Young adopters of Smartphones:

Examining determinants of the adoption decision

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Abstract

An extended version of the Technology Acceptance Model was employed to examine the Smartphone acceptance process by young people and the possible determinants of Smartphone usage intention were empirically tested. Data from 73 prospect adopters was gathered by means of an online survey and analyzed to gain insights on the extent to which Smartphone usage intention was influenced by the following factors: perceived usefulness, perceived ease of use, perceived entertainment, social pressure, and apprehensiveness. The latter three factors (perceived entertainment, social pressure and apprehensiveness) were specifically included for their expected relevance within the context of smartphone adoption by young consumers. Many previous TAM-based studies focused on technology acceptance within work environments and did not take entertainment, technology anxiety or social influences into account. Such influences were however expected to affect usage intention and, hence, were included in the model. The research results provided partial support for the employed model, confirming the hypothesized direct influences of perceived usefulness and perceived entertainment on usage intention. However, the results did not support the theorized direct effect of social pressure on usage intention; instead, social pressure was shown to operate through perceived usefulness and perceived entertainment. The findings also demonstrated that no correlation exists between perceived ease of use and perceived usefulness, contrary to what was expected on the basis of various prior studies. Moreover, apprehensiveness was not found to unambiguously affect perceived usefulness or perceived entertainment, rejecting hypotheses that posited such effects to exist.
Additionally, this study provides insight into the requirements prospect Smartphone users have with regard to such a device and demonstrates relations between a number of those Smartphone properties, such as battery life and processing speed, and perceived usefulness and perceived entertainment on the other. The results of this study contribute to a still emerging body of literature on user acceptance of smartphones and arguably on user acceptance of other devices such as tablet computers. The present study specifically aids in understanding of smartphone adoption for personal purposes outside work environments, whereas several previous studies focused primarily on adoption within a professional context.

Keywords*: Technology Acceptance Model; Smartphone adoption; Social influences; Apprehensiveness; Perceived entertainment; User requirements*

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Table of contents

List of Abbreviations:

3G	3rd Generation mobile telecommunications
App	Apprehensiveness
CPU	Central Processing Unit
GPS	Global Positioning System
IS	Information Systems
OS	Operating System
PC	Personal Computer
PDA	Personal Digital Assistant
PE	Perceived Entertainment
PEOU	Perceived Ease of Use
PU	Perceived Usefulness
RAM	Random-Access Memory
SMS	Short Message Service
SP	Social Pressure
TAM	Technology Acceptance Model
TAM2	Extended Technology Acceptance Model
TRA	Theory of Reasoned Action
Wi-Fi	Wireless networking technology

1. Introduction

1.1 The field of Smartphones

In the past few years, especially since Apple launched its first iPhone in 2007, Smartphone sales numbers have been increasing rapidly. Compared to 2009, markets of several European countries experienced increases in Smartphone adoption ranging from 48 percent up to 70 percent in 2010 (comScore, 2010). Moreover, worldwide Smartphone sales reportedly experienced an even bigger increase with a year-on-year growth of 89 percent in the last quarter of 2010 (Canalys, 2011). More and more consumers decide to purchase a Smartphone, and Smartphone penetration for Western European countries has been predicted to reach 50% within two years (*Cisco Visual Networking Index*, 2010).

Providing its user with numerous ways to be productive, be entertained, communicate, et cetera, the Smartphone can arguably be considered the converged ultimate in mobile consumer products. Regular mobile phones generally allow for making phone calls and sending text messages (SMS), occasionally offering a camera and limited possibilities for contact synchronization (with a computer, for instance). In contrast, Smartphones commonly offer larger displays (usually touch screens, with diameters of up to 4.5 inch) and improved graphics, more processing power (faster processors, partly to match the higher demands of such displays) better cameras, and additional connectivity (by means of Wi-Fi and 3G data connection for instance). The addition of such forms of connectivity provide Smartphone users with the ability to have Internet access wherever and whenever they wish, enabling them to make use of the possibilities of Internet on their device as they would on their home computer. For example, users can take a picture with the device's built-in camera while, add a personal message to the picture and upload the file to their online social network account (e.g. Facebook or Twitter), all while having a stroll in the park.

Many of these Smartphones run on operating systems designed by companies such as Research in Motion, Apple or Google, with the latter now taking the lead in the aspect of market share, as both comScore (2011) and Canalys (2011) analysts claim. These operating systems allow for the use of third-party software, generally referred to as applications. Such applications can serve widely varying purposes, such as providing weather or traffic information, food recipes, restaurant reviews or can allow the Smartphone to act as a replacement for personal navigation devices (by using the device's built-in GPS module in combination with electronic road maps). As more software (applications) becomes available

for the respective operating systems, more people are drawn towards the devices that run these operating systems, in turn leading to more applications being built. These developments thus create enormous momentum within the field. For a corporation such as Google, which virtually thrives on information gathering and the subsequent exploitation of this information for advertisement targeting, this field is getting increasingly interesting. After all, Smartphones are used to store, send and receive massive amounts of information, the accumulation of which can provide detailed profiles of the individuals involved. Hence being a part of this is extremely valuable for such corporations, for it allows them to tap into streams of information about their target audience. With such driving forces behind it, the developments in the Smartphone field are unlikely to come to a halt any time soon, making the booming Smartphone market all the more interesting.

1.2 Smartphone definition

For the sake of this study, the research topic, Smartphones, first needs to be defined. A clear-cut scientific or industry definition of the concept is hard to provide, as the field (and what the devices have to offer) continually changes. It is also likely that the designation is influenced by the industry players that want their own products to be 'smarter' and more appealing than those of others. The following description of a Smartphone might nonetheless provide a frame of reference: a mobile phone with advanced computing ability, combining the functions of a multimedia player (allowing for music/video storage and playback) and a personal digital assistant (PDA), offering mobile Internet connectivity, built-in GPS and camera, and the ability to run a wide variety of third party applications (such as games, communication software, applications offering weather or traffic information, et cetera).

A commonly made distinction is that between Smartphones and feature phones, with the former generally offering more capabilities, more advanced techniques and higher processing speeds than the latter (see also Allen, Graupera & Lundrigan, 2010; Lee, Tolentino, Park & Kim, 2010). However, as techniques advance, some feature phones have already surpassed slightly older Smartphones in respect of display size or speed of the central processing unit (CPU). Therefore, the distinction usually also involves the requirement for Smartphones to be 'open', by which is meant that Smartphones must be able to run third-party applications on a standardized operating system (OS) (Lee, 2010; Lee et al, 2010; Simpson, 2009; *Smartphone*, n.d.). It seems plausible that the feature phone will eventually be replaced by the Smartphone as market penetration of feature phones is decreasing rapidly, while

Smartphones prices are gradually dropping and their market share is growing (Entner, 2010; Canalys, 2011).

