -> ITU	0.443	0.465	0.241	1.839	0.066	-0.032	0.945
Functionality -> ITU	0.214	0.190	0.232	0.923	0.356	-0.251	0.660
Helpfulness -> ITU	-0.128	-0.144	0.206	0.622	0.534	-0.546	0.241
Integrity -> ITU	0.227	0.195	0.216	1.048	0.295	-0.259	0.589
Interaction Effect: Age (Product Indicator) -> Benevolence -> ITU	-0.002	-0.002	0.003	0.608	0.543	-0.007	0.004
PEOU -> ITU	0.063	0.020	0.289	0.217	0.828	-0.575	0.528
PU -> ITU	0.076	0.119	0.250	0.306	0.760	-0.342	0.647
Reliability -> ITU	0.096	0.083	0.176	0.545	0.586	-0.284	0.410
SI -> ITU	0.016	0.009	0.201	0.079	0.937	-0.384	0.424

Table A 37: R squared values, UTAUT plus Trust, Study 3

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ITU (R^2)	0.477	0.631	0.087	5.496	0.000	0.457	0.803
ITU (adj. R^2)	0.253	0.473	0.124	2.038	0.042	0.225	0.718

Table A 38: Endogenous variables, UTAUT plus Trust, Study 3

	R Square	R Square adjusted	ITU	Cronbachs Alpha
ANX	0.692	0.572	3.289	0.884
ATT	0.495	0.485	3.381	0.809
Age	0.230	0.198	3.215	1.000
Benevolence	0.081	0.022	2.344	1.000
CSE	0.209	0.140	2.091	1.000
Competence	0.428	0.364	2.643	1.000
FAC	0.862	0.843	2.151	0.156
Functionality	0.548	0.475	2.558	1.000
Helpfulness	0.378	0.260	1.728	1.000
ITU	0.895	0.872		1.000
Integrity	0.782	0.728	2.756	1.000
PEOU	0.898	0.181	3.611	0.897
PU	0.684	0.573	2.011	0.799
Reliability	0.060	-0.861	1.609	1.000
SI	0.483	0.262	1.855	0.756

UTAUT + Social Variables

Table A 39: Path coefficients, UTAUT plus Social Variables, Study 3

	Original Sample (O)	Sampl e Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> ITU	0.292	0.209	0.249	1.173	0.241	-0.275	0.721
ATT -> ITU	0.308	0.254	0.220	1.398	0.162	-0.187	0.695
Age -> ITU	-0.165	-0.134	0.229	0.720	0.471	-0.619	0.282
CSE -> ITU	-0.131	-0.144	0.187	0.697	0.486	-0.495	0.251
FAC -> ITU	0.342	0.373	0.181	1.891	0.059	-0.004	0.708
Image -> ITU	-0.237	-0.224	0.138	1.726	0.085	-0.485	0.072
Interaction Effect: Age -> Image -> ITU	-0.007	-0.008	0.006	1.079	0.281	-0.020	0.004
PEOU -> ITU	0.189	0.142	0.250	0.754	0.451	-0.353	0.631
PU -> ITU	0.180	0.215	0.233	0.773	0.439	-0.221	0.687
Perceived Enjoyment -> ITU	-0.324	-0.339	0.237	1.371	0.170	-0.835	0.123
Reputation -> ITU	0.136	0.120	0.129	1.048	0.295	-0.134	0.381
SI -> ITU	-0.036	-0.036	0.170	0.213	0.831	-0.366	0.305

Table A 40: R squared values, UTAUT plus Social Variables, Study 3

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ITU (R^2)	0.481	0.615	0.094	5.097	0.000	0.418	0.787
ITU (adj. R^2)	0.316	0.493	0.124	2.551	0.011	0.234	0.719

Table A 41: Endogenous variables, UTAUT plus Social Variables, Study 3

	R Square	R Square adjusted	VIF	CA
ANX	0.698	0.603	3.235	0.884
ATT	0.499	0.489	3.377	0.809
Age	0.234	0.202	2.850	1.000
CSE	0.171	0.118	1.662	1.000
FAC	0.860	0.848	1.897	0.156
ITU	-	-	-	1.000
Image	0.242	0.139	1.625	0.852
PEOU	0.800	0.762	3.747	0.897
PU	0.718	0.656	2.107	0.799
Perceived Enjoyment	0.983	0.979	3.369	0.869
Reputation	0.514	0.377	1.454	0.858
SI	0.615	0.778	1.770	0.756

UTAUT + Trust + Social Variables

Table A 42: Path coefficients, UTAUT plus Trust plus Social Variables, Study 3

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> ITU	0.296	0.237	0.301	0.983	0.326	-0.352	0.768
ATT -> ITU	0.232	0.211	0.290	0.799	0.424	-0.394	0.800
Age -> ITU	-0.216	-0.197	0.333	0.648	0.517	-0.918	0.421
Benevolence -> ITU	-0.264	-0.166	0.364	0.727	0.468	-0.798	0.633
CSE -> ITU	-0.240	-0.263	0.283	0.845	0.398	-0.851	0.291
Competence -> ITU	0.153	0.175	0.316	0.482	0.630	-0.417	0.779
FAC -> ITU	0.369	0.448	0.292	1.264	0.207	-0.167	1.110
Functionality -> ITU	0.126	0.079	0.252	0.499	0.618	-0.460	0.586
Helpfulness -> ITU	-0.201	-0.169	0.272	0.738	0.461	-0.698	0.382
Image -> ITU	-0.156	-0.195	0.241	0.647	0.518	-0.673	0.255
Integrity -> ITU	0.248	0.168	0.322	0.770	0.442	-0.566	0.789
Interaction Effect: Age -> Benevolence -> ITU	-0.001	0.000	0.004	0.181	0.857	-0.009	0.007
Interaction Effect: Age -> Image -> ITU	-0.006	-0.007	0.011	0.523	0.601	-0.030	0.013
PEOU -> ITU	0.168	0.119	0.363	0.463	0.644	-0.565	0.762
PU -> ITU	0.146	0.200	0.282	0.517	0.605	-0.359	0.763
Perceived Enjoyment -> ITU	-0.416	-0.454	0.314	1.323	0.186	-1.146	0.118
Reliability -> ITU	0.110	0.099	0.207	0.530	0.597	-0.332	0.499
Reputation -> ITU	0.227	0.175	0.229	0.992	0.321	-0.299	0.642
SI -> ITU	-0.020	-0.028	0.230	0.089	0.929	-0.513	0.426

Table A 43: R squared values, UTAUT plus Trust plus Social Variables, Study 3

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ITU (R^2)	0.557	0.734	0.088	6.322	0.000	0.557	0.889
ITU (adj. R^2)	0.285	0.570	0.142	2.008	0.045	0.286	0.821

Table A 44: Endogenous variables, UTAUT plus Trust plus Social Variables, Study 3

	R Square	R Square adjusted	VIF	CA
ANX	0.746	0.591	3.874	0.884
ATT	0.500	0.490	3.939	0.809
Age	0.229	0.197	3.604	1.000
Benevolence	0.080	0.021	3.477	1.000
CSE	0.208	0.140	2.345	1.000
Competence	0.432	0.369	4.033	1.000
FAC	0.092	-0.104	2.515	0.156
Functionality	0.484	0.400	3.101	1.000
Helpfulness	0.179	0.022	2.187	1.000
ITU	-	-	-	1.000
Image	0.348	0.185	2.504	0.852
Integrity	0.639	0.537	3.087	1.000
PEOU	0.848	0.789	4.083	0.897
PU	0.782	0.689	2.344	0.799
Perceived Enjoyment	0.069	-0.101	4.148	0.869
Reliability	0.324	-0.024	1.783	1.000
Reputation	0.657	0.465	2.225	0.858
SI	0.089	-0.470	1.936	0.756

UTAUT + Cognitive Variables

Table A 45: Path Coefficients, UTAUT plus Cognitive Variables, Study 3

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> ITU	0.380	0.288	0.231	1.643	0.100	-0.201	0.742
ATT -> ITU	0.288	0.282	0.210	1.372	0.170	-0.132	0.713
Age -> ITU	-0.622	-0.580	0.304	2.047	0.041	-1.129	0.082
CSE -> ITU	-0.081	-0.086	0.179	0.450	0.653	-0.453	0.252
FAC -> ITU	0.345	0.379	0.184	1.872	0.061	0.028	0.725
PEOU -> ITU	0.071	-0.016	0.248	0.287	0.774	-0.518	0.454
PU -> ITU	0.165	0.169	0.209	0.792	0.429	-0.221	0.621
SI -> ITU	-0.034	-0.098	0.163	0.211	0.833	-0.411	0.223
SWM BetweenErrors -> ITU	-0.014	-0.026	0.259	0.054	0.957	-0.634	0.423
SWM Strategy -> ITU	0.141	0.168	0.209	0.674	0.501	-0.209	0.618
WTAR -> ITU	0.433	0.416	0.190	2.279	0.007	0.004	0.753
WTAR -> PEOU	-0.341	-0.344	0.122	2.804	0.005	-0.571	-0.088

Table A 46: R squared values, UTAUT plus Cognitive Variables, Study 3

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ITU (R^2)	0.491	0.612	0.090	5.426	0.000	0.422	0.780
ITU (adj. R^2)	0.347	0.503	0.116	2.993	0.003	0.259	0.718

Table A 47: Endogenous variables, UTAUT plus Cognitive Variables, Study 3

	R Square	R Square adjusted	VIF	CA
ANX	0.691	0.593	3.037	0.884
ATT	0.493	0.483	3.117	0.809
Age	0.250	0.218	5.079	1.000
CSE	0.174	0.122	1.538	1.000
FAC	0.683	0.656	2.003	0.156
ITU	-	-	-	1.000
PEOU	0.825	0.801	3.906	0.897
PU	0.687	0.636	1.936	0.799
SI	0.516	0.424	1.794	0.756
SWM BetweenErrors	0.520	0.414	3.132	1.000
SWM Strategy	0.739	0.674	2.851	1.000
WTAR	0.719	0.639	2.187	1.000

UTAUT + Trust + Cognitive Variables

Table A 48: Path Coefficients, UTAUT plus Trust plus Cognitive Variables, Study 3

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> ITU	0.403	0.342	0.287	1.401	0.162	-0.233	0.890
ATT -> ITU	0.174	0.165	0.324	0.538	0.591	-0.499	0.764
Age -> ITU	-0.671	-0.641	0.392	1.712	0.087	-1.405	0.132
Benevolence -> ITU	-0.298	-0.249	0.262	1.137	0.256	-0.761	0.295
CSE -> ITU	-0.092	-0.125	0.279	0.328	0.743	-0.693	0.406
Competence -> ITU	-0.015	0.009	0.257	0.059	0.953	-0.527	0.477
FAC -> ITU	0.330	0.359	0.243	1.359	0.174	-0.108	0.873
Functionality -> ITU	0.134	0.098	0.273	0.490	0.624	-0.450	0.668
Helpfulness -> ITU	-0.079	-0.104	0.225	0.351	0.725	-0.572	0.314
Integrity -> ITU	0.199	0.157	0.277	0.717	0.474	-0.447	0.700
Interaction Effect: Age -> Benevolence -> ITU	-0.006	-0.007	0.009	0.708	0.479	-0.025	0.011
PEOU -> ITU	0.031	-0.037	0.340	0.092	0.927	-0.754	0.590
PU -> ITU	0.179	0.212	0.263	0.680	0.497	-0.267	0.755
Reliability -> ITU	-0.005	0.049	0.201	0.027	0.978	-0.371	0.452
SI -> ITU	-0.057	-0.044	0.254	0.223	0.824	-0.531	0.481
SWM BetweenErrors -> ITU	0.062	0.051	0.286	0.218	0.827	-0.594	0.555
SWM Strategy -> ITU	0.151	0.176	0.304	0.498	0.618	-0.432	0.778
WTAR -> ITU	0.403	0.372	0.273	1.474	0.141	-0.194	0.916
WTAR -> PEOU	-0.341	-0.348	0.116	2.950	0.003	-0.555	-.0101

Table A 49: R squared values, UTAUT plus Trust plus Cognitive Variables, Study 3

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ITU (R^2)	0.547	0.737	0.079	6.925	0.000	0.582	0.887
ITU (adj. R^2)	0.293	0.589	0.124	2.371	0.018	0.347	0.823

Table A 50: Endogenous Variables, UTAUT plus Trust plus Cognitive Variables, Study 3

	R Square	R Square adjusted	VIF	CA
ANX	0.730	0.625	3.356	0.884
ATT	0.497	0.487	4.277	0.809
Age	0.238	0.206	5.721	1.000
Benevolence	0.080	0.021	2.759	1.000
CSE	0.210	0.142	2.253	1.000
Competence	0.428	0.365	2.727	1.000
FAC	0.842	0.820	2.479	0.156
Functionality	0.548	0.475	2.780	1.000
Helpfulness	0.374	0.255	1.734	1.000
ITU	-	-		1.000
Integrity	0.714	0.642	2.997	1.000
PEOU	0.016	-0.021	4.276	0.897
PU	0.443	-0.950	2.137	0.799
Reliability	0.183	-0.810	1.655	1.000
SI	0.456	0.223	2.167	0.756
SWM BetweenErrors	0.567	0.363	3.413	1.000
SWM Strategy	0.714	0.567	3.670	1.000
WTAR	0.737	0.590	2.769	1.000

UTAUT + Social Variables + Cognitive Variables

Table A 51: Path Coefficients, UTAUT plus Social Variables plus Cognitive Variables, Study 3

	Original Sample (O)	Sampl e Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> ITU	0.371	0.270	0.265	1.401	0.161	-0.259	0.805
ATT -> ITU	0.347	0.332	0.253	1.369	0.171	-0.160	0.849
Age -> ITU	-0.520	-0.492	0.363	1.433	0.152	-1.164	0.266
CSE -> ITU	-0.117	-0.119	0.201	0.583	0.560	-0.509	0.277
FAC -> ITU	0.301	0.346	0.208	1.448	0.148	-0.076	0.758
Image -> ITU	-0.178	-0.151	0.163	1.094	0.274	-0.458	0.190
Interaction Effect: Age -> Image -> ITU	-0.007	-0.008	0.007	0.928	0.354	-0.021	0.006
PEOU -> ITU	0.140	0.053	0.292	0.478	0.633	-0.528	0.662
PU -> ITU	0.227	0.224	0.230	0.985	0.325	-0.226	0.686
Perceived Enjoyment -> ITU	-0.254	-0.253	0.224	1.137	0.256	-0.707	0.174
Reputation -> ITU	0.058	0.059	0.145	0.398	0.690	-0.229	0.338
SI -> ITU	-0.077	-0.104	0.204	0.377	0.706	-0.516	0.304
SWM BetweenErrors -> ITU	0.024	0.013	0.285	0.084	0.933	-0.621	0.523
SWM Strategy -> ITU	0.132	0.157	0.241	0.549	0.583	-0.303	0.654
WTAR -> ITU	0.364	0.348	0.213	1.709	0.088	-0.099	0.765
WTAR -> PEOU	-0.341	-0.349	0.118	2.887	0.004	-0.557	-0.125

Table A 52: R squared values, UTAUT plus Social Variables plus Cognitive Variables, Study 3

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ITU (R^2)	0.542	0.685	0.091	5.974	0.000	0.498	0.845
ITU (adj. R^2)	0.346	0.550	0.130	2.668	0.008	0.283	0.779

Table A 53: Endogenous Variables, UTAUT plus Social Variables plus Cognitive Variables, Study 3

	R Square	R Square adjusted	VIF	CA
ANX	0.730	0.625	3.404	0.884
ATT	0.497	0.487	3.735	0.809
Age	0.240	0.208	5.681	1.000
CSE	0.171	0.118	1.717	1.000
FAC	0.841	0.827	2.131	0.156
ITU	-	-	-	1.000
Image	0.241	0.138	1.821	0.852
PEOU	0.790	0.750	1.215	0.856
PU	0.684	0.615	4.300	0.897
Perceived Enjoyment	0.967	0.959	2.181	0.799
Reputation	0.280	0.077	3.470	0.858
SI	0.575	0.072	1.581	0.756
SWM BetweenErrors	0.387	0.172	1.906	1.000
SWM Strategy	0.357	0.108	3.392	1.000
WTAR	0.620	0.456	3.110	1.000

UTAUT + Trust + Social Variables + Cognitive Variables

Table A 54: Path Coefficients, UTAUT plus Trust plus Social Variables plus Cognitive Variables, Study 3

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> ITU	0.335	0.280	0.385	0.868	0.385	-0.509	1.091
ATT -> ITU	0.313	0.258	0.434	0.722	0.471	-0.645	1.061
Age -> ITU	-0.561	-0.541	0.528	1.064	0.287	-1.528	0.504
Benevolence -> ITU	-0.317	-0.241	0.450	0.703	0.482	-1.087	0.681
CSE -> ITU	-0.177	-0.213	0.353	0.500	0.617	-0.916	0.477
Competence -> ITU	0.064	0.041	0.401	0.159	0.874	-0.812	0.835
FAC -> ITU	0.318	0.378	0.348	0.914	0.361	-0.327	1.116
Functionality -> ITU	0.085	0.072	0.357	0.237	0.813	-0.658	0.755
Helpfulness -> ITU	-0.125	-0.121	0.287	0.436	0.663	-0.710	0.412
Image -> ITU	-0.134	-0.128	0.317	0.423	0.672	-0.710	0.557
Integrity -> ITU	0.236	0.187	0.388	0.609	0.543	-0.584	0.967
Interaction Effect: Age -> Benevolence -> ITU	-0.002	-0.003	0.015	0.148	0.882	-0.034	0.025
Interaction Effect: Age -> Image -> ITU	-0.005	-0.005	0.014	0.367	0.713	-0.032	0.022
PEOU -> ITU	0.088	0.029	0.473	0.186	0.852	-0.870	1.023
PU -> ITU	0.229	0.254	0.344	0.667	0.505	-0.405	0.973
Perceived Enjoyment -> ITU	-0.347	-0.318	0.383	0.906	0.365	-1.081	0.422
Reliability -> ITU	0.012	0.068	0.273	0.043	0.966	-0.474	0.597
Reputation -> ITU	0.154	0.133	0.285	0.539	0.590	-0.441	0.722
SI -> ITU	-0.055	-0.061	0.334	0.164	0.869	-0.702	0.586
SWM BetweenErrors -> ITU	0.071	0.065	0.359	0.199	0.843	-0.725	0.698
SWM Strategy -> ITU	0.168	0.169	0.393	0.429	0.668	-0.607	0.923
WTAR -> ITU	0.284	0.269	0.359	0.793	0.428	-0.425	0.957
WTAR -> PEOU	-0.341	-0.347	0.121	2.825	0.005	-0.572	-0.095

Table A 55: R squared values, UTAUT plus Trust plus Social Variables plus Cognitive Variables, Study 3

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ITU (R^2)	0.593	0.805	0.078	7.598	0.000	0.642	0.946
ITU (R^2 adjusted)	0.274	0.652	0.139	1.962	0.050	0.361	0.903

Table A 56: Endogenous Variables, UTAUT plus Trust plus Social Variables plus Cognitive Variables, Study 3

	R Square	R Square adjusted	VIF	CA
ANX	0.761	0.573	4.000	0.884
ATT	0.501	0.491	4.815	0.809
Age	0.235	0.203	6.289	1.000
Benevolence	0.079	0.020	3.800	1.000
CSE	0.210	0.141	2.537	1.000
Competence	0.432	0.369	4.176	1.000
FAC	1.067	1.077	2.729	0.156
Functionality	0.464	0.376	3.305	1.000
Helpfulness	0.138	-0.027	2.191	1.000
ITU	-	-	-	1.000
Image	0.348	0.185	2.661	0.852
Integrity	0.637	0.535	3.376	1.000
Interaction Effect: Age -> Benevolence	0.432	0.252	2.899	1.000
Interaction Effect: Age -> Image	0.404	0.195	1.873	0.856
PEOU	0.849	0.790	4.695	0.897
PU	0.775	0.679	2.459	0.799
Perceived Enjoyment	0.069	-0.102	4.369	0.869
Reliability	0.309	-0.047	1.847	1.000
Reputation	0.657	0.464	2.371	0.858
SI	0.147	-0.375	2.261	0.756
SWM BetweenErrors	0.645	0.408	3.594	1.000
SWM Strategy	0.495	0.130	3.783	1.000
WTAR	0.760	0.572	3.135	1.000

UTAUT + Personality

Table A 57: Path Coefficients, UTAUT plus Personality, Study 3

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> ITU	0.248	0.180	0.265	0.937	0.349	-0.388	0.663
ATT -> ITU	0.241	0.247	0.241	0.998	0.319	-0.266	0.722
Age -> ITU	-0.307	-0.269	0.267	1.152	0.250	-0.880	0.215
CSE -> ITU	-0.120	-0.116	0.190	0.631	0.528	-0.497	0.273
FAC -> ITU	0.467	0.473	0.206	2.265	0.024	0.109	0.909
PEOU -> ITU	0.005	-0.048	0.278	0.017	0.986	-0.611	0.470
PU -> ITU	0.111	0.100	0.219	0.505	0.614	-0.312	0.514
SI -> ITU	0.041	-0.047	0.162	0.256	0.798	-0.360	0.260
TIPI 1 -> ITU	-0.001	-0.016	0.149	0.006	0.995	-0.340	0.294
TIPI 2 -> ITU	-0.135	-0.155	0.157	0.855	0.393	-0.458	0.166
TIPI 3 -> ITU	-0.040	-0.029	0.182	0.219	0.827	-0.389	0.308
TIPI 4 -> ITU	-0.157	-0.153	0.163	0.963	0.336	-0.473	0.142
TIPI 5 -> ITU	-0.109	-0.119	0.177	0.615	0.539	-0.450	0.238

Table A 58: R squared values, UTAUT plus Personality, Study 3

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ITU (R^2)	0.450	0.605	0.097	4.621	0.000	0.423	0.793
ITU (adj. R^2)	0.257	0.466	0.132	1.951	0.052	0.220	0.720

Table A 59: Endogenous Variables, UTAUT plus Personality, Study 3

	R Square	R Square adjusted	VIF	CA
ANX	0.718	0.619	3.232	0.884
ATT	0.504	0.494	3.213	0.809
Age	0.232	0.200	3.172	1.000
CSE	0.173	0.120	1.722	1.000
FAC	0.683	0.655	1.873	0.156
ITU	-	-	-	1.000
PEOU	0.828	0.805	3.909	0.897
PU	0.694	0.644	1.919	0.799
SI	0.528	0.438	1.758	0.756
TIPI 1	0.487	0.375	1.468	1.000
TIPI 2	0.168	-0.040	1.175	1.000
TIPI 3	0.469	0.319	1.852	1.000
TIPI 4	0.606	0.482	1.366	1.000
TIPI 5	0.417	0.213	1.444	1.000

UTAUT + Trust + Personality

Table A 60: Path Coefficients, UTAUT plus Trust plus Personality, Study 3

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> ITU	0.389	0.327	0.372	1.046	0.296	-0.440	1.047
ATT -> ITU	0.077	0.175	0.362	0.213	0.831	-0.534	1.003
Age -> ITU	-0.316	-0.306	0.354	0.893	0.372	-1.084	0.344
Benevolence -> ITU	-0.224	-0.208	0.279	0.803	0.422	-0.856	0.347
CSE -> ITU	-0.162	-0.111	0.306	0.528	0.598	-0.649	0.546
Competence -> ITU	-0.031	-0.080	0.305	0.100	0.920	-0.736	0.474
FAC -> ITU	0.456	0.444	0.317	1.439	0.151	-0.194	1.033
Functionality -> ITU	0.287	0.268	0.312	0.922	0.357	-0.335	0.887
Helpfulness -> ITU	-0.122	-0.136	0.256	0.475	0.635	-0.681	0.374
Integrity -> ITU	0.136	0.120	0.320	0.427	0.670	-0.508	0.709
Interaction Effect: Age -> Benevolence -> ITU	-0.002	-0.002	0.003	0.654	0.513	-0.009	0.006
PEOU -> ITU	-0.006	-0.067	0.380	0.015	0.988	-0.796	0.602
PU -> ITU	0.073	0.075	0.292	0.251	0.802	-0.511	0.684
Reliability -> ITU	0.145	0.119	0.216	0.672	0.502	-0.292	0.552
SI -> ITU	-0.005	-0.003	0.257	0.021	0.983	-0.495	0.537
TIPI 1 -> ITU	0.022	0.020	0.239	0.093	0.926	-0.478	0.467
TIPI 2 -> ITU	-0.126	-0.180	0.217	0.583	0.560	-0.605	0.253
TIPI 3 -> ITU	-0.126	-0.053	0.307	0.409	0.683	-0.661	0.543
TIPI 4 -> ITU	-0.210	-0.186	0.250	0.839	0.402	-0.714	0.297
TIPI 5 -> ITU	-0.120	-0.130	0.234	0.513	0.608	-0.621	0.365

Table A 61: R squared values, UTAUT plus Trust plus Personality, Study 3

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ITU (R^2)	0.533	0.741	0.086	6.170	0.000	0.567	0.900
ITU (adj. R^2)	0.221	0.569	0.144	1.537	0.125	0.278	0.833

Table A 62: R squared values, UTAUT plus Trust plus Personality, Study 3

	R Square	R Square adjusted	VIF	CA
			3.804	0.884
ATT	0.499	0.489	4.323	0.809
Age	0.220	0.188	3.568	1.000
Benevolence	0.082	0.024	2.438	1.000
CSE	0.207	0.139	2.427	1.000
Competence	0.429	0.365	2.992	1.000
FAC	0.876	0.859	2.367	0.156
Functionality	0.558	0.486	2.734	1.000
Helpfulness	0.405	0.292	2.033	1.000
ITU	-	-	-	1.000
Integrity	0.328	-0.660	3.259	1.000
Interaction Effect: Age -> Benevolence	0.037	-0.329	1.673	1.000
PEOU	0.637	0.523	4.393	0.897
PU	0.702	0.597	2.046	0.799
Reliability	0.498	-0.081	2.086	1.000
SI	0.492	0.275	2.120	0.756
TIPI 1	0.713	0.578	1.749	1.000
TIPI 2	0.247	-0.141	1.382	1.000
TIPI 3	0.535	0.274	2.622	1.000
TIPI 4	0.011	-0.018	1.766	1.000
TIPI 5	0.846	0.538	1.734	1.000

UTAUT + Social Variables + Personality

Table A 63: Path Coefficients, UTAUT plus Social Variables plus Personality, Study 3

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> ITU	0.229	0.176	0.257	0.894	0.372	-0.354	0.624
ATT -> ITU	0.378	0.360	0.261	1.445	0.149	-0.155	0.908
Age -> ITU	-0.117	-0.137	0.264	0.442	0.659	-0.728	0.329
CSE -> ITU	-0.223	-0.194	0.192	1.158	0.247	-0.551	0.216
FAC -> ITU	0.357	0.378	0.211	1.693	0.091	-0.037	0.808
Image -> ITU	-0.391	-0.363	0.171	2.288	0.023	-0.698	-0.032
Interaction Effect: Age -> Image -> ITU	-0.010	-0.010	0.007	1.412	0.159	-0.025	0.003
PEOU -> ITU	0.168	0.128	0.291	0.576	0.565	-0.449	0.664
PU -> ITU	0.222	0.209	0.217	1.020	0.308	-0.224	0.621
Perceived Enjoyment -> ITU	-0.448	-0.437	0.279	1.605	0.109	-1.045	0.062
Reputation -> ITU	0.162	0.137	0.142	1.144	0.253	-0.151	0.406
SI -> ITU	-0.035	-0.044	0.177	0.196	0.844	-0.377	0.323
TIPI 1 -> ITU	-0.055	-0.032	0.162	0.342	0.733	-0.378	0.279
TIPI 2 -> ITU	-0.231	-0.230	0.173	1.335	0.183	-0.576	0.127
TIPI 3 -> ITU	-0.113	-0.095	0.203	0.556	0.578	-0.484	0.273
TIPI 4 -> ITU	-0.161	-0.153	0.171	0.938	0.348	-0.498	0.187
TIPI 5 -> ITU	-0.251	-0.272	0.190	1.321	0.187	-0.649	0.063

Table A 64: R squared values, UTAUT plus Social Variables plus Personality, Study 3

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ITU (R^2)	0.597	0.742	0.080	7.486	0.000	0.572	0.889
ITU (adj. R^2)	0.389	0.609	0.121	3.221	0.001	0.351	0.832

Table A 65: Endogenous Variables, UTAUT plus Social Variables plus Personality, Study 3

	R Square	R Square adjusted	VIF	CA
ANX	0.746	0.615	3.668	0.884
ATT	0.505	0.495	3.729	0.809
Age	0.227	0.194	3.535	1.000
CSE	0.170	0.117	1.940	1.000
FAC	0.841	0.827	2.044	0.156
ITU	-	-	-	1.000
Image	0.244	0.141	2.005	0.852
Interaction Effect: Age -> Image	0.009	-0.174	1.335	0.856
PEOU	0.815	0.780	4.287	0.897
PU	0.726	0.666	2.177	0.799
Perceived Enjoyment	0.997	0.996	3.648	0.869
Reputation	0.793	0.419	1.509	0.858
SI	0.526	0.481	1.914	0.756
TIPI 1	0.052	-0.281	1.628	1.000
TIPI 2	0.036	-0.440	1.262	1.000
TIPI 3	0.437	0.196	1.999	1.000
TIPI 4	0.123	-0.651	1.440	1.000
TIPI 5	0.429	0.135	1.658	1.000

UTAUT + Cognitive Variables +Personality

Table A 66: Path Coefficients, UTAUT plus Cognitive Variables plus Personality, Study 3

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> ITU	0.378	0.295	0.292	1.294	0.196	-0.293	0.849
ATT -> ITU	0.259	0.286	0.263	0.986	0.325	-0.294	0.740
Age -> ITU	-0.615	-0.607	0.391	1.572	0.117	-1.369	0.134
CSE -> ITU	-0.127	-0.112	0.219	0.579	0.563	-0.532	0.276
FAC -> ITU	0.359	0.417	0.237	1.513	0.131	-0.038	0.887
PEOU -> ITU	0.081	-0.012	0.302	0.267	0.790	-0.628	0.588
PU -> ITU	0.184	0.159	0.218	0.847	0.397	-0.296	0.598
SI -> ITU	-0.023	-0.141	0.214	0.106	0.915	-0.557	0.301
SWM BetweenErrors -> ITU	-0.054	-0.048	0.298	0.181	0.857	-0.730	0.486
SWM Strategy -> ITU	0.132	0.166	0.253	0.520	0.603	-0.285	0.744
TIPI 1 -> ITU	0.098	0.110	0.176	0.555	0.579	-0.239	0.452
TIPI 2 -> ITU	-0.083	-0.095	0.177	0.471	0.638	-0.450	0.218
TIPI 3 -> ITU	-0.083	-0.085	0.213	0.389	0.697	-0.508	0.343
TIPI 4 -> ITU	-0.177	-0.169	0.176	1.005	0.315	-0.515	0.174
TIPI 5 -> ITU	-0.170	-0.194	0.192	0.886	0.376	-0.537	0.225
WTAR -> ITU	0.456	0.473	0.250	1.827	0.068	-0.044	0.953
WTAR->PEOU	-0.341	-0.344	0.111	3.070	0.002	-0.537	-0.105