1.3 Social and scientific relevance

Nowadays, young individuals tend to have a myriad of technological devices serving numerous purposes. Regular cell phones are still abundant, as are laptops and PC's, and there is the inevitable iPod (or any other MP3-player). Yet, the Smartphone seems to have earned its own place, despite the fact that many of its features are not solely reserved to that device. Mobile phone calls and text messaging have been possible (and easily accessible) for years, music has been 'portable' for decades and easy Internet access is not exactly new either. However, the Smartphone seems to merge many of the aspects offered by mentioned devices, although their use may not always be as practical as on the dedicated devices (e.g. compare Internet browsing on a Smartphone with that on a laptop or PC). Regardless, great numbers of young people choose to purchase such a device. According to Nielsen's *U.S. Mobile Snapshot* (2010), smartphone users within the age category of 18 through 34 make up for 42 percent of all smartphone users. That age category is even more prominently represented for specific types of smartphones such as iPhones (43 percent) and Android-based devices, with 50 percent of the users aged under 35. Additionally, smartphone use within a similar age group (15 to 29) in The Netherlands has reportedly reached 60 percent (Preuschat, 2011). Hence, it is most interesting to find out why Smartphones are actually adopted and what factors influence the adoption process. The purpose of this study is thus to provide understanding of those factors by investigating the motivations of young prospect buyers to purchase a Smartphone and their perceptions with regard to such devices. Additionally, this study will give insight into which properties or features potential buyers want from a Smartphone and the (mutual) importance of those aspects.

The relative novelty of the field, its enormous growth rates and its rapidly increasing impact on lives of many not merely justify research towards its various aspects, but urge to do so. Moreover, due to the newness of the field, the body of previous scientific research is still very much in early development, especially regarding Smartphone adoption outside professional environments. The outcomes of this research effort present an addition to the body of literature on smartphone adoption which is still very much in development. For Smartphone manufacturers and retailers it is important to know under which conditions the adoption of those devices will flourish, in order to optimize their products and strategies.

1.4 Research overview

In this study on Smartphone adoption by young people, the Technology Acceptance Model (Davis, 1989) and an extension thereof (Igbaria et al, 1996; Kwon & Chidambaram, 2000) are used to investigate determinants of Smartphone usage intention. An additional part focuses on user requirements with regard to Smartphones. Chapter 2 will provide an overview of the theories relevant to this research, with a main focus on the Technology Acceptance Model (TAM), its components and a number of derivates of the model that have come into existence over the many years since its conception. This description of previous applications of TAM and discussion of a several additions done through time will subsequently lead up to the research model used for this study. The employed model and the accompanying hypotheses are formed mainly on the basis of two discussed studies performed by Igbaria, Parasuraman and Baroudi (1996), and Kwon and Chidambaram (2000). All relevant components will be described and illustrated, as will the hypotheses derived from it. Chapter 3 gives a brief overview of the research questions and hypotheses, and the additional exploratory part of the research is discussed. Chapter 4 describes the performed research, the used methods of data collection and methods of analysis. An online survey was used to gather data for the TAM-study. The additional segment on Smartphone requirements is based on analyzed content of two websites and a segment regarding Smartphone requirements within mentioned TAM-survey. In chapter 5 the results or both parts of this study are presented, followed by discussion thereof in chapter 6, and final conclusions and suggestions for future research in chapter 7.

2. Theory and previous research

This research attempts to provide insights into Smartphone adoption by young people, by means of the Technology Acceptance Model (TAM). This model examines specific factors that may influence technology adoption, such as perceived usefulness and perceives ease of use. This chapter will provide an overview of relevant literature regarding technology adoption and discuss a number of models derived from the initial TAM. The model as used for this study will subsequently be explained.

2.1 Consumer decision strategies

Although the field of Smartphones is relatively new, that of consumer motivations or decision strategies is broad and far from novel, with psychologist Ernest Dichter covering the matter already in the early nineteen hundreds in his Handbook of Consumer Motivations (Dichter, 1964) and numerous studies and theories followed since (Folkes, 1988). However, not every model or theory can be universally applied to account for consumer behavior and their acceptance of products or certain innovations: different aspects that might come into play ask for different models. Through time, scholars such as Davis, Bagozzi and Warshaw (1992) and Deci (1972; 1975, as referred to by Kwon & Chidambaram, 2000, p.1) have referred to intrinsic and extrinsic motivations in order to explain (consumer) behavior, while others, such as Fishbein and Ajzen (1975), developed alternative views on intrinsic and extrinsic behavioral attitudes with their Theory of Reasoned Action.

2.2 Theory of Reasoned Action

In 1975, Fishbein and Ajzen formed their Theory of Reasoned Action, which may now be considered a predecessor of the Technology Acceptance Model. TRA examines people's attitudes and behaviors in general and attempts to provide for predictions regarding those. The model suggests that the intended and actual behavior of individuals is based on four main variables - beliefs, attitudes, intentions and behaviors - and on the causal connections between those variables. It theorizes that people's intention to display certain behavior is determined by their attitude towards this behavior. Their attitudes are in turn determined by their beliefs of what that certain behavior will lead to, i.e. what outcomes it may have. Hence, the theory poses that beliefs influence attitudes, attitudes influence intentions and intentions determine

actual behavior. TRA further posits that the beliefs and attitudes people have with regard to those behaviors are influenced by subjective norm: social pressure, through which individuals form ideas on which behaviors will be regarded as favorable by others. The Theory of Reasoned action was not developed with a particular aim on technology acceptance research, but it has been widely applied in such research (see e.g. Davis, Bagozzi & Warshaw, 1989) and was found to provide useful predictions of people's intentions and usage with regard to information systems (Igbaria, 1993)

2.3 Technology Acceptance Model

The Theory of Reasoned Action is what led Davis (1989) to formulate the initial version of the Technology Acceptance Model, as he noted that high-quality measuring of user acceptance of information technologies had hitherto been difficult to achieve due to the proper measures being short in supply. Davis (1989) proceeded to develop new measures for technology acceptance based on the *perceived usefulness* (PU) and *perceived ease of use* (PEOU) as attributed to a system by its prospect user. These two variables were theorized to be fundamental determinants of user acceptance of a system and the main focus of Davis' search for valid and reliable predictors of such. His endeavors were mainly aimed at technology adoption within professional environments and primarily focused on measuring whether the introduction of a new system resulted in improved performance or production.

Within TAM, perceived usefulness was defined as "the degree to which a person believes that using a particular system would enhance his or her job performance." (Davis, 1989, p. 320). The author illustrated this term further by referring to general practice within organizations, where performance increases tend to be rewarded (with bonuses, raises, et cetera), thus leading to a favorable attitude towards systems or technologies resulting in such increases. Therefore, when a (prospect) user believes a system to have a positive impact on performance, the system is attributed a high perceived usefulness by that user. The other variable, perceived ease of use, was defined by Davis as "the degree to which a person believes that using a particular system would be free of effort." (1989, p. 320). The author hereby refers to 'ease' as meaning "freedom from difficulty or great effort". Persons are capable of directing effort towards certain goals and as effort is not infinitively available (put differently, people can get tired) and one would normally direct ones efforts as efficiently as possible, preventing from spilling effort that would otherwise result in more valuable outcomes if directed elsewhere. Davis thus claims that users are more likely to accept a

system with a higher perceived ease of use over one with lower perceived ease of use.