Table A 67: R squared values, UTAUT plus Cognitive Variables plus Personality, Study 3

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ITU (R^2)	0.541	0.715	0.086	6.272	0.000	0.542	0.875
ITU (R^2 adjusted)	0.325	0.581	0.127	2.560	0.011	0.327	0.816

Table A 68: Endogenous Variables, UTAUT plus Cognitive Variables plus Personality, Study 3

	R Square	R Square adjusted	VIF	CA
ANX	0.760	0.648	3.448	0.884
ATT	0.500	0.490	3.658	0.809
Age	0.239	0.207	5.705	1.000
CSE	0.173	0.120	1.821	1.000
FAC	0.669	0.640	2.259	0.156
ITU	-	-	-	1.000
PEOU	0.825	0.801	4.570	0.897
PU	0.681	0.629	2.016	0.799
SI	0.507	0.413	1.909	0.756
SWM BetweenErrors	0.525	0.420	3.913	1.000
SWM Strategy	0.737	0.671	3.214	1.000
TIPI 1	0.602	0.490	1.619	1.000
TIPI 2	0.312	0.095	1.335	1.000
TIPI 3	0.533	0.369	2.201	1.000
TIPI 4	0.694	0.575	1.381	1.000
TIPI 5	0.432	0.189	1.540	1.000
WTAR	0.931	0.898	2.485	1.000

UTAUT + Trust + Social Variables + Personality

Table A 69: Path Coefficients, UTAUT plus Trust plus Social Variables plus Personality, Study 3

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> ITU	0.307	0.248	0.439	0.699	0.485	-0.689	1.198
ATT -> ITU	0.286	0.245	0.466	0.613	0.540	-0.715	1.094
Age -> ITU	-0.135	-0.108	0.466	0.290	0.772	-1.166	0.721
Benevolence -> ITU	-0.155	-0.125	0.503	0.309	0.757	-1.140	0.736
CSE -> ITU	-0.297	-0.279	0.385	0.772	0.440	-1.021	0.427
Competence -> ITU	0.040	0.042	0.478	0.083	0.934	-0.769	1.015
FAC -> ITU	0.359	0.439	0.460	0.781	0.435	-0.513	1.402
Functionality -> ITU	0.126	0.075	0.416	0.303	0.762	-0.800	0.725
Helpfulness -> ITU	-0.136	-0.082	0.383	0.356	0.722	-0.824	0.572
Image -> ITU	-0.387	-0.382	0.407	0.952	0.342	-1.120	0.405
Integrity -> ITU	0.137	0.117	0.467	0.294	0.769	-0.746	1.033

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
Interaction Effect: Age -> Benevolence -> ITU	0.000	0.000	0.005	0.019	0.984	-0.012	0.010
Interaction Effect: Age -> Image -> ITU	-0.007	-0.009	0.015	0.462	0.644	-0.042	0.021
PEOU -> ITU	0.198	0.215	0.505	0.393	0.695	-0.869	1.233
PU -> ITU	0.219	0.207	0.371	0.589	0.556	-0.529	0.929
Perceived Enjoyment -> ITU	-0.516	-0.502	0.479	1.079	0.281	-1.473	0.393
Reliability -> ITU	0.218	0.218	0.355	0.614	0.539	-0.400	0.946
Reputation -> ITU	0.234	0.179	0.355	0.658	0.511	-0.504	0.860
SI -> ITU	-0.017	-0.058	0.362	0.047	0.963	-0.772	0.694
TIPI 1 -> ITU	0.013	0.051	0.293	0.043	0.966	-0.505	0.661
TIPI 2 -> ITU	-0.240	-0.283	0.277	0.868	0.386	-0.838	0.275
TIPI 3 -> ITU	-0.230	-0.229	0.424	0.541	0.588	-1.140	0.590
TIPI 4 -> ITU	-0.165	-0.132	0.304	0.542	0.588	-0.665	0.536
TIPI 5 -> ITU	-0.241	-0.286	0.360	0.669	0.504	-1.050	0.438

Table A 70: R squared values, UTAUT plus Trust plus Social Variables plus Personality, Study 3

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ITU	0.648	0.846	0.088	7.348	0.000	0.669	0.980
ITU	0.323	0.704	0.170	1.905	0.057	0.364	0.961

Table A 71: Endogenous Variables, UTAUT plus Trust plus Social Variables plus Personality, Study 3

	R Square	R Square adjusted	VIF	CA
	0.795	0.606	4.386	0.884
ATT	0.503	0.493	4.780	0.809
Age	0.222	0.189	4.029	1.000
Benevolence	0.081	0.023	3.976	1.000
CSE	0.207	0.139	2.818	1.000
Competence	0.432	0.369	4.531	1.000
FAC	1.083	1.094	2.808	0.156
Functionality	0.464	0.377	3.553	1.000
Helpfulness	0.144	-0.019	2.635	1.000
ITU	-	-	-	1.000
Image	0.347	0.183	3.693	0.852
Integrity	0.638	0.535	3.684	1.000
Interaction Effect: Age -> Benevolence	0.441	0.264	3.091	1.000
Interaction Effect: Age -> Image	0.404	0.194	2.314	0.856
PEOU	0.855	0.798	5.008	0.897
PU	0.785	0.693	2.442	0.799
Perceived Enjoyment	1.080	1.118	4.402	0.869
Reliability	0.318	-0.034	2.356	1.000
Reputation	0.664	0.475	2.360	0.858
SI	0.146	-0.378	2.247	0.756
TIPI 1	0.215	-0.308	1.987	1.000
TIPI 2	0.297	-0.212	1.515	1.000
TIPI 3	0.656	0.385	3.185	1.000
TIPI 4	0.411	-0.090	1.891	1.000
TIPI 5	0.717	0.456	2.236	1.000

UTAUT + Trust + Cognitive Variables + Personality

Table A 72: Path Coefficients, UTAUT plus Trust plus Cognitive Variables plus Personality, Study 3

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> ITU	0.454	0.364	0.418	1.088	0.277	-0.561	1.136
ATT -> ITU	0.247	0.306	0.467	0.530	0.596	-0.636	1.196
Age -> ITU	-0.638	-0.709	0.522	1.223	0.222	-1.665	0.322
Benevolence -> ITU	-0.168	-0.136	0.370	0.453	0.651	-0.806	0.595
CSE -> ITU	-0.134	-0.116	0.339	0.396	0.692	-0.769	0.616
Competence -> ITU	-0.047	-0.064	0.355	0.132	0.895	-0.763	0.664
FAC -> ITU	0.362	0.412	0.366	0.989	0.323	-0.304	1.147
Functionality -> ITU	0.220	0.160	0.373	0.590	0.555	-0.583	0.953
Helpfulness -> ITU	-0.122	-0.125	0.291	0.417	0.677	-0.735	0.447
Integrity -> ITU	0.112	0.074	0.344	0.327	0.744	-0.650	0.786
PEOU -> ITU	0.015	-0.113	0.502	0.030	0.976	-1.215	0.692
PU -> ITU	0.174	0.174	0.332	0.524	0.601	-0.450	0.870
Reliability -> ITU	0.012	0.040	0.248	0.048	0.962	-0.422	0.562
SI -> ITU	-0.034	-0.137	0.344	0.098	0.922	-0.896	0.451
SWM BetweenErrors -> ITU	-0.001	-0.009	0.406	0.002	0.998	-0.930	0.776
SWM Strategy -> ITU	0.162	0.223	0.394	0.412	0.681	-0.621	1.008
TIPI 1 -> ITU	0.067	0.071	0.281	0.237	0.812	-0.455	0.690
TIPI 2 -> ITU	-0.060	-0.084	0.280	0.214	0.831	-0.662	0.419
TIPI 3 -> ITU	-0.096	-0.074	0.372	0.258	0.796	-0.909	0.629
TIPI 4 -> ITU	-0.214	-0.204	0.289	0.739	0.460	-0.774	0.318
TIPI 5 -> ITU	-0.125	-0.141	0.278	0.450	0.653	-0.663	0.437
WTAR -> ITU	0.382	0.433	0.348	1.099	0.273	-0.324	1.112

Table A 73: R squared values, UTAUT plus Trust plus Cognitive Variables plus Personality, Study 3

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ITU (R^2)	0.574	0.807	0.084	6.853	0.000	0.643	0.957
ITU (R^2 adjusted)	0.240	0.656	0.150	1.603	0.110	0.363	0.923

Table A 74: Endogenous Variables, UTAUT plus Trust plus Cognitive Variables plus Personality, Study 3

	R Square	R Square adjusted	VIF	CA
ANX	0.796	0.622	3.959	0.884
ATT	0.501	0.491	5.867	0.809
Age	0.228	0.196	6.291	1.000
Benevolence	0.081	0.023	2.926	1.000
CSE	0.209	0.140	2.905	1.000
Competence	0.429	0.366	3.050	1.000
FAC	0.856	0.837	2.794	0.156
Functionality	0.556	0.484	2.964	1.000
Helpfulness	0.395	0.279	2.044	1.000
ITU	-	-	-	1.000
Integrity	0.819	0.774	3.567	1.000
Interaction Effect: Age -> Benevolence	0.701	0.617	1.839	1.000
PEOU	1.772	2.015	5.405	0.897
PU	0.576	0.427	2.192	0.799
Reliability	0.599	0.298	2.265	1.000
SI	0.461	0.230	2.423	0.756
SWM BetweenErrors	0.565	0.360	4.690	1.000
SWM Strategy	0.744	0.612	4.507	1.000
TIPI 1	0.763	0.630	1.930	1.000
TIPI 2	0.788	0.657	1.582	1.000
TIPI 3	0.700	0.499	3.375	1.000
TIPI 4	6.310	10.155	1.782	1.000
TIPI 5	0.326	-0.204	1.780	1.000
WTAR	0.721	0.483	3.033	1.000

UTAUT + Social Variables + Cognitive Variables + Personality

Table A 75: Path Coefficients, UTAUT plus Social Variables plus Cognitive Variables plus Personality, Study 3

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> ITU	0.335	0.265	0.326	1.028	0.305	-0.382	0.937
ATT -> ITU	0.374	0.425	0.301	1.242	0.215	-0.218	1.040
Age -> ITU	-0.409	-0.450	0.474	0.863	0.389	-1.472	0.458
CSE -> ITU	-0.221	-0.164	0.244	0.905	0.366	-0.624	0.336
FAC -> ITU	0.326	0.361	0.256	1.275	0.203	-0.088	0.924
Image -> ITU	-0.332	-0.278	0.234	1.417	0.157	-0.733	0.205
Interaction Effect: Age -> Image -> ITU	-0.008	-0.009	0.009	0.888	0.375	-0.026	0.010
PEOU -> ITU	0.165	0.082	0.340	0.485	0.628	-0.627	0.717
PU -> ITU	0.270	0.225	0.258	1.047	0.296	-0.322	0.751
Perceived Enjoyment -> ITU	-0.379	-0.359	0.305	1.241	0.215	-0.984	0.206
Reputation -> ITU	0.093	0.069	0.180	0.514	0.608	-0.316	0.405
SI -> ITU	-0.067	-0.151	0.275	0.245	0.807	-0.665	0.417
SWM BetweenErrors -> ITU	0.023	0.002	0.333	0.069	0.945	-0.632	0.667
SWM Strategy -> ITU	0.091	0.148	0.276	0.329	0.742	-0.370	0.707
TIPI 1 -> ITU	0.012	0.046	0.220	0.056	0.955	-0.371	0.524
TIPI 2 -> ITU	-0.165	-0.183	0.223	0.741	0.459	-0.647	0.236
TIPI 3 -> ITU	-0.155	-0.145	0.272	0.569	0.570	-0.726	0.342
TIPI 4 -> ITU	-0.184	-0.163	0.201	0.915	0.360	-0.540	0.230
TIPI 5 -> ITU	-0.265	-0.294	0.243	1.088	0.277	-0.817	0.144
WTAR -> ITU	0.316	0.363	0.312	1.013	0.312	-0.284	0.959
WTAR -> PEOU	-0.341	-0.337	0.121	2.823	0.005	-0.547	-0.083

Table A 76:R squared Values, UTAUT plus Social Variables plus Cognitive Variables plus Personality, Study 3

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ITU (R^2)	0.634	0.805	0.075	8.511	0.000	0.650	0.937
ITU (R^2 adjusted)	0.390	0.676	0.124	3.143	0.002	0.416	0.894

Table A 77: Endogenous Variables, UTAUT plus Social Variables plus Cognitive Variables plus Personality, Study 3

	R Square	R Square adjusted	VIF	CA
ANX	0.789	0.648	4.058	0.884
ATT	0.503	0.493	4.170	0.809
Age	0.233	0.201	6.733	1.000
CSE	0.171	0.118	2.137	1.000
FAC	0.825	0.810	2.383	0.156
ITU	-	-	-	1.000
Image	0.241	0.137	2.349	0.852
Interaction Effect: Age -> Image	0.224	-0.424	1.445	0.856
PEOU	0.805	0.768	5.056	0.897
PU	0.694	0.627	2.310	0.799
Perceived Enjoyment	0.982	0.978	3.791	0.869
Reputation	0.390	0.218	1.667	0.858
SI	4.814	6.019	2.041	0.756
SWM BetwErrors	0.392	0.178	4.490	1.000
SWM Strategy	0.387	0.148	3.578	1.000
TIPI 1	0.111	-0.269	1.855	1.000
TIPI 2	0.102	-0.321	1.488	1.000
TIPI 3	0.560	0.334	2.558	1.000
TIPI 4	0.028	-0.519	1.477	1.000
TIPI 5	0.421	0.066	1.690	1.000
WTAR	0.742	0.570	2.810	1.000

UTAUT + Trust + Social Variables + Cognitive Variables +Personality

Table A 78: Path Coefficients, UTAUT plus Trust plus Social Variables plus Cognitive Variables plus Personality, Study 3

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> ITU	0.366	0.242	1.083	0.338	0.736	-1.870	1.605
ATT -> ITU	0.292	0.342	1.031	0.283	0.778	-1.811	2.209
Age -> ITU	-0.371	-0.402	1.393	0.266	0.790	-2.416	1.866
Benevolence -> ITU	-0.170	-0.191	1.617	0.105	0.916	-1.924	1.531
CSE -> ITU	-0.291	-0.366	1.036	0.281	0.779	-1.849	0.992
Competence -> ITU	0.012	0.104	1.420	0.008	0.993	-1.405	2.123
FAC -> ITU	0.349	0.376	1.131	0.309	0.757	-1.159	1.884
Functionality -> ITU	0.115	0.063	0.993	0.116	0.908	-1.495	1.511
Helpfulness -> ITU	-0.138	-0.042	1.076	0.129	0.898	-1.325	1.297
Image -> ITU	-0.355	-0.322	0.923	0.385	0.701	-2.035	0.955
Integrity -> ITU	0.141	0.152	1.186	0.119	0.905	-1.609	1.557

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
Interaction Effect: Age (Product Indicator) -> Benevolence -> ITU	-0.000	-0.001	0.020	0.023	0.982	-0.021	0.020
Interaction Effect: Age (Product Indicator) -> Image -> ITU	-0.005	-0.007	0.046	0.115	0.908	-0.063	0.045
PEOU -> ITU	0.168	0.164	1.493	0.113	0.910	-1.666	2.211
PU -> ITU	0.259	0.255	1.064	0.244	0.807	-1.358	1.378
Perceived Enjoyment -> ITU	-0.462	-0.642	1.763	0.262	0.794	-3.059	0.930
Reliability -> ITU	0.189	0.164	0.727	0.260	0.795	-0.941	1.139
Reputation -> ITU	0.193	0.126	0.701	0.275	0.783	-1.200	1.346
SI -> ITU	-0.040	-0.165	1.363	0.030	0.976	-1.532	1.380
SWM BetweenErrors -> ITU	0.110	0.091	1.402	0.078	0.937	-1.319	1.612
SWM Strategy -> ITU	0.042	0.038	1.168	0.036	0.972	-1.647	1.614
TIPI 1 -> ITU	0.042	0.075	0.772	0.055	0.957	-1.205	1.206
TIPI 2 -> ITU	-0.179	-0.186	0.531	0.338	0.736	-0.989	0.706
TIPI 3 -> ITU	-0.254	-0.234	1.073	0.237	0.813	-1.807	1.310
TIPI 4 -> ITU	-0.190	-0.164	0.676	0.280	0.779	-1.105	0.842
TIPI 5 -> ITU	-0.232	-0.254	1.065	0.218	0.828	-1.433	0.892
WTAR -> ITU	0.207	0.228	1.061	0.195	0.846	-1.751	1.663
WTAR -> PEOU	-0.341	-0.349	0.122	2.807	0.006	-0.533	0.105

Table A 79: R squared values, UTAUT plus Trust plus Social Variables plus Cognitive Variables plus Personality, Study 3

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ITU	0.665	0.911	0.067	9.969	0.000	0.758	1.000
ITU	0.272	0.807	0.145	1.874	0.062	0.473	1.000

Table A 80: Endogenous Variables, UTAUT plus Trust plus Social Variables plus Cognitive Variables plus Personality, Study 3

	R Square	R Square adjusted	VIF	CA
ANX			4.780	0.884
ATT	0.504	0.494	6.470	0.809
Age	0.228	0.196	7.397	1.000
Benevolence	0.081	0.022	4.128	1.000
CSE	0.208	0.140	3.575	1.000
Competence	0.432	0.369	4.618	1.000
FAC	1.062	1.070	3.152	0.156
Functionality	0.440	0.349	3.691	1.000
Helpfulness	0.101	-0.071	2.648	1.000
ITU	-0.575	-0.921		1.000
Image	0.347	0.183	4.451	0.852
Integrity	0.636	0.534	3.953	1.000
Interaction Effect: Age (Product Indicator) -> Benevolence	0.438	0.260	3.946	1.000
Interaction Effect: Age (Product Indicator) -> Image	0.404	0.195	2.745	0.856
PEOU	0.854	0.798	6.061	0.897
PU	0.778	0.683	2.550	0.799
Perceived Enjoyment	1.079	1.116	4.783	0.869
Reliability	0.304	-0.055	2.757	1.000
Reputation	0.663	0.474	2.509	0.858
SI	0.195	-0.298	2.714	0.756
SWM BetweenErrors	0.648	0.414	5.377	1.000
SWM Strategy	0.498	0.135	5.067	1.000
TIPI 1	0.266	-0.310	2.397	1.000
TIPI 2	0.392	-0.126	1.769	1.000
TIPI 3	0.800	0.616	4.554	1.000
TIPI 4	0.448	-0.104	1.983	1.000
TIPI 5	0.746	0.471	2.247	1.000
WTAR	0.917	0.819	3.903	1.000

16.6 Appendix 5: Study 4

First Order Factor Model

Factor Analysis:

Table A 81: Factor Loadings, First Order Model, Study 4

	Func.	Comp.	Reliab.	Integ.	Helpf.	Benev.	ITU
Func_1	0.825						
Func_2	0.863						
Func_3	0.858						
Func_4	0.911						
Comp_1		0.863					
Comp_2		0.899					
Comp_3		0.889					
Comp_4		0.700					
Reliab_1			0.880				
Reliab_2			0.905				
Reliab_3			0.876				
Reliab_4			0.759				
Reliab_5			0.688				
Integ_1				0.919			
Integ_2				0.930			
Integ_3				0.888			
Integ_4				0.924			
Helpf_1					0.906		
Helpf_2					0.897		
Helpf_3					0.843		
Benev_1						0.775	
Benev_2						0.948	
Benev_3						0.470	
ITU_1							0.976
ITU_2							0.971
ITU_3							0.971

Table A 82: Factor Correlations and AVE values, First Order Factor Model, Study 4

	Benev.	Comp.	Func.	Helpf.	ITU	Integ.	Reliab.
Benevolence	**0.757**	.230**	.248**	.500**	0.094	.456**	.317**
Competence		**0.842**	.620**	.315**	.476**	.248**	.481**
Functionality			**0.865**	.385**	.514**	.261**	.481**
Helpfulness				**0.882**	.235**	.475**	.391**
ITU					**0.973**	.166**	.280**
Integrity						**0.916**	.382**
Reliability							**0.826**

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

Table A 83: Path differences, First Order Factor Model, Study 4

	Delta Pathways	Sig.
Benevolence -> ITU	0.080	0.255
Competence -> ITU	0.093	0.288
Functionality -> ITU	0.125	0.219
Helpfulness -> ITU	0.188	0.109
Integrity -> ITU	0.060	0.361
Reliability -> ITU	0.321	0.989

Table A 84: Path Coefficients, First Order Factor Model, Study 4

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
Benevolence -> ITU	-0.082	-0.113	0.088	0.929	0.353	-0.271	0.075
Competence -> ITU	0.202	0.196	0.091	2.229	0.026	0.021	0.376
Functionality -> ITU	0.444	0.434	0.095	4.688	0.000	0.244	0.609
Helpfulness -> ITU	0.056	0.051	0.070	0.795	0.427	-0.087	0.189
Integrity -> ITU	0.046	0.068	0.068	0.677	0.498	-0.055	0.205
Reliability -> ITU	-0.060	-0.047	0.064	0.943	0.346	-0.169	0.078

Table A 85: R^2 values, First Order Factor Model, Study 4

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ITU (R^2)	0.334	0.358	0.055	6.019	0.000	0.254	0.471
ITU (adj. R^2)	0.320	0.344	0.057	5.650	0.000	0.239	0.460

Table A 86: Endogenous Variables, First Order Factor Model, Study 4

	R Square	R Square adj.	VIF	CA
Benevolence	0.493	0.482	1.639	0.864
Competence	0.039	0.036	1.714	0.860
Functionality	0.490	0.487	1.800	0.887
Helpfulness	0.528	0.523	1.827	0.858
ITU	-	-	-	0.972
Integrity	0.523	0.515	1.571	0.937
Reliability	0.418	0.406	1.581	0.897

Second Order Factor Model

Factor Analysis:

Table A 87: Factor Loadings, Second Order Model, Study 4

	Functionality – Competence	Reliability – Integrity	Helpfulness – Benevolence	ITU
Func_1	0.742			
Func_2	0.815			
Func_3	0.790			
Func_4	0.838			
Comp_1	0.771			
Comp_2	0.778			
Comp_3	0.764			
Comp_4	0.589			
Reliab_1		0.757		
Reliab_2		0.794		
Reliab_3		0.776		
Reliab_4		0.657		
Reliab_5		0.616		
Integ_1		0.726		
Integ_2		0.722		
Integ_3		0.723		
Integ_4		0.746		
Helpf_1			0.893	
Helpf_2			0.885	
Helpf_3			0.848	
Benev_1			0.555	
Benev_2			0.669	
Benev_3			0.427	
ITU_1				0.976
ITU_2				0.971
ITU_3				0.971

Table A 88: Factor Correlations and AVE values, Second Order Factor Model, Study 4

	Func_Comp	Helpf_Benev	ITU	Reliab_Integ
Func_Comp	**0.764**	0.396	0.559	0.508
Helpf_Benev		**0.734**	0.221	0.524
ITU			**0.973**	0.272
Reliab_Integ				**0.726**

Note: Values in **bold** are square roots of the factor related AVE values.

Table A 89: Path invariance, Second Order Factor Model, Study 4

	Delta pathways	Sig.
Functionality - Competence -> ITU	0.162	0.073
Helpfulness - Benevolence -> ITU	0.279	0.048
Reliability - Integrity -> ITU	0.201	0.957

Note: Based on randomized sub-samples, bootstrapped

Table A 90: Path Coefficients, Second Order Factor Model, Study 4

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
Functionality - Competence -> ITU	0.582	0.580	0.057	10.250	0.000	0.463	0.684
Helpfulness - Benevolence -> ITU	0.031	0.037	0.058	0.537	0.591	-0.081	0.145
Reliability - Integrity -> ITU	-0.069	-0.066	0.059	1.173	0.241	-0.181	0.050

Table A 91: R^2 values, Second Order Factor Model, Study 4

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ITU (R^2)	0.317	0.325	0.054	5.855	0.000	0.223	0.433
ITU (adj. R^2)	0.310	0.318	0.055	5.666	0.000	0.215	0.428

Table A 92: Endogenous Variables, Second Order Factor Model, Study 4

	R Square	R Square adjusted	VIF	CA
Functionality - Competence	0.478	0.472	1.408	0.747
Helpfulness - Benevolence	0.279	0.276	1.551	0.707
ITU	0.435	0.431	-	1.000
Reliability - Integrity	0.496	0.491	1.682	0.569

16.7 Appendices 6: Study 5

Mediation Analysis:

Table A 93: Mediation Analysis Results, ITU as a mediator on Actual Use, Study 5

CSE Direct (NoMed): -0.190 Direct W/ Med: -0.192 IV to Med Beta: -0.025 Med to DV Beta: -0.066 IV to Med SE: 0.098 Med to DV SE: 0.110 *Sobel test statistic:* 0.23476392 *One-tailed probability:* 0.40719599 *Two-tailed probability:* 0.81439197	ANX Direct (NoMed): -0.058 Direct W/ Med: -0.064 IV to Med Beta: -0.095 Med to DV Beta: -0.068 IV to Med SE: 0.104 Med to DV SE: 0.113 *Sobel test statistic:* 0.50252457 *One-tailed probability:* 0.30764929 *Two-tailed probability:* 0.61529857
FAC Direct (NoMed): 0.004 Direct W/ Med: 0.008 IV to Med Beta: 0.060 Med to DV Beta: -0.062 IV to Med SE: 0.102 Med to DV SE: 0.114 *Sobel test statistic:* -0.39933436 *One-tailed probability:* 0.34482343 *Two-tailed probability:* 0.68964685	SI Direct (NoMed): 0.081 Direct W/ Med: 0.084 IV to Med Beta: 0.044 Med to DV Beta: -0.065 IV to Med SE: 0.108 Med to DV SE: 0.113 *Sobel test statistic:* -0.33246559 *One-tailed probability:* 0.36976886 *Two-tailed probability:* 0.73953772
ATT Direct (NoMed): 0.208 Direct W/ Med: 0.220 IV to Med Beta: 0.131 Med to DV Beta: -0.090 IV to Med SE: 0.121 Med to DV SE: 0.107 *Sobel test statistic:* -0.66421914 *One-tailed probability:* 0.25327503 *Two-tailed probability:* 0.50655006	PEOU Direct (NoMed): 0.035 Direct W/ Med: 0.052 IV to Med Beta: 0.227 Med to DV Beta: -0.073 IV to Med SE: 0.108 Med to DV SE: 0.119 *Sobel test statistic:* -0.58887703 *One-tailed probability:* 0.27797188 *Two-tailed probability:* 0.55594376
PU Direct (NoMed): 0.023 Direct W/ Med: 0.037 IV to Med Beta: 0.202 Med to DV Beta: -0.069 IV to Med SE: 0.118 Med to DV SE: 0.115 *Sobel test statistic:* -0.56622756 *One-tailed probability:* 0.28561955 *Two-tailed probability:* 0.57123910	Functionality Direct (NoMed): -0.272 Direct W/ Med: -0.281 IV to Med Beta: 0.316 Med to DV Beta: 0.027 IV to Med SE: 0.086 Med to DV SE: 0.125 *Sobel test statistic:* 0.21562775 *One-tailed probability:* 0.41463896 *Two-tailed probability:* 0.82927792

Table A 93: Mediation Analysis Results, ITU as a mediator on Actual Use, Study 5 (continued)

Competence Direct (NoMed): -0.243 Direct W/ Med: -0.239 IV to Med Beta: 0.093 Med to DV Beta: -0.039 IV to Med SE: 0.111 Med to DV SE: 0.111 *Sobel test statistic:* -0.32401424 *One-tailed probability:* 0.37296363 *Two-tailed probability:* 0.74592725	Reliability Direct (NoMed): -0.190 Direct W/ Med: -0.189 IV to Med Beta: 0.296 Med to DV Beta: -0.006 IV to Med SE: 0.092 Med to DV SE: 0.120 *Sobel test statistic:* -0.04999396 *One-tailed probability:* 0.48006360 *Two-tailed probability:* 0.96012720
Integrity Direct (NoMed): 0.003 Direct W/ Med: 0.020 IV to Med Beta: 0.245 Med to DV Beta: -0.066 IV to Med SE: 0.096 Med to DV SE: 0.117 *Sobel test statistic:* -0.55080762 *One-tailed probability:* 0.29088278 *Two-tailed probability:* 0.58176556	Helpfulness Direct (NoMed): -0.116 Direct W/ Med: -0.108 IV to Med Beta: 0.224 Med to DV Beta: -0.037 IV to Med SE: 0.096 Med to DV SE: 0.124 *Sobel test statistic:* -0.29597681 *One-tailed probability:* 0.38362390 *Two-tailed probability:* 0.76724779
Benevolence Direct (NoMed): -0.004 Direct W/ Med: -0.002 IV to Med Beta: 0.026 Med to DV Beta: -0.061 IV to Med SE: 0.094 Med to DV SE: 0.114 *Sobel test statistic:* -0.24570977 *One-tailed probability:* 0.40295345 *Two-tailed probability:* 0.80590691	Reputation Direct (NoMed): -0.243 Direct W/ Med: -0.239 IV to Med Beta: 0.093 Med to DV Beta: -0.039 IV to Med SE: 0.106 Med to DV SE: 0.112 *Sobel test statistic:* -0.32365484 *One-tailed probability:* 0.37309968 *Two-tailed probability:* 0.74619936
Image Direct (NoMed): 0.158 Direct W/ Med: 0.152 IV to Med Beta: -0.137 Med to DV Beta: -0.041 IV to Med SE: 0.112 Med to DV SE: 0.120 *Sobel test statistic:* 0.32907085 *One-tailed probability:* 0.37105107 *Two-tailed probability:* 0.74210214	Perceived Enjoyment Direct (NoMed): 0.276 Direct W/ Med: 0.290 IV to Med Beta: 0.141 Med to DV Beta: -0.102 IV to Med SE: 0.120 Med to DV SE: 0.110 *Sobel test statistic:* -0.72790849 *One-tailed probability:* 0.23333480 *Two-tailed probability:* 0.46666961

Table A 93: Mediation Analysis Results, ITU as a mediator on Actual Use, Study 5 (continued)

<table>
<tr><td>WTAR
Direct (NoMed): -0.072
Direct W/ Med: -0.061
IV to Med Beta: 0.226
Med to DV Beta: -0.048
IV to Med SE: 0.107
Med to DV SE: 0.121

Sobel test statistic: -0.38987742
One-tailed probability: 0.34831360
Two-tailed probability: 0.69662719</td><td>SWM_BetweenErrors
Direct (NoMed): 0.011
Direct W/ Med: 0.010
IV to Med Beta: -0.021
Med to DV Beta: -0.061
IV to Med SE: 0.130
Med to DV SE: 0.114