Justification for employing both perceived usefulness and perceived ease of use as variables in Davis' model is to be found in research performed prior to his 1989 study. The author mentions several scholars such as Reby, and Schultz and Slevin, (Davis, 1989, p. 320) who have pointed towards perceived usefulness and perceived ease of use as important indicators of technology acceptance, with Bandura further arguing that, although they have different antecedents, both variables should be considered together when predicting usage behavior (Davis, 1989). Based on his review of (interdisciplinary) existing literature on technology adoption, Davis concludes that perceived usefulness and perceived ease of use can be regarded as key determinants of usage behavior and argues that "improved measures are needed to gain further insight into the nature of [those variables], and their roles as determinants of computer use" (p. 323).

Originally aimed at computer adoption, its relevance to other technologies was theorized and researchers set out to apply TAM to numerous other systems (Lee, Kozar & Larsen, 2003). During the period following its conception the model was applied to several other technologies, such as word processors and e-mail, and has been found to "[maintain] its consistency and validity in explaining users' IS acceptance behavior" (Lee et al., p. 755), in which 'IS' stands for Information Systems. In their overview of the many appliances of the Technology Acceptance Model, Lee et al. give an indication of TAM's impact in information system research, by stating it is "the most widely applied" model, with the two main TAM articles (Davis, 1989; Davis et al., 1989) having received 698 journal citations until 2003 (p. 753). Moreover, as Venkatesh and Davis claim, "in 10 years, TAM has become well-established as a robust, powerful, and parsimonious model for predicting user acceptance" and has, "consistently been a strong determinant of usage intentions" (2000, p. 187).

2.4. TAM2: A Theoretical Extension

Similarly to what Davis had stated in his 1989 study, Venkatesh and Davis (2000) noted that impressive progress had been made with regard to information systems for professional purposes, yet the actual usage of those systems had fallen short and systems remained underutilized. Acknowledging the value of TAM, Venkatesh and Davis set off to expand the scope of the Technology Acceptance Model, initially introduced by Davis (1989) and Davis, Bagozzi and Warshaw (1989).

As a follow-up, Venkatesh and Davis proposed their extended Technology Acceptance

Model (TAM2), with which they attempted to gain a better insight into technology usage intention, by attempting to model the determinants of perceived usefulness. As the authors explain, perceived usefulness had been found to be a "fundamental driver of usage intention" in prior research, yet its determinants "[had] been relatively overlooked" (p. 187). Hence, TAM2 not only focuses on perceived usefulness and perceived ease of use, but also integrates social influences as a potential factor of impact on acceptance, theorized to operate through perceived usefulness (2000, p. 187). As described by the authors, the social influence processes encompass three factors which influence individuals when in the situation of possible adoption of system. The first of these factors is subjective norm, which concerns the influence of a 'third person' on a person's decision process on whether or not to perform specific behavior. The second is voluntariness, and interlinks with the first factor in that the degree of voluntariness is theorized to influence compliance to the subjective norm. The third factor is image and relates to the effect of using a system on the social status of a person within a group.

Within the context of Smartphone adoption, mainly two additions of TAM2 are noteworthy: the inclusion of subjective norm and image as (indirect) determinants of behavioral intention. Subjective norm is defined as a "person's perception that most people who are important to him think he should or should not perform the behavior in question" by Fishbein and Ajzen (1975, p. 302). The latter had already included this factor in their Theory of Reasoned Action, as mentioned earlier. Venkatesh and Davis theorize this variable (i.e. subjective norm) to have an effect on usage intention via perceived usefulness, although they recognize that previous research lead to inconsistent outcomes. The authors illustrated this by referring to research by Mathieson (1991), who did not find a significant effect of subjective norm on usage intention, while other research results (Taylor & Todd, 1995) did in fact show such an effect (both cited by Venkatesh & Davis, p. 187).

The other noticeable addition, image, also has links to TRA's subjective norm and regards the establishment of a favorable status within a group. The authors expect image to have a similar (indirect) effect on usage intention, itself also being influenced by subjective norm, illustrating how interwoven the above concepts are thought to be. Voluntariness, the third force within the social influence processes as described by Venkatesh and Davis, is also noteworthy, as it addresses the degree to which a prospect user perceives technology adoption to be on a voluntary basis. However, in the present research on Smartphone adoption, the adoption process is considered to occur on a purely voluntary basis, as opposed to the scenarios with differing levels of voluntariness as described in the TAM2-study.

Testing their extended model, Venkatesh and Davis (2000) performed four longitudinal studies on the adoption of several systems within a number of professional environments. Two of these studies took place in an environment where users were exposed to a new technology on a voluntary basis, the other two studies concerned mandatory system usage. As in previous TAM-research, perceived usefulness and perceived ease of use were found to be strong primary and secondary determinants of usage intention. Another finding of the research is that subjective norm mainly had an effect on usage intention when system use was mandatory. In cases of voluntary use, "subjective norm had no direct effect on intention over and above what was explained by perceived usefulness and perceived ease of use" (Venkatesh & Davis, p. 195). The authors argue that this finding may explain previous research, in which social influences were found to have a non-significant role in voluntary system use. However, the fact that their study did not supply evidence for the working of social pressure in voluntary settings does not mean that social influences are to be ruled out as a factor in Smartphone adoption by young people. It is important to stress that all four studies performed by Venkatesh & Davis took place in work environments, as mentioned earlier, and focused on computer (program) adoption. One could argue that a person's use of computers for professional purposes might be subject to different factors than Smartphone use would be. A notable difference exists between the levels of voluntariness of technology adoption within the present Smartphone research and the research performed by Venkatesh and Davis. Although in two out of four studies conducted by the authors the technology adoption process was considered to be voluntary, the adoption was still set within in a professional environment. Moreover, the involved technology was unlikely to be adopted outside of that environment, as it concerned computer software for business use in all cases. In contrast, the Smartphone adoption process as examined in the present study takes place outside of professional environments and regards Smartphone use to be for personal purposes. After all, Smartphone users are likely to carry the device with them most of the time, using it to make phone calls, take pictures, for only social networking, et cetera, thereby possibly showing the device in public or to their friends. In short, a Smartphone is argued to be a much more 'personal' technology and social influences might very well be involved in the described settings.

TAM-based research about the adoption of Smartphones specifically has been performed by Park and Chen (2007), yet that study was also set in professional healthcare environment. Similarly to the findings of Venkatesh and Davis (2000), they too found an effect of perceived usefulness and perceived ease of use on usage intention, with the effect of

PU being stronger than that of PEOU (p. 1358). Although the possible influence of social pressures was not researched, the authors recognize that this might be a factor in technology acceptance (p. 1351) and also propose another factor which may play a role therein: perceived playfulness. In reference to Fang et al. (2005, as cited by Park & Chen, 2007), the authors state that this is suggested to have influence on people's intention to use a Smartphone for leisure activities. This ties in with the following statement of Bruner and Kumar (2002): "the key difference between workplace and consumer contexts with respect to TAM is that in the latter, a hedonic factor may be an important addition to the model". (p. 553).

2.5 TAM outside work environments

Contrary to many of the TAM-based studies that took place within a professional environment, such as the ones mentioned previously, Kwon and Chidambaram (2000) instead focused on cellular phone adoption by consumers in an urban area. For this research, authors used a TAM-adapted model of computer use, retrieved from Igbaria (1993; Igbaria, Parasuraman & Baroudi, 1996) which does in fact take social influences and hedonic factors into consideration.

The main constructs of the model are:

- individual characteristics
- perceived ease of use
- intrinsic motivation (e.g. enjoyment, fun)
- extrinsic motivation (usefulness of the technology)
- social pressure (regarding obtainment of status, social prestige)
- apprehensiveness

This model is distinct from other TAM-based research in a number of respects. Whereas the factor *perceived ease of use* as well as *extrinsic motivations* (usefulness of the technology) were included in the early TAM models, Igbaria et al (1996) and Kwon and Chidambaram (2000) adopted the social pressure from TAM2 and added two additional factors: *intrinsic motivation* (which covers the hedonic aspect of technology use) and *apprehensiveness* (which addresses anxiety towards technology).

Foundation for such TAM-adaptation was laid by Igbaria (1993) who introduced the factor of computer anxiety in examining acceptance of microcomputer technology by means of TAM. Anxiety, described by the author as the "tendency of a particular person to experience a level

of uneasiness over his/her impending use of computers" (p. 75) was theorized and confirmed to affect perceived usefulness and individuals' attitudes towards computer use. To account for additional influences on microcomputer usage, Igbaria et al (1996) subsequently expanded the proposed model with social pressure (in line with the Theory of Reasoned Action), and perceived enjoyment. The authors realized that the "recreational basis of microcomputer usage" had been largely overlooked and noted that the limited research that had been performed, suggested that microcomputer use "[could] be stimulated by the intrinsic joy and enjoyment derived." (1996, p. 128). Considering the increased use and presence of microcomputer in that time, Igbaria et al. acknowledged the growing significance of computer literacy and posed that these developments could translate into social pressures, urging individuals towards microcomputer use. Thus the altered model posited perceived enjoyment and social pressure to be of direct effect on usage intention.

Prior to Igbaria et al, Davis et al (1992) had noted already that most TAM-based research focused primarily on the perceived usefulness of certain technology and tended to ignore the role of enjoyment in the adoption process. Addressing this limitation, Davis et al. compared the influence of both usefulness and enjoyment on technology adoption. Following the reasoning of motivation theorists, the authors illustrate a common distinction of two classes of motivation: intrinsic motivation and extrinsic motivation (Davis et al., p. 1112). According to them, extrinsic motivation is used to denote "the performance of an activity because it is perceived to be instrumental in achieving valued outcomes that are distinct from the activity itself, such as improved job performance, pay, or promotions" (p. 1112). Intrinsic motivation on the other hand, refers to performing an activity for no other value outcome other than that of the performance itself. In reference to the Technology Acceptance Model, Davis et al. point out that perceived usefulness is in fact an example of extrinsic motivation, whereas intrinsic motivation may be exemplified by enjoyment. The latter motivational factor had primarily been subject of research in the context of computer games, but Davis et al. set out to employ intrinsic motivation (together with extrinsic motivation) for research on computers as a professional tool.

For their research on cellular phone adoption, Kwon and Chidambaram (2000) elaborated on these principles set out by Davis et al (1992) and posited that the decision to adopt such technology would depend on people's extrinsic motivations (perceived usefulness) as well as on their intrinsic motivations (perceived enjoyment). In addition, following Igbaria et al. (1996), they added social pressure as a third motivational factor to their proposed research model. In the studies of both Kwon and Chidambaram, and Igbaria et al., system

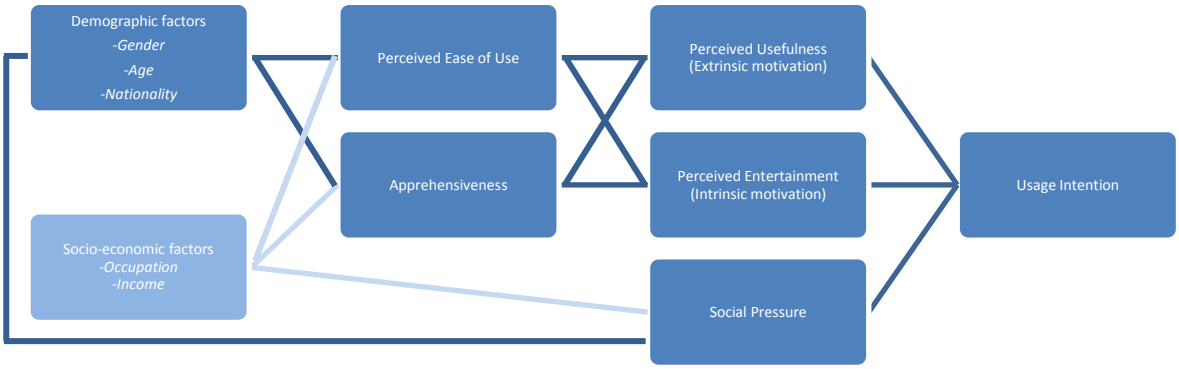
usage was suggested to be a function of the three main factors as discussed above: perceived usefulness (extrinsic motivation), entertainment (intrinsic motivation) and social pressure. The authors of both studies furthermore included a number of additional factors which were theorized to have a direct or indirect effect on system usage. One common factor is ease of use, or perceived complexity, in accordance with previous TAM studies and the original Technology Acceptance Model.

An important difference between the studies of Kwon and Chidambaram, and Igbaria et al., is that the latter researched system acceptance within a work environment, whereas the former focused on consumers outside a professional environment. A number of factors included by Igbaria et al. are specifically aimed at measuring possible effects as they may occur within such environment and will therefore be regarded irrelevant for research aimed at a non-professional setting. Examples of these factors are organizational support and organizational usage, neither of which applies to voluntary, personal use.

2.6 Smartphone adoption research

A representation of the model as used by Kwon and Chidambaram in their study is produced below (figure I).

Figure I. *Research model*



In the study at hand, a slightly adapted version of this model is used, the elements of which will hereupon be illustrated. The dependent variable in this research, on which the effect of all of the constructs as described below will be measured, is the usage intention. The indicator for this will be an aggregate of self-reported expected use of a series of individual Smartphone features.

2.6.1 Discussion of individual model constructs

Perceived usefulness

The model as proposed by Igbaria et al. (1996) and Kwon and Chidambaram (2000) posits that perceived usefulness has a direct effect on usage intention (in a similar fashion as many earlier TAM-studies and the original TAM model), and that it is a moderator for both apprehensiveness (see below) and perceived ease of use. Since the development of the Technology Acceptance Model, perceived usefulness has proved to be a strong determinant of usage intention (e.g. Davis, 1989; Venkatesh and Davis, 2000; Cho, 2011). Previous research has shown that perceived usefulness is a major factor in user acceptance of technology, not only within professional environments, but outside also (Igbaria et al., 1996; Pedersen, 2005).