Sobel test statistic: 0.15464504
One-tailed probability: 0.43855058
Two-tailed probability: 0.87710116</td></tr>
<tr><td>SWM_Strategy
Direct (NoMed): 0.097
Direct W/ Med: 0.090
IV to Med Beta: -0.153
Med to DV Beta: -0.048
IV to Med SE: 0.106
Med to DV SE: 0.113

Sobel test statistic: 0.40749894
One-tailed probability: 0.34182079
Two-tailed probability: 0.68364157</td><td></td></tr>
</table>

Mediation Analysis: PEOU as a mediator of the effect of Cognitive Variables on ITU

Table A 94: Mediation Analysis results, PEOU as a mediator on Cognitive Variables and ITU, Study 5

WTAR Direct (NoMed): 0.184 Direct W/ Med: 0.140 IV to Med Beta: 0.167 Med to DV Beta: 0.268 IV to Med SE: 0.092 Med to DV SE: 0.103 ***Sobel test statistic:*** **1.48873309** ***One-tailed probability:*** **0.06827883** ***Two-tailed probability:*** **0.13655767**	SWM_BetweenErrors Direct (NoMed): 0.051 Direct W/ Med: 0.025 IV to Med Beta: 0.090 Med to DV Beta: 0.289 IV to Med SE: 0.121 Med to DV SE: 0.103 ***Sobel test statistic:*** **0.71896824** ***One-tailed probability:*** **0.23608024** ***Two-tailed probability:*** **0.47216049**
SWM_Strategy Direct (NoMed): -0.072 Direct W/ Med: -0.118 IV to Med Beta: 0.148 Med to DV Beta: 0.309 IV to Med SE: 0.112 Med to DV SE: 0.104 ***Sobel test statistic:*** **1.20739854** ***One-tailed probability:*** **0.11363935** ***Two-tailed probability:*** **0.22727870**	

Regression Analysis

Intention to Use:

UTAUT

Table A 95: Path Coefficients, UTAUT on ITU, Study 5

	Original Sample (O)	**Sample Mean (M)**	**SE**	**t**	**Sig.**	**CI Low**	**CI Up**
ANX -> ITU	0.030	0.012	0.124	0.240	0.811	-0.215	0.297
ATT -> ITU	0.089	0.115	0.201	0.441	0.659	-0.343	0.454
CSE -> ITU	-0.108	-0.104	0.097	1.113	0.266	-0.296	0.088
FAC -> ITU	0.052	-0.028	0.168	0.311	0.756	-0.334	0.282
PEOU -> ITU	0.080	0.073	0.155	0.515	0.607	-0.212	0.409
PU -> ITU	0.172	0.175	0.148	1.159	0.247	-0.148	0.442
SI -> ITU	0.180	0.051	0.193	0.933	0.351	-0.290	0.339

Table A 96: R squared values, UTAUT on ITU, Study 5

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ITU (R^2)	0.160	0.267	0.067	2.396	0.017	0.147	0.415
ITU (adj. R^2)	0.077	0.195	0.073	1.048	0.295	0.063	0.358

Table A 97: Endogenous Variables, UTAUT on ITU, Study 5

	R Square	R Square adjusted	VIF	CA
ANX	0.413	0.355	1.644	0.794
ATT	0.221	0.211	2.300	0.757
CSE	0.028	0.003	1.063	1.000
FAC	0.525	0.506	1.293	0.386
ITU	-	-	-	1.000
PEOU	0.777	0.761	2.443	0.878
PU	0.689	0.663	1.830	0.792
SI	0.125	0.039	1.250	0.817

UTAUT + Trust

Table A 98: Path Coefficients, UTAUT plus Trust on ITU, Study 5

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> ITU	0.027	0.033	0.144	0.190	0.849	-0.242	0.326
ATT -> ITU	0.012	0.053	0.219	0.055	0.956	-0.396	0.439
Benevolence -> ITU	0.112	-0.080	0.224	0.501	0.616	-0.472	0.333
CSE -> ITU	-0.205	-0.211	0.125	1.648	0.100	-0.459	0.038
Competence -> ITU	-0.037	-0.083	0.199	0.183	0.854	-0.470	0.309
FAC -> ITU	0.030	-0.015	0.154	0.198	0.843	-0.317	0.276
Functionality -> ITU	0.235	0.289	0.231	1.014	0.311	-0.159	0.749
Helpfulness -> ITU	0.051	0.049	0.135	0.380	0.704	-0.225	0.312
Integrity -> ITU	0.098	0.140	0.126	0.776	0.438	-0.097	0.403
PEOU -> ITU	-0.051	-0.089	0.188	0.270	0.788	-0.448	0.301
PU -> ITU	0.161	0.176	0.149	1.078	0.281	-0.148	0.463
Reliability -> ITU	0.101	0.117	0.151	0.665	0.506	-0.195	0.411
SI -> ITU	0.128	0.030	0.162	0.791	0.429	-0.262	0.306

Table A 99: R squared values, UTAUT plus Trust on ITU, Study 5

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ITU (R^2)	0.254	0.420	0.077	3.290	0.001	0.283	0.589
ITU (adj. R^2)	0.105	0.305	0.093	1.131	0.258	0.139	0.507

Table A 100: Endogenous Variables, UTAUT plus Trust on ITU, Study 5

	R Square	R Square adjusted	VIF	CA
ANX	0.450	0.340	1.843	0.794
ATT	0.219	0.209	2.572	0.757
Benevolence	0.150	0.128	1.293	0.710
CSE	0.038	-0.001	1.470	1.000
Competence	0.435	0.405	3.632	0.895
FAC	0.539	0.508	1.464	0.386
Functionality	0.852	0.840	3.231	0.870
Helpfulness	0.589	0.548	1.795	0.823
ITU				1.000
Integrity	0.710	0.672	1.437	0.934
PEOU	0.861	0.841	2.736	0.878
PU	0.817	0.787	1.909	0.792
Reliability	0.618	0.548	2.098	0.865
SI	0.274	0.129	1.363	0.817

UTAUT + Social Variables

Table A 101: Path Coefficients, UTAUT plus Social Variables on ITU, Study 5

	Original Sample (O)	Sampl e Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> ITU	0.110	0.072	0.134	0.823	0.411	-0.189	0.337
ATT -> ITU	0.006	0.023	0.243	0.025	0.980	-0.503	0.411
CSE -> ITU	-0.100	-0.103	0.107	0.933	0.351	-0.311	0.105
FAC -> ITU	0.002	-0.029	0.138	0.015	0.988	-0.288	0.242
Image -> ITU	-0.263	-0.240	0.117	2.242	0.025	-0.463	0.027
PEOU -> ITU	0.062	0.057	0.178	0.348	0.728	-0.302	0.404
PU -> ITU	0.176	0.168	0.149	1.183	0.237	-0.137	0.455
Perceived Enjoyment -> ITU	0.163	0.166	0.184	0.883	0.377	-0.154	0.576
Reputation -> ITU	-0.035	-0.031	0.154	0.231	0.818	-0.358	0.244
SI -> ITU	0.196	0.084	0.195	1.007	0.314	-0.274	0.399

Table A 102: R squared values, UTAUT plus Social Variables on ITU, Study 5

	Original Sample (O)	Sampl e Mean (M)	SE	t	Sig.	CI Low	CI Up
ITU (R^2)	0.226	0.343	0.070	3.224	0.001	0.214	0.496
ITU (adj. R^2)	0.112	0.247	0.080	1.392	0.164	0.098	0.422

Table A 103: Endogenous Variables, UTAUT plus Social Variables on ITU, Study 5

	R Square	R Square adjusted	VIF	CA
ANX	0.463	0.384	1.780	0.794
ATT	0.205	0.194	3.024	0.757
CSE	0.027	0.002	1.178	1.000
FAC	0.521	0.501	1.406	0.386
ITU	-	-	-	1.000
Image	0.261	0.211	1.192	0.835
PEOU	0.788	0.770	2.658	0.878
PU	0.683	0.652	1.917	0.792
Perceived Enjoyment	0.443	0.398	2.533	0.793
Reputation	0.456	0.385	1.716	0.938
SI	0.336	0.239	1.295	0.817

UTAUT + Trust + Social Variables

Table A 104: Path Coefficients, UTAUT plus Trust plus Social Variables on ITU, Study 5

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> ITU	0.133	0.101	0.168	0.791	0.429	-0.238	0.423
ATT -> ITU	0.025	0.026	0.254	0.097	0.922	-0.509	0.447
Benevolence -> ITU	0.062	-0.051	0.192	0.322	0.747	-0.413	0.317
CSE -> ITU	-0.188	-0.199	0.127	1.473	0.141	-0.461	0.048
Competence -> ITU	-0.080	-0.100	0.212	0.375	0.708	-0.512	0.305
FAC -> ITU	0.027	-0.016	0.145	0.189	0.850	-0.295	0.265
Functionality -> ITU	0.287	0.309	0.244	1.176	0.240	-0.152	0.800
Helpfulness -> ITU	0.085	0.090	0.150	0.568	0.570	-0.201	0.378
Image -> ITU	-0.217	-0.200	0.127	1.713	0.087	-0.441	0.068
Integrity -> ITU	0.101	0.135	0.128	0.788	0.431	-0.101	0.394
PEOU -> ITU	-0.042	-0.074	0.199	0.212	0.832	-0.452	0.324
PU -> ITU	0.194	0.192	0.157	1.236	0.217	-0.141	0.491
Perceived Enjoyment -> ITU	0.071	0.063	0.202	0.353	0.724	-0.309	0.510
Reliability -> ITU	0.131	0.149	0.168	0.781	0.435	-0.182	0.481
Reputation -> ITU	-0.187	-0.180	0.187	1.000	0.318	-0.554	0.193
SI -> ITU	0.137	0.096	0.162	0.844	0.399	-0.219	0.395

Table A 105: R squared values, UTAUT plus Trust plus Social Variables on ITU, Study 5

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ITU (R^2)	0.320	0.491	0.080	3.992	0.000	0.338	0.650
ITU (adj. R^2)	0.144	0.360	0.101	1.432	0.152	0.168	0.559

Table A 106: Endogenous Variables, UTAUT plus Trust plus Social Variables on ITU, Study 5

	R Square	R Square adjusted	VIF	CA
ANX	0.510	0.384	2.036	0.794
ATT	0.209	0.199	3.225	0.757
Benevolence	0.155	0.133	1.404	0.710
CSE	0.038	0.000	1.555	1.000
Competence	0.425	0.394	3.666	0.895
FAC	0.538	0.506	1.558	0.386
Functionality	0.853	0.841	3.437	0.870
Helpfulness	0.587	0.546	1.820	0.823
ITU	-	-	-	1.000
Image	0.355	0.270	1.338	0.835
Integrity	0.718	0.676	1.509	0.934
PEOU	0.876	0.856	2.916	0.878
PU	0.831	0.800	1.994	0.792
Perceived Enjoyment	0.862	0.761	2.720	0.793
Reliability	0.618	0.534	2.150	0.865
Reputation	0.631	0.543	2.028	0.938
SI	0.517	0.393	1.419	0.817

UTAUT + Cognitive Variables

Table A 107: Path Coefficeints, UTAUT plus Cognitive Variables on ITU, Study 5

	Original Sample (O)	Sampl e Mean (M)	Standar d Error (STERR)	t	Sig.	CI Low	CI Up
ANX -> ITU	0.006	-0.008	0.140	0.045	0.964	-0.264	0.289
ATT -> ITU	0.136	0.147	0.209	0.651	0.515	-0.342	0.512
CSE -> ITU	-0.113	-0.106	0.101	1.112	0.266	-0.316	0.088
FAC -> ITU	0.014	-0.018	0.148	0.094	0.925	-0.314	0.251
PEOU -> ITU	0.070	0.060	0.168	0.415	0.678	-0.274	0.414
PU -> ITU	0.142	0.146	0.165	0.861	0.390	-0.209	0.458
SI -> ITU	0.139	0.037	0.181	0.768	0.443	-0.288	0.328
SWM BetweenErrors -> ITU	0.133	0.125	0.144	0.925	0.355	-0.155	0.397
SWM Strategy -> ITU	-0.147	-0.153	0.121	1.219	0.223	-0.378	0.094
WTAR -> ITU	0.131	0.107	0.129	1.012	0.312	-0.153	0.348

Table A 108: R squared values, UTAUT plus Cognitive Variables on ITU, Study 5

	Original Sample (O)	Sampl e Mean (M)	SE	t	Sig.	CI Low	CI Up
ITU (R^2)	0.191	0.324	0.073	2.593	0.010	0.193	0.473
ITU (adj. R^2)	0.072	0.225	0.084	0.848	0.396	0.074	0.395

Table A 109: Endogenous variables, UTAUT plus Cognitive Variables on ITU, Study 5

	R Square	R Square adjusted	VIF	CA
ANX	0.435	0.351	1.705	0.794
ATT	0.214	0.204	2.422	0.757
CSE	0.029	0.003	1.084	1.000
FAC	0.519	0.500	1.392	0.386
ITU	-	-	-	1.000
PEOU	0.778	0.763	2.484	0.878
PU	0.686	0.660	1.910	0.792
SI	0.095	0.006	1.333	0.817
SWM BetweenErrors	0.085	-0.020	1.647	1.000
SWM Strategy	0.473	0.404	1.702	1.000
WTAR	0.227	0.113	1.273	1.000

UTAUT + Trust + Cognitive Variables

Table A 110: Path Coefficients, UTAUT plus Trust plus Cognitive Variables, Study 5

	Original Sample (O)	Sample Mean (M)	Standard Error (STERR)	t	Sig.	CI Low	CI Up
ANX -> ITU	0.012	0.021	0.160	0.077	0.938	-0.279	0.356
ATT -> ITU	0.038	0.057	0.223	0.171	0.864	-0.401	0.479
Benevolence -> ITU	0.082	-0.071	0.215	0.382	0.702	-0.484	0.321
CSE -> ITU	-0.221	-0.222	0.131	1.695	0.090	-0.479	0.040
Competence -> ITU	0.004	-0.049	0.210	0.020	0.984	-0.485	0.362
FAC -> ITU	-0.005	-0.016	0.160	0.034	0.973	-0.326	0.300
Functionality -> ITU	0.181	0.233	0.244	0.743	0.457	-0.197	0.726
Helpfulness -> ITU	0.047	0.047	0.143	0.329	0.742	-0.267	0.317
Integrity -> ITU	0.112	0.137	0.129	0.866	0.387	-0.107	0.406
PEOU -> ITU	-0.046	-0.084	0.192	0.238	0.812	-0.458	0.309
PU -> ITU	0.136	0.153	0.160	0.849	0.396	-0.184	0.459
Reliability -> ITU	0.114	0.131	0.159	0.718	0.473	-0.173	0.453
SI -> ITU	0.104	0.032	0.164	0.634	0.526	-0.269	0.339
SWM BetweenErrors -> ITU	0.095	0.088	0.142	0.669	0.504	-0.196	0.368
SWM Strategy -> ITU	-0.081	-0.085	0.135	0.601	0.548	-0.342	0.187
WTAR -> ITU	0.138	0.083	0.152	0.910	0.363	-0.223	0.367

Table A 111: R squared values, UTAUT plus Trust plus Cognitive Variables on ITU, Study 5

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ITU (R^2)	0.274	0.457	0.079	3.491	0.000	0.315	0.622
ITU (adj. R^2)	0.087	0.317	0.099	0.881	0.378	0.138	0.525

Table A 112: Endogenous Variables, UTAUT plus Trust plus Cognitive Variables on ITU, Study 5

	R Square	R Square adjusted	VIF	CA
ANX	0.476	0.341	1.917	0.794
ATT	0.214	0.204	2.767	0.757
Benevolence	0.149	0.126	1.368	0.710
CSE	0.038	0.000	1.531	1.000
Competence	0.434	0.403	3.730	0.895
FAC	0.540	0.508	1.569	0.386
Functionality	0.852	0.840	3.380	0.870
Helpfulness	0.589	0.549	1.813	0.823
ITU	-	-	-	1.000
Integrity	0.715	0.677	1.534	0.934
PEOU	0.862	0.842	2.784	0.878
PU	0.819	0.789	1.997	0.792
Reliability	0.618	0.549	2.208	0.865
SI	0.283	0.140	1.436	0.817
SWM BetweenErrors	0.163	-0.020	1.786	1.000
SWM Strategy	0.565	0.461	1.842	1.000
WTAR	0.518	0.394	1.374	1.000

UTAUT + Social Variables + Cognitive Variables

Table A 113: Path Coefficients, UTAUT plus Social Variables plus Cognitive Variables on ITU, Study 5

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> ITU	0.085	0.049	0.144	0.590	0.555	-0.229	0.358
ATT -> ITU	0.025	0.037	0.239	0.106	0.916	-0.457	0.427
CSE -> ITU	-0.114	-0.111	0.106	1.079	0.281	-0.326	0.096
FAC -> ITU	-0.039	-0.027	0.132	0.299	0.765	-0.299	0.226
Image -> ITU	-0.244	-0.214	0.128	1.910	0.056	-0.453	0.079
PEOU -> ITU	0.044	0.044	0.191	0.230	0.818	-0.316	0.442
PU -> ITU	0.146	0.149	0.162	0.906	0.365	-0.194	0.459
Perceived Enjoyment -> ITU	0.188	0.168	0.181	1.035	0.301	-0.153	0.591
Reputation -> ITU	-0.015	-0.018	0.159	0.095	0.924	-0.355	0.270
SI -> ITU	0.166	0.078	0.186	0.890	0.374	-0.263	0.415
SWM BetweenErrors -> ITU	0.095	0.097	0.147	0.651	0.515	-0.200	0.367
SWM Strategy -> ITU	-0.103	-0.128	0.134	0.774	0.439	-0.380	0.139
WTAR -> ITU	0.131	0.098	0.134	0.979	0.328	-0.172	0.349

Table A 114: R squared values, UTAUT plus Social Variables plus Cognitive Variables on ITU, Study 5

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ITU (R^2)	0.248	0.390	0.072	3.432	0.001	0.254	0.537
ITU (adj. R^2)	0.097	0.268	0.087	1.123	0.262	0.105	0.445

Table A 115: Endogenous Variables, UTAUT plus Social Variables plus Cognitive Variables on ITU, Study 5

	R Square	R Square adjusted	VIF	CA
ANX	0.484	0.381	1.863	0.794
ATT	0.199	0.188	3.209	0.757
CSE	0.027	0.002	1.215	1.000
FAC	0.520	0.501	1.546	0.386
ITU	-	-	-	1.000
Image	0.266	0.216	1.218	0.835
PEOU	0.789	0.772	2.705	0.878
PU	0.681	0.650	2.002	0.792
Perceived Enjoyment	0.433	0.389	2.628	0.793
Reputation	0.456	0.385	1.741	0.938
SI	0.333	0.235	1.380	0.817
SWM BetweenErrors	0.046	-0.111	1.672	1.000
SWM Strategy	0.429	0.326	1.735	1.000
WTAR	0.246	0.096	1.310	1.000

UTAUT + Trust + Social Variables + Cognitive Variables

Table A 116: Path Coefficients, UTAUT plus Trust plus Social Variables plus Cognitive Variables on ITU, Study 5

	Original Sample (O)	Sample Mean (M)	SE	t	sig	CI Low	CI Up
ANX -> ITU	0.120	0.088	0.178	0.673	0.501	-0.259	0.432
ATT -> ITU	0.020	0.024	0.271	0.075	0.940	-0.553	0.489
Benevolence -> ITU	0.038	-0.046	0.188	0.200	0.841	-0.412	0.320
CSE -> ITU	-0.209	-0.210	0.139	1.498	0.134	-0.484	0.074
Competence -> ITU	-0.046	-0.072	0.223	0.206	0.837	-0.530	0.356
FAC -> ITU	-0.008	-0.023	0.153	0.050	0.960	-0.338	0.280
Functionality -> ITU	0.242	0.265	0.246	0.981	0.327	-0.193	0.755
Helpfulness -> ITU	0.084	0.085	0.155	0.540	0.589	-0.224	0.378
Image -> ITU	-0.213	-0.196	0.137	1.555	0.120	-0.451	0.097
Integrity -> ITU	0.115	0.134	0.129	0.893	0.372	-0.111	0.409
PEOU -> ITU	-0.045	-0.084	0.217	0.208	0.835	-0.502	0.350
PU -> ITU	0.171	0.175	0.164	1.041	0.298	-0.156	0.497
Perceived Enjoyment -> ITU	0.093	0.077	0.217	0.430	0.667	-0.305	0.554
Reliability -> ITU	0.132	0.165	0.175	0.757	0.449	-0.180	0.516
Reputation -> ITU	-0.159	-0.158	0.200	0.793	0.428	-0.561	0.216
SI -> ITU	0.126	0.083	0.170	0.740	0.460	-0.231	0.389
SWM BetweenErrors -> ITU	0.061	0.066	0.151	0.404	0.686	-0.243	0.348
SWM Strategy -> ITU	-0.034	-0.051	0.148	0.227	0.820	-0.350	0.242
WTAR -> ITU	0.117	0.071	0.153	0.763	0.446	-0.233	0.363

Table A 117: R squared values, UTAUT plus Trust plus Social Variables plus Cognitive Variables on ITU, Study 5

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ITU (R^2)	0.331	0.523	0.084	3.960	0.000	0.368	0.695
ITU (adj. R^2)	0.116	0.370	0.111	1.047	0.295	0.164	0.597

Table A 118: Endogenous Variables, UTAUT plus Trust plus Social Variables plus Cognitive Variables on ITU, Study 5

	R Square	R Square adjusted	VIF	CA
ANX	0.536	0.387	2.148	0.794
ATT	0.205	0.194	3.492	0.757
Benevolence	0.154	0.132	1.486	0.710
CSE	0.039	0.000	1.637	1.000
Competence	0.424	0.393	3.776	0.895
FAC	0.539	0.508	1.717	0.386
Functionality	0.854	0.841	3.648	0.870
Helpfulness	0.588	0.547	1.844	0.823
ITU	-	-	-	1.000
Image	0.361	0.277	1.361	0.835
Integrity	0.724	0.683	1.600	0.934
PEOU	0.878	0.858	2.946	0.878
PU	0.834	0.804	2.096	0.792
Perceived Enjoyment	0.871	0.726	2.809	0.793
Reliability	0.618	0.535	2.269	0.865
Reputation	0.632	0.544	2.102	0.938
SI	0.516	0.391	1.494	0.817
SWM BetweenErrors	0.069	-0.190	1.808	1.000
SWM Strategy	0.472	0.314	1.883	1.000
WTAR	0.528	0.376	1.446	1.000

Actual Use:

UTAUT

Table A 119: Path Coefficients, UTAUT on Actual Use, Study 5

	Original Sample (O)	Sampl e Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> Actual Use	-0.105	-0.074	0.157	0.672	0.502	-0.352	0.246
ATT -> Actual Use	0.365	0.288	0.172	2.126	0.034	-0.205	0.562
CSE -> Actual Use	-0.230	-0.227	0.146	1.580	0.114	-0.441	0.186
FAC -> Actual Use	-0.165	0.006	0.234	0.705	0.481	-0.367	0.414
PEOU -> Actual Use	-0.194	-0.117	0.171	1.135	0.256	-0.453	0.222
PU -> Actual Use	-0.067	-0.083	0.170	0.396	0.692	-0.409	0.252
SI -> Actual Use	0.069	0.059	0.143	0.484	0.628	-0.234	0.294

Table A 120: R squared values, UTAUT on Actual Use, Study 5

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
Actual Use (R^2)	0.185	0.331	0.087	2.119	0.034	0.177	0.516
Actual Use (adj. R^2)	0.105	0.265	0.096	1.092	0.275	0.096	0.469

Table A 121: Endogenous Variables, UTAUT on Actual Use, Study 5

	R Square	R Square adjusted	VIF	CA
ANX	0.415	0.357	1.609	0.794
ATT	0.206	0.195	1.707	0.757
Actual Use	-	-		1.000
CSE	0.280	0.251	1.077	0.151
FAC	0.551	0.526	1.080	0.386
PEOU	0.814	0.801	2.018	0.878
PU	0.707	0.682	1.501	0.792
SI	0.219	0.142	1.114	0.817

UTAUT + Trust

Table A 122: Path Coefficients, UTAUT plus Trust on Actual Use, Study 5

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> Actual Use	-0.111	-0.069	0.158	0.705	0.481	-0.360	0.259
ATT -> Actual Use	0.326	0.288	0.167	1.955	0.051	-0.164	0.562
Benevolence -> Actual Use	-0.117	0.042	0.186	0.631	0.528	-0.301	0.417
CSE -> Actual Use	-0.126	-0.094	0.129	0.974	0.330	-0.351	0.165
Competence -> Actual Use	-0.002	-0.079	0.178	0.012	0.990	-0.433	0.285
FAC -> Actual Use	-0.032	0.013	0.168	0.192	0.848	-0.299	0.339
Functionality -> Actual Use	-0.300	-0.203	0.192	1.565	0.118	-0.582	0.190
Helpfulness -> Actual Use	-0.002	-0.034	0.206	0.008	0.994	-0.421	0.373
Integrity -> Actual Use	0.189	0.040	0.200	0.948	0.343	-0.365	0.378
PEOU -> Actual Use	0.031	0.054	0.173	0.178	0.859	-0.280	0.388
PU -> Actual Use	-0.031	-0.056	0.170	0.181	0.856	-0.397	0.268
Reliability -> Actual Use	-0.043	-0.080	0.181	0.235	0.814	-0.410	0.299
SI -> Actual Use	0.016	0.014	0.146	0.112	0.911	-0.289	0.278

Table A 123: R squared values, UTAUT plus Trust on Actual Use, Study 5

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
Actual Use (R^2)	0.309	0.469	0.095	3.245	0.001	0.274	0.647
Actual Use (adj. R^2)	0.171	0.363	0.114	1.494	0.135	0.129	0.576

Table A 124: Endogenous Variables, UTAUT plus Trust on Actual Use, Study 5

	R Square	R Square adjusted	VIF	CA
	0.448	0.338	1.728	0.794
ATT	0.215	0.205	1.856	0.757
Actual Use	-	-	-	1.000
Benevolence	0.164	0.131	1.362	0.710
CSE	0.086	0.037	1.363	0.151
Competence	0.523	0.490	3.178	0.895
FAC	0.539	0.501	1.291	0.386
Functionality	0.858	0.844	3.428	0.870
Helpfulness	0.588	0.541	1.981	0.823
Integrity	0.667	0.623	1.262	0.934
PEOU	0.861	0.840	2.487	0.878
PU	0.789	0.755	1.557	0.792
Reliability	0.610	0.539	2.061	0.865
SI	0.286	0.144	1.267	0.817

UTAUT + Social Variables

Table A 125: Path Coefficients, UTAUT plus Social Variables on Actual Use, Study 5

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> Actual Use	-0.040	-0.056	0.124	0.326	0.745	-0.295	0.194
ATT -> Actual Use	-0.033	-0.017	0.184	0.181	0.856	-0.418	0.308
CSE -> Actual Use	-0.131	-0.116	0.104	1.260	0.208	-0.312	0.092
FAC -> Actual Use	-0.190	0.035	0.222	0.855	0.392	-0.336	0.419
Image -> Actual Use	0.108	0.087	0.128	0.848	0.397	-0.184	0.320
PEOU -> Actual Use	-0.138	-0.111	0.156	0.887	0.375	-0.411	0.195
PU -> Actual Use	-0.028	-0.073	0.188	0.151	0.880	-0.429	0.267
Perceived Enjoyment -> Actual Use	0.517	0.442	0.192	2.697	0.007	0.089	0.849
Reputation -> Actual Use	-0.376	-0.309	0.158	2.379	0.017	-0.601	0.047
SI -> Actual Use	0.084	0.065	0.151	0.559	0.576	-0.256	0.321

Table A 126: R squared values, UTAUT plus Social Variables on Actual Use, Study 5

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
Actual Use (R^2)	0.348	0.465	0.101	3.449	0.001	0.275	0.664
Actual Use (adj. R^2)	0.252	0.386	0.116	2.178	0.030	0.168	0.614

Table A 127: Endogenous Variables, UTAUT plus Social Variables on Actual Use, Study 5

	R Square	R Square adjusted	VIF	CA
ANX	0.457	0.378	1.705	0.794
ATT	0.200	0.189	3.424	0.757
Actual Use	-	-		1.000
CSE	0.081	0.044	1.235	1.000
FAC	0.524	0.498	1.089	0.386
Image	0.222	0.168	1.324	0.835
PEOU	0.795	0.778	2.286	0.878
PU	0.690	0.660	1.539	0.792
Perceived Enjoyment	0.441	0.369	3.748	0.793
Reputation	0.511	0.448	1.497	0.938
SI	0.327	0.228	1.330	0.817

UTAUT + Trust + Social Variables

Table A 128: Path Coefficients, UTAUT plus Trust plus Social Variables on Actual Use, Study 5

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> Actual Use	-0.025	-0.043	0.134	0.184	0.854	-0.307	0.216
ATT -> Actual Use	-0.071	-0.054	0.195	0.361	0.718	-0.463	0.313
Benevolence -> Actual Use	-0.064	0.048	0.167	0.381	0.703	-0.254	0.388
CSE -> Actual Use	-0.107	-0.084	0.128	0.836	0.403	-0.337	0.166
Competence -> Actual Use	-0.098	-0.147	0.171	0.578	0.564	-0.499	0.178
FAC -> Actual Use	-0.067	0.029	0.165	0.409	0.683	-0.293	0.349
Functionality -> Actual Use	-0.228	-0.172	0.181	1.258	0.208	-0.532	0.174
Helpfulness -> Actual Use	0.030	-0.002	0.197	0.150	0.881	-0.390	0.382
Image -> Actual Use	0.045	0.040	0.139	0.326	0.744	-0.250	0.301
Integrity -> Actual Use	0.120	0.030	0.171	0.701	0.484	-0.327	0.329
PEOU -> Actual Use	-0.029	0.000	0.174	0.166	0.868	-0.335	0.327
PU -> Actual Use	-0.016	-0.071	0.180	0.089	0.929	-0.412	0.285
Perceived Enjoyment -> Actual Use	0.593	0.530	0.216	2.749	0.006	0.117	0.975
Reliability -> Actual Use	-0.058	-0.079	0.173	0.336	0.737	-0.405	0.280
Reputation -> Actual Use	-0.204	-0.145	0.163	1.245	0.213	-0.460	0.194
SI -> Actual Use	0.064	0.038	0.154	0.414	0.679	-0.283	0.335

Table A 129: R squared values, UTAUT plus Trust plus Social Variables on Actual Use, Study 5

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
Actual Use (R^2)	0.412	0.573	0.088	4.674	0.000	0.397	0.743
Actual Use (adj. R^2)	0.261	0.462	0.111	2.349	0.019	0.241	0.676

Table A 130: Endogenous Variables, UTAUT plus Trust plus Social Variables on Actual Use, Study 5