For this study, perceived usefulness is defined as how well consumers believe a Smartphone can be integrated into their daily activities. It thus concerns the extent to which a prospect user believes that a smartphone allows them to be more efficient and more productive and whether they believe that the use of such a device will be convenient. Analogous to the research model proposed by Kwon and Chidambaram, it is hypothesized to have a direct effect on usage intention. Thus, an increase of perceived usefulness is expected to have a positive effect on usage intention.

Perceived entertainment

As discussed above, technology acceptance research has traditionally been focused on professional settings and, as such, the employed research models paid much attention to utilitarian aspects of the technologies or systems in question. However, many technologies are not (only) used professionally, but also partly or entirely for personal purposes. Igbaria et al. (1996) thus suggest that system use may be motivated not only by expected increases in productivity or efficiency, but also by intrinsic psychological rewards: entertainment. The idea being that the level of fun experienced by a person while using a device, will affect the frequency or intensity of use. Consequently, utilitarian aspects of the research model are to be supplemented with hedonic ones. The hedonic aspects of a technology are those that do not lead to any apparent extrinsic value for the user (such as usefulness), but instead refer to the aspects which user values for the sole *intrinsic* reward they might give; the aspects that lead to the experience of pleasure or entertainment. (Abad, Díaz & Vigo, 2010; Bruner & Kumar, 2003, Kwon & Chidambaram, 2000).

Early TAM-research did not consider a hedonic factor to be part of the adoption process, but the inclusion of this factor has later gained in popularity and several scholars have suggested perceived entertainment (or intrinsic motivation) to be of influence on the intention to use a technology or system. Numerous researches have come up with varying constructs referring to roughly the same factor yet under different names, such as hedonic factor, perceived playfulness, and intrinsic motivations. However, the issues they are intended to measure are mostly similar: fun, enjoyment, curiosity, interest, et cetera (e.g. Chung & Tan, 2004; Igbaria et al., 1996; Moon & Kim, 2001). Since various researchers have documented users' perceived enjoyment to be a determinant of technology acceptance and highlighted its importance (Igbaria et al, 1996; Kwon and Chidambaram, 2000, Van der Heijden, 2004), the factor will be included in this research.

In the proposed model, perceived entertainment (or intrinsic motivation) refers to the extent to which a prospect user expects Smartphone use to be fun and involving. It is theorized to be of influence on usage intention, with higher experienced levels of 'fun' positively affecting the prospect user's intention to adopt the device.

Social pressure

In the theory of reasoned action, Fishbein and Ajzen (1975) already addressed the aspect of social influences with, among others, the term subjective norm. This term refers to the perceptions an individual has of whatever social pressure might be exerted on him with regard to (not) performing the behavior in question. In the context of Smartphone adoption, this could refer to an individual experiencing pressure, towards buying a Smartphone, from others that are important to him (such as friends or relatives). This mechanism ties into another aspect of social pressure: social status. In reference to Kwon and Chidambaram (2000), this regards "the motivations of individuals who believe they should use [a system] for obtaining a higher social status or a more important position in their society" (p. 3) and may even be the only reason for and individual to adopt a system. Venkatesh and Davis (2000) have also included similar factors in their extension of TAM and affirm that people tend to respond to social influences to "establish or maintain a favorable image within a reference group" (p. 189). Igbaria et al. (1996) suggested the effects of social pressure on the acceptance of microcomputers, when that technology was still very much 'up and coming' and its presence in society was increasing rapidly. A rough parallel can be drawn between the situation described by Igbaria and his colleagues, and the current developments in society with regard to Smartphones. Although the research conducted by Igbaria et al. was focused on a

professional environment, social pressure is surely not limited to the workplace. Social reference groups, including friends or family for instance, can have a considerable impact on an individual's purchasing behavior (see e.g. Childers & Rao, 1992).

In Fishbein and Ajzen's TRA, and similarly in the research models of both Kwon and Chidambaram (2000), and Igbaria et al (1996), social pressure is posited to have a direct effect on usage intention (or behavioral intention, as is the case in TRA). This effect has been affirmed in various studies (e.g. Igbaria, 1993; Igbaria et al., 1996, Kwon and Chidambaram, 2000) and the construct of social pressure is included in this study in a similar fashion.

Perceived ease of use

As discussed earlier, perceived ease of use (perceived complexity) has been found to be an important determinant of technology usage, both in a direct and indirect manner, and technology users have been proven to "attempt to minimize their cognitive effort on their behaviors" (Cho, 2011). Individuals will thus exhibit a higher intention to use a system, when it is perceived to be easy to use. As described, this has been found to operate mainly through perceived usefulness, for when system is difficult to use, its usefulness is harder to identify. Furthermore, it is suggested that perceived ease of use has a strong influence on the level of perceived entertainment of a certain technology (Webster & Martocchio, 1992, as referred to by Igbaria et al, 1996). Both the studies by Kwon and Chidambaram (2000), and Igbaria et al. (1996) included it as an indirect determinant of usage intention and in both studies, its effect on usage intention has been confirmed. Additionally, result of the study performed by Igbaria et al. confirmed the hypothesized effect of perceived ease of use on perceived entertainment: a system which is difficult to use, prohibits an optimal entertainment experience, which in turn influences usage intention.

With regard to Smartphone adoption, perceived ease of use can be described as the extent to which users would find it easy to operate the device, navigate, without much mental effort. In line with research mentioned earlier, PEOU is expected to have a positive indirect effect on usage intention, moderated by perceived usefulness and perceived entertainment.

Apprehensiveness

The construct of apprehensiveness as used by Kwon and Chidambaram (2000) in their proposed model refers to "anxiety about using a new medium or technology" (p. 2) and was included by the authors since it had been found to moderate system usage in contexts other than that of TAM (Davis, 1994, as referred to by Kwon & Chidambaram). Through time, new

technologies have been received with optimism by many, but have simultaneously been rejected or regarded with skepticism by others. This may express itself in several ways, ranging from apparent feelings of discomfort when setting a digital alarm clock, to the avoidance of computer or Internet use (Walczuch, Lemmink & Streukens, 2007). Individuals might feel anxious or suspicious towards the use of certain new technologies and, due to this anxiety, choose not to use a particular system.

Apprehensiveness about technology is said to be similar to computer avoidance (Moore, 1989, as cited by Kwon & Chidambaram) and, due to the similarities between computers and Smartphones, it may be of influence in the Smartphone adoption process as well. The anxiety may be caused by privacy concerns, as individuals might fear sharing their personal information with or through a Smartphone, or by concerns regarding security, of that very same information or other aspects. Due to the novelty of the technology, people might not have full understanding of possible threats or weaknesses that using the technology could entail. Consequently, a specific or overall apprehensiveness may cause a decrease in perceived usefulness and prevent individuals from adapting Smartphones. Moreover, anxiety towards a technology (partly) associated with leisure, could prove to have a negative effect on the perceived entertainment of that technology. In the context of cellular phone adoption, apprehensiveness has been found to have a negative impact on perceived usefulness and perceived entertainment (Kwon & Chidambaram, 2000). Regarding other technologies, constructs similar to apprehensiveness (e.g. insecurity, discomfort) were reported to affect technology usage indirectly, through various factors such as perceived usefulness and perceived ease of use (Chen, Gillenson & Sherrell, 2002; Susskind & Stefanone, 2010; Walczuch et al., 2007). In the research at hand, apprehensiveness regards users' concerns about security and privacy issues associated with Smartphone use. It is theorized to have an effect on both perceived usefulness and perceived entertainment.