	R Square	R Square adjusted	VIF	CA
ANX	0.498	0.368	1.847	0.794
ATT	0.206	0.196	3.594	0.757
Actual Use	-	-	-	1.000
Benevolence	0.169	0.135	1.406	0.710
CSE	0.087	0.038	1.519	1.000
Competence	0.516	0.482	3.478	0.895
FAC	0.538	0.499	1.363	0.386
Functionality	0.860	0.846	3.674	0.870
Helpfulness	0.587	0.539	2.284	0.823
Image	0.323	0.235	1.528	0.835
Integrity	0.679	0.632	1.313	0.934
PEOU	0.876	0.856	2.536	0.878
PU	0.799	0.762	1.572	0.792
Perceived Enjoyment	0.733	0.611	4.329	0.793
Reliability	0.610	0.525	2.162	0.865
Reputation	0.623	0.533	2.019	0.938
SI	0.527	0.405	1.602	0.817

UTAUT + Cognitive Variables

Table A 131: Path coefficients, UTAUT plus Cognitive Variables on Actual Use, Study 5

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> Actual Use	-0.124	-0.083	0.168	0.741	0.459	-0.364	0.269
ATT -> Actual Use	0.348	0.281	0.173	2.011	0.044	-0.203	0.561
CSE -> Actual Use	-0.229	-0.191	0.114	2.005	0.045	-0.401	0.041
FAC -> Actual Use	-0.165	0.004	0.252	0.656	0.512	-0.403	0.432
PEOU -> Actual Use	-0.178	-0.112	0.169	1.054	0.292	-0.418	0.234
PU -> Actual Use	-0.072	-0.089	0.185	0.388	0.698	-0.443	0.265
SI -> Actual Use	0.065	0.056	0.160	0.408	0.683	-0.279	0.306
SWM BetweenErrors -> Actual Use	-0.007	-0.018	0.143	0.051	0.959	-0.309	0.253
SWM Strategy -> Actual Use	0.045	0.046	0.145	0.314	0.754	-0.238	0.328
WTAR -> Actual Use	0.010	0.004	0.099	0.102	0.919	-0.193	0.199

Table A 132: R squared values, UTAUT plus Cognitive Variables on Actual Use, Study 5

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
Actual Use (R^2)	0.187	0.342	0.089	2.099	0.036	0.179	0.523
Actual Use (adj. R^2)	0.067	0.245	0.102	0.657	0.511	0.058	0.453

Table A 133: Endogenous Variables, UTAUT plus Cognitive Variables on Actual Use, Study 5

	R Square	R Square adjusted	VIF	CA
ANX	0.437	0.354	1.694	0.794
ATT	0.206	0.196	1.770	0.757
Actual Use	-	-	-	1.000
CSE	0.082	0.046	1.087	1.000
FAC	0.525	0.499	1.123	0.386
PEOU	0.789	0.775	2.088	0.878
PU	0.697	0.671	1.514	0.792
SI	0.112	0.025	1.112	0.817
SWM BetweenErrors	0.091	-0.013	1.635	1.000
SWM Strategy	0.470	0.401	1.615	1.000
WTAR	0.224	0.110	1.207	1.000

UTAUT + Trust + Cognitive Variables

Table A 134: Path Coefficients, UTAUT plus Trust plus Cognitive Variables on Actual Use, Study 5

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> Actual Use	-0.109	-0.067	0.170	0.637	0.524	-0.392	0.267
ATT -> Actual Use	0.324	0.276	0.175	1.851	0.064	-0.190	0.554
Benevolence -> Actual Use	-0.129	0.049	0.191	0.677	0.499	-0.306	0.426
CSE -> Actual Use	-0.134	-0.094	0.138	0.972	0.331	-0.376	0.171
Competence -> Actual Use	0.008	-0.078	0.195	0.042	0.967	-0.477	0.284
FAC -> Actual Use	-0.040	0.022	0.183	0.219	0.827	-0.306	0.385
Functionality -> Actual Use	-0.307	-0.207	0.205	1.498	0.134	-0.617	0.203
Helpfulness -> Actual Use	0.010	-0.031	0.211	0.047	0.963	-0.428	0.404
Integrity -> Actual Use	0.194	0.038	0.203	0.956	0.339	-0.364	0.388
PEOU -> Actual Use	0.023	0.056	0.185	0.123	0.902	-0.305	0.411
PU -> Actual Use	-0.037	-0.057	0.181	0.204	0.838	-0.409	0.284
Reliability -> Actual Use	-0.041	-0.073	0.189	0.218	0.827	-0.410	0.330
SI -> Actual Use	0.015	0.022	0.153	0.100	0.920	-0.292	0.293
SWM BetweenErrors -> Actual Use	0.015	-0.005	0.144	0.101	0.919	-0.302	0.275
SWM Strategy -> Actual Use	0.028	0.014	0.148	0.189	0.850	-0.285	0.309
WTAR -> Actual Use	0.039	0.010	0.113	0.342	0.732	-0.212	0.231

Table A 135: R squared values, UTAUT plus Trust plus Cognitive Variables on Actual Use, Study 5

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
Actual Use (R^2)	0.311	0.494	0.093	3.335	0.001	0.317	0.676
Actual Use (adj. R^2)	0.133	0.363	0.117	1.132	0.258	0.141	0.593

Table A 136: Endogenous Variables, UTAUT plus Trust plus Cognitive Variables on Actual Use, Study 5

	R Square	R Square adjusted	VIF	CA
ANX	0.474	0.339	1.814	0.794
ATT	0.210	0.200	1.923	0.757
Actual Use	-	-	-	1.000
Benevolence	0.162	0.129	1.443	0.710
CSE	0.087	0.038	1.505	1.000
Competence	0.522	0.490	3.314	0.895
FAC	0.540	0.502	1.335	0.386
Functionality	0.859	0.845	3.592	0.870
Helpfulness	0.589	0.542	2.134	0.823
Integrity	0.671	0.628	1.286	0.934
PEOU	0.862	0.842	2.523	0.878
PU	0.790	0.756	1.585	0.792
Reliability	0.611	0.540	2.159	0.865
SI	0.297	0.156	1.263	0.817
SWM BetweenErrors	0.164	-0.019	1.709	1.000
SWM Strategy	0.580	0.480	1.690	1.000
WTAR	0.503	0.375	1.334	1.000

UTAUT + Social Variables + Cognitive Variables

Table A 137: Path Coefficients, UTAUT plus Social Variables plus Cognitive Variables on Actual Use, Study 5

	Original Sample (O)	Sampl e Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> Actual Use	-0.026	-0.049	0.131	0.197	0.844	-0.316	0.209
ATT -> Actual Use	-0.053	-0.030	0.196	0.268	0.789	-0.455	0.302
CSE -> Actual Use	-0.134	-0.120	0.105	1.283	0.200	-0.331	0.081
FAC -> Actual Use	-0.187	0.029	0.231	0.809	0.419	-0.360	0.437
Image -> Actual Use	0.115	0.087	0.141	0.811	0.417	-0.223	0.335
PEOU -> Actual Use	-0.131	-0.112	0.165	0.798	0.425	-0.433	0.214
PU -> Actual Use	-0.026	-0.077	0.193	0.133	0.895	-0.431	0.297
Perceived Enjoyment -> Actual Use	0.525	0.453	0.203	2.579	0.010	0.074	0.890
Reputation -> Actual Use	-0.377	-0.305	0.168	2.243	0.025	-0.598	0.105
SI -> Actual Use	0.084	0.065	0.155	0.544	0.587	-0.277	0.336
SWM BetweenErrors -> Actual Use	-0.050	-0.053	0.142	0.351	0.726	-0.329	0.220
SWM Strategy -> Actual Use	0.082	0.069	0.136	0.604	0.546	-0.198	0.339
WTAR -> Actual Use	0.009	0.002	0.099	0.088	0.930	-0.193	0.195

Table A 138: R squared values, UTAUT plus Social Variables plus Cognitive Variables on Actual Use, Study 5

	Original Sample (O)	Sampl e Mean (M)	SE	t	Sig.	CI Low	CI Up
Actual Use (R^2)	0.352	0.493	0.098	3.579	0.000	0.304	0.684
Actual Use (adj. R^2)	0.222	0.391	0.118	1.884	0.060	0.165	0.620

Table A 139: Endogenous Variables, UTAUT plus Social Variables plus Cognitive Variables on Actual Use, Study 5

	R Square	R Square adjusted	VIF	CA
ANX	0.480	0.375	1.792	0.794
ATT	0.194	0.183	3.525	0.757
Actual Use	-	-	-	1.000
CSE	0.081	0.045	1.270	1.000
FAC	0.524	0.498	1.132	0.386
Image	0.226	0.173	1.356	0.835
PEOU	0.797	0.780	2.389	0.878
PU	0.688	0.657	1.562	0.792
Perceived Enjoyment	0.429	0.385	3.777	0.793
Reputation	0.512	0.448	1.515	0.938
SI	0.328	0.229	1.348	0.817
SWM BetweenErrors	0.048	-0.108	1.650	1.000
SWM Strategy	0.418	0.312	1.634	1.000
WTAR	0.237	0.084	1.236	1.000

UTAUT + Trust + Social Variables + Cognitive Variables

Table A 140: Path Coefficients, UTAUT plus Trust plus Social Variables plus Cognitive Variables on Actual Use, Study 5

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
ANX -> Actual Use	-0.014	-0.036	0.146	0.093	0.926	-0.341	0.241
ATT -> Actual Use	-0.081	-0.057	0.212	0.382	0.702	-0.508	0.334
Benevolence -> Actual Use	-0.069	0.048	0.178	0.389	0.698	-0.284	0.406
CSE -> Actual Use	-0.115	-0.083	0.132	0.873	0.383	-0.343	0.169
Competence -> Actual Use	-0.090	-0.134	0.192	0.469	0.639	-0.529	0.258
FAC -> Actual Use	-0.072	0.034	0.187	0.387	0.699	-0.316	0.396
Functionality -> Actual Use	-0.225	-0.168	0.198	1.133	0.258	-0.563	0.215
Helpfulness -> Actual Use	0.038	-0.001	0.204	0.189	0.850	-0.398	0.401
Image -> Actual Use	0.051	0.042	0.147	0.347	0.729	-0.265	0.320
Integrity -> Actual Use	0.126	0.031	0.173	0.728	0.467	-0.320	0.336
PEOU -> Actual Use	-0.030	-0.001	0.182	0.167	0.868	-0.348	0.347
PU -> Actual Use	-0.018	-0.084	0.193	0.093	0.926	-0.460	0.281
Perceived Enjoyment -> Actual Use	0.594	0.533	0.235	2.526	0.012	0.078	1.023
Reliability -> Actual Use	-0.063	-0.085	0.183	0.344	0.731	-0.433	0.313
Reputation -> Actual Use	-0.205	-0.159	0.183	1.118	0.264	-0.515	0.235
SI -> Actual Use	0.062	0.040	0.165	0.373	0.709	-0.309	0.343
SWM BetweenErrors -> Actual Use	-0.029	-0.030	0.140	0.208	0.835	-0.321	0.251
SWM Strategy -> Actual Use	0.054	0.031	0.139	0.390	0.697	-0.242	0.295
WTAR -> Actual Use	0.029	0.018	0.109	0.269	0.788	-0.196	0.240

Table A 141: R squared values, UTAUT plus Trust plus Social Variables plus Cognitive Variables on Actual Use, Study 5

	Original Sample (O)	Sample Mean (M)	SE	t	Sig.	CI Low	CI Up
Actual Use (R^2)	0.414	0.599	0.088	4.717	0.000	0.413	0.763
Actual Use (adj. R^2)	0.226	0.470	0.116	1.945	0.052	0.224	0.687

Table A 142: Endogenous variables, UTAUT plus Trust plus Social Variables plus Cognitive Variables on Actual Use, Study 5

	R Square	R Square adjusted	VIF	CA
ANX	0.525	0.372	1.948	0.794
ATT	0.201	0.191	3.694	0.757
Actual Use	0.049	0.024	-	1.000
Benevolence	0.167	0.134	1.492	0.710
CSE	0.087	0.038	1.584	1.000
Competence	0.515	0.482	3.606	0.895
FAC	0.540	0.501	1.401	0.386
Functionality	0.861	0.847	3.888	0.870
Helpfulness	0.587	0.540	2.355	0.823
Image	0.330	0.242	1.548	0.835
Integrity	0.685	0.639	1.334	0.934
PEOU	0.878	0.857	2.600	0.878
PU	0.801	0.765	1.608	0.792
Perceived Enjoyment	0.730	0.690	4.357	0.793
Reliability	0.610	0.525	2.220	0.865
Reputation	0.623	0.533	2.052	0.938
SI	0.531	0.409	1.612	0.817
SWM BetweenErrors	0.071	-0.188	1.733	1.000
SWM Strategy	0.469	0.310	1.715	1.000
WTAR	0.514	0.358	1.348	1.000

Table A 143: Model Comparisons incl. ITU, Actual Use, Study 5

	Base	Addition	R2	adj. R2	Δ R	F Δ	df 1	df 2	sig
1	UTAUT		0.188	0.095	0.188	2.381	6	72	0.030
2	UTAUT	plus Trust	0.309	0.158	0.121	1.722	6	66	0.130
3	UTAUT	plus SOC	0.361	0.256	0.173	5.595	3	69	0.002
4	UTAUT plus Trust	plus SOC	0.415	0.252	0.227	3.020	3	63	0.036
5	UTAUT plus SOC	plus Trust	0.415	0.252	0.227	0.815	6	63	0.562
6	UTAUT	plus COG	0.189	0.056	0.001	0.026	3	69	0.995
7	UTAUT plus Trust	plus COG	0.311	0.119	0.123	0.048	3	63	0.986
8	UTAUT plus COG	plus Trust	0.311	0.119	0.123	1.564	6	63	0.173
9	UTAUT plus SOC	plus COG	0.363	0.224	0.175	0.059	3	66	0.981
10	UTAUT plus COG	plus SOC	0.363	0.224	0.175	5.099	2	66	0.003
11	UTAUT plus Trust plus SOC	plus COG	0.417	0.216	0.229	0.050	3	60	0.985
12	UTAUT plus Trust plus COG	plus SOC	0.417	0.216	0.229	2.667	3	60	0.056
13	UTAUT plus SOC plus COG	plus Trust	0.417	0.216	0.229	0.726	6	60	0.631

Table A 144: Pearson Correlations for Blackboard Actual Use Variables

	ResM Sum AllContent Area	ResM Usertime	ResM First14 days total	ResM Nov4 weeks	ResM First6 weeks	DPsy Total	DPsy Sum AllContent Area	DPsy Usertime	DPsy First14 days total	DPsy Nov4weeks	DPsy First6 weeks
ResM Total	.943**	.275*	.453**	.577**	.609**	.782**	.757**	.280*	.585**	.601**	.667**
ResM Sum AllContentArea	1	.196	.404**	.543**	.564**	.719**	.715**	.248*	.528**	.582**	.633**
ResM Usertime	.196	1	.149	.276*	.263*	.192	.159	.750**	.166	.207	.218
ResM First14 days total	.404**	.149	1	.488**	.772**	.380**	.346**	.099	.603**	.360**	.488**
ResM Nov4weeks	.543**	.276*	.488**	1	.932**	.566**	.561**	.230	.451**	.657**	.663**
ResM First6weeks	.564**	.263*	.772**	.932**	1	.570**	.553**	.209	.579**	.629**	.687**
DPsy Total	.719**	.192	.380**	.566**	.570**	1	.987**	.291*	.688**	.779**	.840**
DPsy Sum_AllContentArea	.715**	.159	.346**	.561**	.553**	.987**	1	.279*	.672**	.800**	.850**
DPsy Usertime	.248*	.750**	.099	.230	.209	.291*	.279*	1	.260*	.135	.195
DPsy First14 days_total	.528**	.166	.603**	.451**	.579**	.688**	.672**	.260*	1	.531**	.759**
DPsy Nov4weeks	.582**	.207	.360**	.657**	.629**	.779**	.800**	.135	.531**	1	.955**

16.8Research Material / Survey

16.8.1 LTAM questionnaire (Study 3 example)

(not featuring CANTAB or WTAR measures)

Computer Perception and Attitudes

Thank you for your interest in this project, which looks at how people react to different types computer technology. It is aimed at determining if the same principles that apply for workplace technology also apply to lifestyle technology, and we are particularly interested in reactions to the use of home desktop and laptop computers.