2.6.2 Additional considerations

Inclusion of apprehensiveness and social pressure (discussed above) as constructs in the research model furthermore addresses criticism on TAM for ignoring social influences on technology adoption and having a technological deterministic bias (Chen et al, 2002; Chung & Tan, 2003). The used model arguably presents a more balanced approach to technology acceptance, attributing a prominent role to the influence of human factors, and thereby respecting the neutrality of technology and attempting to overcome linear explanation of

technology diffusion. The present TAM-adaptation is not the first model to account for such social influences, as for instance illustrated by the inclusion of subjective norm in the extended technology acceptance model (TAM2) by Venkatesh and Davis (2000). However, as discussed earlier, that model is aimed towards technology acceptance in professional settings and includes a number of factors irrelevant to the study at hand (e.g. job relevance), and does not include (a construct similar to) apprehensiveness.

In their research, Kwon & Chidambaram (2000) found that socio-economic factors (income and occupation) had no significant impact on user's perceptions about cellular phones. Since the target group for the current research is even narrower than the one used by Kwon and Chidambaram, those factors are unlikely to be of influence and are therefore left out. These alterations with regard to the initial model are denoted by the different colors in the model representation (figure I). Furthermore, individual characteristics, except age, were found to have no significant relationship with social pressure, which was contrary to what had been hypothesized by the authors. A significant association between age and social pressure was found, "[supporting] the notion that there is more social pressure on older people to use cellular telephones than on younger people" (p. 4). Since the research presently at hand focuses on young people only, social pressure and age are not expected to exhibit a significant correlation. In line with mentioned research, other individual demographics (gender, nationality) are likewise not expected to influence social pressure. Nevertheless, those characteristics will be gathered, because of common practice and because of possible filtering to be applied later on.

2.6.3 Concluding

In summary, this research is based on an adapted version of the Technology Acceptance Model, which incorporates common TAM-constructs such as perceived usefulness and perceived ease of use and expands on this by including the factors of perceived entertainment, social pressure, and apprehensiveness. With the latter two constructs, the adapted model addresses criticism regarding a technological determinist slant of the initial Technology Acceptance Model. Together with individual characteristics, the mentioned factors are expected to be either direct or indirect determinants of Smartphone usage intention. A brief overview of the corresponding research hypotheses, stating exactly which effects are theorized to be present, can be found in the segment hereafter.

3. Research questions and hypotheses

The purpose of this research is to investigate - and gain a better understanding of - the human motivations and perceptions involved in the process of Smartphone adoption. To do so, an adapted version of the Technology Acceptance Model will be employed, based on the research and various models discussed previously. The following hypotheses will be tested within the scope of this study:

Hypothesis 1: Perceived usefulness will have a direct effect on usage intention

Hypothesis 2: Perceived entertainment will have a direct effect on usage intention

Hypothesis 3: Social pressure will have a direct effect on usage intention

Hypothesis 4a: Perceived ease of use will have an indirect effect on usage intention through perceived usefulness
Hypothesis 4b: Perceived ease of use will have an indirect effect on usage intention through perceived entertainment

Hypothesis 5a: Apprehensiveness will have an indirect effect on usage intention through perceived usefulness
Hypothesis 5b: Apprehensiveness will have an indirect effect on usage intention through perceived entertainment

An additional, more exploratory part of this research focuses on specific demands and wishes a prospect buyer might have with regard to a Smartphone. The requirements such a device must meet are likely to differ from person to person and may bear correlations with some of the factors enquired after in the TAM-segment of this research. For instance, certain wishes might be affected by demographic factors or by social pressure as experienced by a prospect user. To illustrate: one could think of a possible relation between a respondent's score on the social pressure construct and the importance he or she attributes to a Smartphone's brand (as certain brands might be considered more fashionable than others). Two websites with Smartphone news and product descriptions will provide source material, in the form of comments made and questions posed by visitors, which will be analyzed for utterances about

these requirements. The results of this analysis will subsequently be used in an attempt to gain insights into what prospect Smartphone users want from those devices.

Thus, the main goal of this research is to examine the Smartphone acceptance process by young people, through applying an adapted version of the Technology Acceptance Model and empirically testing the possible determinants of Smartphone usage intention. A secondary goal is to gain insights into the requirements individuals have with regards to Smartphones and investigate possible relations between these requirements and the determinants of Smartphone usage intention.

4. Research methodology

The main part of this research is dedicated to the Technology Acceptance Model-based study on Smartphone adoption. An additional explorative part focuses on the requirements Smartphones must meet for their prospect users. First, the methodology for the TAM-based study will be discussed, followed by a section on the additional explorative research.

4.1 TAM study

The adapted TAM model was applied and the proposed hypotheses tested through a quantitative method of an online survey, the details of which will be discussed hereafter.

4.1.1 Population and sample

The survey was distributed among members of the younger generation, aged between 18 and 30. This group includes a large portion of all Smartphone buyers with young adults throughout their twenties, yet excludes the very youngest mobile phone users, to avoid issues with parental permission to partake in this research. Also, various motivations, such as peer pressure, money issues, et cetera, might apply (more severely) to those individuals than to slightly older consumers. Adoption numbers for the *exact* age group of this study were unavailable at the time of research, but as mentioned earlier, the age category of 18 through 34 was found to comprise 42 percent of all Smartphone users. (*Mobile Snapshot*, 2010).

The actual population, people aged between 18 and 30 who have yet to purchase their first Smartphone, can be considered somewhat of a niche for several reasons. As mentioned before, the Smartphone has seen impressive increases in sale figures, especially among a younger audience (comScore, 2010; Canalys, 2011; *Cisco Visual Networking Index*, 2010), causing young prospect adopters to be increasingly hard to reach (and arguably even more so for survey participation). Additionally, young people without a Smartphone are not necessarily adopters, as not everyone has the desire to purchase such a device in the (near) future. For matters of feasibility, the population for this research was expanded to include young people who had purchased a Smartphone recently (at the point of research), with a maximum length of use of 6 months. To compensate for this issue, respondents were explicitly asked to fill out the survey whilst keeping in mind all memories (of expectations, for instance) they had prior to the actual purchase of their Smartphone and to provide answers based on those recollections as much as possible.

Respondents were mainly gathered by a form of network sampling through online social networks (Facebook, Twitter) and to a lesser extent through other means, such as e-mail and word of mouth. Facebook contacts were asked to participate in the survey through the creation of an 'event', which enables Facebook users to send one-to-many invitations to all contacts (or a selection thereof). Such an event can be (and was) set up to remain current and visible to all contacts for a specific amount of time, consequently reminding all contacts of the survey over a prolonged period of time. Furthermore, Facebook and Twitter contacts were requested to suggest (additional) respondents and forward the online survey to their own contacts. The survey was formulated in English.