However, ownership or previous use of such a device (or similar devices / applications) is NOT required for participation. We are just interested in your perception of / attitudes toward such devices. This survey is purely for academic purposes and is in no way linked to any commercial organisation.

What technology are we looking at?

In this study we are looking at computers and laptops as multi- function devices that allow users to read and edit electronic documents (such as PDFs), access the internet and make calculations. The key feature of these devices is that they are designed to cover a broad range of activities, while being designed to be used in a more permanent set-up, rather than being used 'on- the-go'.

What do I have to do for this survey?

If you choose to participate, you will first be asked a few demographic questions (age, sex and so on). You will then be ask about your general computer use patterns in terms of time spent using a computer. Following this, you will be asked questions regarding your attitudes toward using technology such as an computers, and how using such a device would affect your life. As we are interested in potential future use of computers, it does not matter whether you own or have access to such a device or not.

Key information:

- Taking part in this study takes around 20 minutes.
- Participation is entirely voluntary, and you have the right to withdraw at any time without having to give a reason.
- Once you begin the survey, you will not be able to leave it and then come back later.
- If there are any questions you do not wish to answer, you may leave them blank.
- Your responses will be anonymous, and treated with full confidentiality. No individuals will be identifiable from the project write-up, or any publications arising from it.
- You will receive more information at the end of the survey, explaining theories behind it. For ethical reasons we will not be able to give you individual feedback on your responses.
- Benefits: You might potentially learn about different aspects of evaluating technology and deepen your understanding of your interaction with it.
- Risks: Apart from the time invested into completing this questionnaire, there are no risk for the participants that differ from risks encountered in everyday life.

Who is in charge of this project?

The study has been approved by the University of Westminster Psychology Department Ethics Committee (Chair: Dr John Colwell, j.colwell@wmin.ac.uk). It is based at the University of Westminster in the UK. The lead researcher is Boris Altemeyer, who should be the first point of contact if you have questions or problems: Boris Altemeyer, 309 Regent Street, W1B 2UW, London. Tel: +44 (0)20 7911 5000. Email: boris.altemeyer@my.westminster.ac.uk. The supervising researcher is Dr. Catherine Loveday, 309 Regent Street, W1B 2UW, London. Tel: +44 (0)20 7911 5000. Email: C.Loveday@westminster.ac.uk.

If you have read the information above, and give your consent to participate under these conditions, please tick "I wish to take part in the study" and then click the 'Continue' button.

- ○ I wish to take part in the study (you will be asked to confirm this again at the end of the survey).
- ○ I do not wish to take part in the study.

Section 1: Demographics

Are you male or female?

- ◯ Male
- ◯ Female

In which country do you currently reside?

[ ]

What is your ethnicity?
(Please use the term you feel that best describes your ethnicity.)
White

- ◯ White British
- ◯ Irish
- ◯ Other White Background
- ◯ Mixed
- ◯ White and Black Caribbean
- ◯ White and Black African
- ◯ White and Asian
- ◯ Other mixed Background
- ◯ Black or Black British
- ◯ Caribbean
- ◯ African
- ◯ Other Black Background
- ◯ Asian or Asian British
- ◯ Indian
- ◯ Pakistani
- ◯ Bangladeshi
- ◯ Other Asian Background
- ◯ Chinese
- ◯ Other ethnic group

What is the highest level of education you have completed?

- ◯ Less than High School
- ◯ High School or equivalent
- ◯ Some College
- ◯ 2-year College Degree
- ◯ 4-year College Degree / BSc / BA
- ◯ Master's Degree
- ◯ Doctoral Degree
- ◯ Professional Degree (JD, MD)

What is your age in years?

[ ]

Which of these best describes your main current occupational status?

- ○ Employed for wages ○ Self-employed
- ○ Unemployed but looking for work ○ Home-maker
- ○ Student ○ Retired
- ○ Unable to work for health or other reasons

Section 2: Computer and Internet Use

How many hours do you on average spend using a computer per week?
(We are aware that your response will be an average and not exact for every week. Please only give one number and not a range, as we only need a general estimate.)

[ ]

How many hours do you on average spend on the Internet per week?
(This is regardless of your access device, i.e. PC, tablet PC, mobile phone, etc. We are aware that your response will be an average and not exact for every week. Please only give one number and not a range, as we only need a general estimate.)

[ ]

How often do you use the internet for the following activities?

	Never	Less than Once a Month	Once a Month	2-3 Times a Month	Once a Week	2-3 Times a Week	Daily
Communication	○	○	○	○	○	○	○
General Information	○	○	○	○	○	○	○
News / Weather	○	○	○	○	○	○	○
Shopping	○	○	○	○	○	○	○
Social Networking	○	○	○	○	○	○	○
Travel	○	○	○	○	○	○	○
Health Information	○	○	○	○	○	○	○
Leisure /	○	○	○	○	○	○	○

When using technology in general, I would describe myself as ...

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
... spontaneous.	○	○	○	○	○
... creative.	○	○	○	○	○
... playful.	○	○	○	○	○

Section 3: Computers and Laptops How to complete Section 3:

PLEASE DO:

In the following you will be asked questions with regard to computers and laptops. You will find that the device is referred to as 'technology' for standardisation purposes. Whenever you are asked about 'this technology', please think of a computer.

For this project, it is important that you think about the actual devices as depicted above. The questions are based on research into technology acceptance in general at work. Some questions might seem to be similar to each other or not to be relevant to computers at all. Please do answer all of the following questions, regardless whether they seem to be repetitive or apply to computers at all.

PLEASE DON'T:

Please DO NOT refer to devices that simulate similar features, such as E-Readers, tablet PCs or smartphones.

Section 3: Computers and Laptops (continued)

Have you ever used a Computer?

○ Yes ○ No
○ I don't know.

Do you have easy access to a Computer?

○ Yes ○ No
○ No, but I am intending to buy one. ○ I don't know.

On average, how many hours do you use your Computer per week? (Please only give one number, not a range, as an average is sufficient for this research)

[ ]

Which make or brand is your Computer? (if you know, multiple answers possible in case you own more than one)

☐ HP

☐ DELL

☐ Apple ☐ Asus ☐ Acer
☐ Compaq ☐ Samsung ☐ Toshiba
☐ Other (please specify...)
[ ]

Section 3a: Perception of technology

Usefulness of the technology

Please rate the following statements using the scale provided.

	Strongly disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
Using this technology would enable me to accomplish tasks more quickly.	○	○	○	○	○
Using this technology would improve my performance.	○	○	○	○	○
Using this technology would enhance my effectiveness in performing tasks.	○	○	○	○	○
Using this technology would make things easier.	○	○	○	○	○
I would find this technology to be useful.	○	○	○	○	○

Things that make it easy to use this technology

	Strongly disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
This technology would not be compatible with other technology I use.	○	○	○	○	○
A specific person or group would be available to me for assistance with difficulties with this technology.	○	○	○	○	○

It would be easy for me to use this technology, taking into account...

	Strongly disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
...the resources it takes to use it.	○	○	○	○	○
...the opportunities it takes to use it.	○	○	○	○	○
...the knowledge it takes to use it.	○	○	○	○	○

Section 3b: Attitudes toward technology

Please rate the following statements using the scale provided.

	Strongly disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
Using this technology would not require a lot of mental effort for me.	○	○	○	○	○
Learning how to use this technology would be easy for me.	○	○	○	○	○
I would find it easy to get this technology to do what I want it to do.	○	○	○	○	○
My interaction with this technology would be clear and understandable.	○	○	○	○	○

How easy the technology is to use

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I would like interacting with this technology.	○	○	○	○	○
I think it is a good idea to use this technology.	○	○	○	○	○
Using this technology would make my life more interesting.	○	○	○	○	○

Using this technology would make me feel...

Annoyed	○	○	○	○	○	Happy
Negative	○	○	○	○	○	Positive
Bad	○	○	○	○	○	Good

Using this technology would be ... for performing my tasks.

Foolish	○	○	○	○	○	Wise
Harmful	○	○	○	○	○	Beneficial
Worthless	○	○	○	○	○	Valuable

How you feel about this technology

	Strongly disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I feel apprehensive about this technology.	○	○	○	○	○
It scares me to think that I could lose a lot of information using this technology by doing something wrong.	○	○	○	○	○
I would hesitate to use this technology for fear of making mistakes that I cannot correct.	○	○	○	○	○
This technology makes me feel uncomfortable.	○	○	○	○	○
This technology is somewhat intimidating to me.	○	○	○	○	○
When using this technology, I would be afraid of breaking something.	○	○	○	○	○

Section 3c: Interacting with technology

I could complete a job or task using this technology...

	Strongly disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
...if there was no one around to tell me what to do as I go.	○	○	○	○	○
...if I could someone for help if I got stuck.	○	○	○	○	○
...if I had a lot of time to complete the job or task.	○	○	○	○	○
...if I had just the built in help facilities for assistance.	○	○	○	○	○
...if I had a good manual.	○	○	○	○	○
...if someone showed me how to do it first.	○	○	○	○	○
...if I had used a similar technology before.	○	○	○	○	○

How enjoyable it is to use this technology

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I would find using this technology to be enjoyable.	○	○	○	○	○
The actual process of using this technology would be pleasant.	○	○	○	○	○
I would have fun using this technology.	○	○	○	○	○
I find this technology fascinating.	○	○	○	○	○
I find this technology boring.	○	○	○	○	○

Section 3d: Attitudes toward technology

I believe a Computer is functional. It...

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
...has the functionality I need.	○	○	○	○	○
...has the features required for my needs.	○	○	○	○	○
...has the ability to do what I want it to do.	○	○	○	○	○
...has the overall capabilities I need.	○	○	○	○	○

I believe a Computer is competent. It...

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
...is competent and effective in providing multi-function computing facilities.	○	○	○	○	○
...performs its role very well.	○	○	○	○	○
...is a capable and proficient multi-function computing facility provider.	○	○	○	○	○
...is very knowledgeable about multi-function computing facilities.	○	○	○	○	○

I believe a Computer is reliable. It...

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
...is a very reliable device.	○	○	○	○	○
...does not fail me.	○	○	○	○	○
...is extremely dependable.	○	○	○	○	○
...does not malfunction for me.	○	○	○	○	○
...provides error free results.	○	○	○	○	○

Advances in technology

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
The trends in technological advancement are worrisome to me.	○	○	○	○	○
I fear that today's best technology will be obsolete fairly	○	○	○	○	○
I am worried about the rapid advances in technology.	○	○	○	○	○

Development of costs

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
The cost of this technology is constantly declining.	○	○	○	○	○
I believe the cost of this technology will continue to decline in the future.	○	○	○	○	○
I think we will see better technology for a lower price in the near future.	○	○	○	○	○

Section 3d: Attitudes toward technology (Continued)

Costs

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
Computers that are available today are too expensive.					
I think Computers are quite pricey.					
I consider a Computer to be a big-ticket item.					

I believe a Computer has integrity. It...

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
...is truthful in its dealings with me.					
...is honest.					
...keeps its commitments.					
...is sincere and genuine.					

I believe a Computer is helpful. It...

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
...supplies my need for help through a help function.					
...provides competent guidance (as needed) through a help function.					
...provides whatever help I need.					

I believe a Computer is benevolent. It...

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
...acts in my best interest.	○	○	○	○	○
...does its best to help me if I need help.	○	○	○	○	○
...is interested in my well-being, not just its own.	○	○	○	○	○

Section 3e: Social Contacts and Technology

The image associated with this technology

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
People in my circle of social contacts who use this technology have more prestige than those who don't.	○	○	○	○	○
People in my circle of social contacts who use the system have a high profile.	○	○	○	○	○
Having this technology is a status symbol in my circle of social contacts.	○	○	○	○	○

How other people see this technology

	Strongly disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
People who influence my behaviour think that I should use this	○	○	○	○	○
People who are important to me think that I should use this technology.	○	○	○	○	○
People who are important in my life would be helpful in the use of this technology.	○	○	○	○	○
In general, my social contacts would support the use of this technology.	○	○	○	○	○

The reputation of this technology

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
Others have mentioned good things about using this technology	○	○	○	○	○
I have heard others speak favourably about using this technology.	○	○	○	○	○
Other people have told me they are satisfied with using this technology.	○	○	○	○	○
I have heard that most others are pleased with using this technology.	○	○	○	○	○

Please rate the following statement using the scale provided.

Please answer the following questions assuming that you have access to a Computer.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
The brand of the technology would matter for me when making a purchase decision.	○	○	○	○	○

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I intend to use this technology in the next 6 months.	○	○	○	○	○
I predict I would use this technology in the next 6 months.	○	○	○	○	○
I plan to use this technology in the next 6 months.	○	○	○	○	○

Can your answers be (anonymously) recorded and used for research?

You should answer NO if, for example, you have completed this questionnaire (or one very similar to it) before, you did not answer the questions seriously, or you do not want to participate in our research.

○ Yes ○ No

Debriefing:

Thank you for your interest in this project.

On the previous pages you have answered questions that have been found to be related to a concept called 'technology acceptance'. This concept describes how willing people are to use certain types of technology.

The questions you answered included questions that are related to intention to use, perceived enjoyment, perceived ease of use, perceived usefulness, trust, anxiety, playfulness, social norms, social presence, results, output, relevance, image, voluntariness, perceived adaptability, computer self efficacy, and facilitating conditions of technology use.

All these variables are used to model technology acceptance. Previously, technology acceptance modelling has mostly been tested with either workplace related technology (mainly software) and internet platforms such as e-commerce platforms and social networks. The aim of this research is to establish whether the attributes that apply to the use of workplace technology and internet platforms do also allow predictions with regard to lifestyle
technology.

This research is part of a PhD research in Psychology aimed at increasing the predictive power of existing technology acceptance
models, especially with regard to lifestyle technology. If you have
any questions regarding this study, please contact Boris Altemeyer via email: boris.altemeyer@my.westminster.ac.uk.

16.8.3TIPI

Ten Item Personality Inventory

Below are a number of personality traits that may or may not apply to you. Please mark a number next to each statement to indicate the extent to which *you agree or disagree with that statement*. You should rate the extent to which the pair of traits applies to you, even if one characteristic applies more strongly than the other.

I see myself as:	**Disagree strongly**	**Disagree moderately**	**Disagree a little**	**Neither agree nor disagree**	**Agree a little**	**Agree moderately**	**Agree strongly**
1. Extraverted, enthusiastic	1	2	3	4	5	6	7
2. Critical, quarrelsome	1	2	3	4	5	6	7
3. Dependable, self-disciplined	1	2	3	4	5	6	7
4. Anxious easily upset	1	2	3	4	5	6	7
5. Open to new experiences, complex	1	2	3	4	5	6	7
6. Reserved, quiet	1	2	3	4	5	6	7
7. Sympathetic, warm	1	2	3	4	5	6	7
8. Disorganized, careless	1	2	3	4	5	6	7
9. Calm, emotionally stable	1	2	3	4	5	6	7
10 Conventional, uncreative	1	2	3	4	5	6	7