4.1.2 Operationalization and measures

A survey was distributed online through Facebook, Twitter and other social networks, by e-mail and through word-of-mouth. The survey comprised a total of 29 questions, including those regarding demographics (age, gender, level of education) and other aspects of respondents' backgrounds (such as details on their Smartphone use, if any). In order to clarify and exemplify what was meant by the term 'Smartphone', an introductory text provided respondents with a definition and examples of the Smartphone concept as used in this study.

The survey was mainly designed to collect data on the five constructs on which the adapted research model is based, namely: perceived usefulness, perceived ease of use, perceived entertainment, apprehensiveness, and social pressure. Each of these five constructs was operationalized by a number of questions within the survey, all of which were statements regarding the (future) use of a Smartphone, to which respondents were asked to respond by means of a five-point Likert scale (ranging from 'totally disagree' to 'totally agree'). As Davis (1989) points out, "[such] self-predictions, or 'behavioral expectations', are among the most accurate predictors available for an individuals' future behavior" (p. 331). All of the questions regarding the five constructs were formed after literature and the used scales were deduced from common scale measurements as used in existing studies.

Perceived usefulness

The construct of perceived usefulness addressed the extent to which the use of a system is anticipated to increase productivity. In this study, it was measured by three indicators which were adapted from related previous research by Park and Chen (2007) and Venkatesh and Davis (2000), which studied adoption of Smartphones and computer systems respectively.

Among various studies, the items to measure PU show considerable overlap (see also Cho, 2011; Vijayasarathy, 2004; Wang, Lin & Luarn, 2006) and the ones which were the most common and mutually distinct were used for this research. Subsequently, the selected items were adjusted in such a way to be relevant to the Smartphone adoption study. Respectively respondents were asked to indicate the extent to which they agreed or disagreed (on a five-point scale) with the following statements:

- *Using a Smartphone in my day-to-day life would enable me to accomplish tasks more quickly.*
- *Using a Smartphone in my day-to-day life would make me more efficient.*
- *Using a Smartphone would make my day-to-day life easier.*

Perceived ease of use

Perceived ease of use – the degree to which user expect system use to be free from effort - was measured by several items which were adapted from the same studies by Park and Chen (2007) and Venkatesh and Davis (2000). Again, comparison with other studies revealed many similarities between the items used to measure this construct (e.g. Kim & Garrison, 2008; Wang et al, 2006) and four items were selected for this research and adapted to fit this study accordingly. By means of mentioned five-point scale, respondents were to indicate whether they agreed or disagreed with the following statements:

- *Learning to operate the Smartphone would be easy for me.*
- *My interaction with the Smartphone would be clear and understandable.*
- *I would find the Smartphone to be user-friendly and flexible to interact with.*
- *Interacting with the Smartphone would require a lot of mental effort.*

Perceived entertainment

The items used to measure perceived entertainment – the level of fun associated with system use - were mainly based on the research on computer system adoption by Igbaria et al. (1996) and Bruner and Kumar's study on handheld Internet devices (2003). Both studies addressed this hedonic aspect. Respondents were asked to indicate on a five-point scale whether they agreed or disagreed with the following three statements:

- *Using a Smartphone will be enjoyable.*
- *Using a Smartphone will be entertaining.*
- *Using a Smartphone will make me want to explore the device further.*

Apprehensiveness

The measures for the construct of apprehensiveness, which regards anxiety towards (using) a system, were formed after Igbaria (1993) and research on adoption of computer software (Walczuch et al, 2007) and online shopping (Vijayasarathy, 2004). While Igbaria's research addressed anxiety as a single construct, the latter two studies addressed issues such as privacy, security and insecurity separately. The items used by these studies are either similar to apprehensiveness or cover considerable aspects of it. Based on these studies and on that performed by Kwon and Chidambaram (2000), the three items were constructed to measure apprehensiveness. Survey respondents were asked to indicate whether they agreed or disagreed with the following statements:

- *I would be comfortable using a Smartphone for storing personal information*
- *I would trust my data and information to be secure in a Smartphone*
- *I would worry about my privacy being affected by using a Smartphone.*

It must be noted that, due to the wording of the items, this construct measures the degree of absence of apprehensiveness, instead of the degree of presence thereof. This nuance merely implies that a high score on apprehensiveness means that an individual will in fact be comfortable with Smartphone use, instead of uncomfortable.

Social pressure

The construct of social pressure, addressing relations between Smartphone adoption and considerations regarding social influences and status, was measured by indicators formed after the ones used in studies by Igbaria et al. (1996), Venkatesh and Davis (2000) and Cho (2011). Indicators in said literature show many common aspects, most of which can be traced back to Fishbein and Ajzen's TRA (1975). Three indicators were formulated for use within this research. Respondents were instructed to indicate their agreement or disagreement with the following statements:

- *Having a Smartphone will be a status symbol.*
- *People who have a Smartphone have more prestige than those without one.*
- *My decision to purchase a Smartphone has been influenced by friends who already had such a device.*

Usage intention

In order to determine usage intention (the dependent variable in this research) respondents were asked to give an indication of their expected use of a list of Smartphone features and capabilities. Considering the various possibilities and applications offered by Smartphones, it

is virtually impossible to provide an exhaustive list of such. Therefore, the options from which participants could choose were formulated broadly, covering a wide range of possible uses. The list included basic features such as texting and placing telephone calls, and more 'advanced' features such as data synchronization, social media connectivity and browsing the Internet. Moreover, respondents were given the opportunity to report (intention of using) additional features, to avoid overlooking any not predefined features. The expected use of each feature was to be indicated on a five-point scale, ranging from 'never' to 'often' (for the complete list see Appendix A, question 1).

4.1.3 Score measurement

The scores of each respondent on the individual constructs was eventually calculated by adding up the item scores related to that construct and dividing the results by the number of items within that particular construct. For instance, the construct of perceived ease of use was measured by means of four questions with a five-point Likert scale, with 1 representing 'totally disagree' and 5 representing 'totally agree'. A respondent's score on the PEOU construct would then be the average of the values from his or hers four answers. In order to be able to perform calculations on usage, the same method was applied to obtain a single value indicating overall use. This was performed by averaging the results of the answers as given by each individual respondent when asked to indicate their usage intention with regard to the various functionalities offered by Smartphones.

4.2 Exploratory study

An additional part of this research focuses on the demands (prospect) users have with regard to Smartphones and can be divided into two parts. First, a number of online sources were examined in order to map which particular properties people would like a Smartphone to have. And secondly, the outcomes of this exploration were used to draw up a list of most recurring features and properties. This list could then be used for an additional segment of the survey, in which respondents were asked to indicate the importance of those issues when purchasing a smartphone. Subsequently, the respondents' input on this aspect could be used to gain insights in possible correlations with TAM-aspects, such as demographics or their scores on one or more of the constructs.

4.2.1 Analysis of online sources

For the first exploratory part of the research regarding Smartphone requirements, units of analysis were consumers with Smartphone interest, looking to purchase a Smartphone or at least familiarizing themselves with such devices on the Internet. A considerable number of comments, remarks and questions regarding Smartphones are available online (e.g. on price comparison sites). For the proposed study, two types of online sources were used. On the one hand, data collection concentrated on question segments within specific Smartphone topics on a price comparison website (*Kieskeurig.nl*). On the other hand, the focus was laid on the comment sections of news articles regarding Smartphones on *Tweakers.net*.

Various websites offer the Internet user the possibility to compare products and prices, exchange thoughts on and pose questions about a large variety of consumer products, among which are Smartphones (to name a few: Google Shopping, Kieskeurig.nl, Beslist.nl, Tweakers.net). For many people, such websites play an important role in the process of familiarizing oneself with a product, before the actual purchase. As Broeckelmann and Groeppel-Klein state: "Indeed, consumers often state that searching for information before making a purchase decision is a very important feature of the Internet" (2008, p. 150). For instance, on a price comparison website such as Kieskeurig.nl, one can find information on (nearly) all Smartphones currently available, compare prices of different stores, view specifications, users' evaluations, et cetera. Each Smartphone has its own product page with dedicated segments for device specifications, price comparison, visitor reviews and visitor questions. Here, questions regarding feature availability are multitudinous and these pages were thus anticipated to offer vast amounts of (prospect) user input regarding Smartphone requirements. In addition, websites as Androidplanet.nl, iPhoned.nl and, again, Tweakers.net present a daily updated stream of news items regarding Smartphones in general or specific brands or types. Many of the articles featured on those websites deal with newly released Smartphones, rumors of yet to be released types, and future plans of the companies responsible for those devices. Aforementioned websites (among others) all offer their users the option to respond to articles and the respective comment sections consequently fill up with varied opinions, claims and questions. Research data was gathered on Kieskeurig.nl and Tweakers.net, since those two were the most popular websites within their own categories (Dutch price comparison websites and IT-news websites respectively) measured by unique visitors (*The 100 most-visited*, 2011).

Considering the nature of numerous comment sections on websites in general (easily accessible, little or no comment 'screening'), not all of the comments were expected to offer

equal value for this research. However, many utterances could be of relevance to this study, since visitors of mentioned websites frequently give their opinion (based on own experiences or expectations) about announced, rumored or reviewed phones. Comments like these are abundant throughout mentioned (and other) websites and were expected to offer an insight into how 'consumers' feel about certain aspects, which features they either appreciate or disvalue and which features might have certain priority over others.

4.2.2 Methodology

Since many websites attract and aim at a certain audience (laymen, IT-specialists), the average level of subject knowledge and thus the nature of comments may vary among the websites. Therefore, the research sample was extracted from a website aimed at consumers in general and one aimed at a more 'knowledgeable' audience, thus pursuing diversity in data sources.

The two online sources used for this analysis are Tweakers.net (http://tweakers.net) and Kieskeurig (http://www.kieskeurig.nl). Tweakers.net is one of the major Dutch websites offering a broad range of IT-related news, from PC hardware to console games and from government internet policies to Smartphones. Within this last category, the website features a vast news sections with articles on all sorts and brands of Smartphones, regardless of operating systems (Adroid, Symbian, iOS, et cetera) and on numerous other areas surrounding the topic of Smartphones (such as technical or legislative developments and financial matters). According to Tweakers.net, the website attracts roughly 3,500,000 unique visitors per month (Tweakers.net FAQ, 2010). Kieskeurig is one of the main Dutch product comparison websites, offering information on myriads of products and on which visitors can post their own reviews or ask question about them to fellow visitors. Kieskeurig claims to reach five million unique visitors monthly (Kieskeurig.nl. n.d.)

4.2.3 Sample

The sample frame comprised consumers with Smartphone interest, looking to purchase a Smartphone or at least familiarizing themselves with such devices on the Internet. According to Kieskeurig (*Adverteren*, n.d.), the target audience of the website is very broad and can in fact be described as "the consumer" and as such, this audience was expected to display a lower level of subject expertise. This in turn could result in questions and statements with a lesser degree of subject knowledge, revealing more immediate, obvious, yet important issues.

Therefore, the user comments from Tweakers.net were included to enrich the data. Due to the target audience of Tweakers.net, mainly IT-professionals and 'people with excessive interest in computers' (*Tweakers.net FAQ*, 2010), the user comments on this website were likely to exhibit a somewhat higher level of expertise than comments of 'average Internet users' (those without excessive IT-interest). A possible advantage of this level of expertise could be that this type of user would be better able to express their opinion, formulate arguments or pin-point possible up- or downsides regarding Smartphones. A drawback could be that those users would not be representative for the 'average Internet user'. The sample for this test analysis thus aimed to represent a balanced mix of information sources with regard to expertise level.

4.2.4 Data collection

To demarcate the amount of data to be analyzed, ten 'topics' (news article; product comparison entry) of both sources were selected based on their date of issuing: between January 1, 2011 until April 1, 2011. The news articles on Tweakers.net regarding Smartphones were retrieved from the corresponding category (*Nieuws in Smartphones*, n.d.) and further selected based on their subject (to illustrate, articles such as 'Manufacturer X releases Phone Z with slide-out keyboard' would be included, whereas 'Manufacturer X cuts 30% of jobs' would not, as the former article appeared much more likely to draw relevant comments from visitors than the latter).

A method of filtering was also applied to the content of Kieskeurig: products were filtered on Smartphones which were on sale at the time of analysis, April 2011, and subsequently sorted on popularity (i.e. most searched-for products). The top ten of Smartphones that followed (of a total of 174), showed a blend of Smartphones from different brands (e.g. HTC, Apple, RIM, Nokia, LG) and different operating systems (e.g. iOS, Android, Symbian), making for a rough reflection of the Smartphone market, while keeping the amount of data manageable. Generally, within each product entry, both product reviews (as placed by website visitors) and questions (as asked by visitors) are visible; for the purpose of this analysis only the questions were examined. All user utterances within these sections dating from January 1, 2011 until April 1, 2011 were read and analyzed (the same time span as used for analysis of Tweakers.net), all phrases regarding users' opinions on device properties were indicated, and any recurring themes (were) noted down and summarized.

4.2.5 Quantification of requirements

As enunciated previously, the outcomes of mentioned explorations were then used to draw up a list of the features and properties that appeared to be the most important for individuals when considering to purchase a Smartphone. This in turn facilitated the inclusion of an extra segment in the survey used for the TAM-study as discussed before. In this segment, survey respondents were presented with a list of Smartphone properties and features and requested to indicate which of those would be of importance when purchasing a Smartphone. Answers were to be provided by means of a three-point scale, ranging from ‘not at all important’ to ‘very important’. The results from this survey segment were then examined for possible correlations with results from the TAM-study.

5. Results

This chapter deals with the results of both the online TAM-survey and the exploratory segment on users' requirements with regard to Smartphones.

5.1 TAM-study

5.1.1 Respondents demographics

A total of 95 respondents participated by at least partially filling out the survey. Out of this group, 82 participants completed the entire survey, 9 of which had to be disqualified for not meeting the population description (either being older than 30 or having had a Smartphone longer than 6 months at the time of the research). As a result, responses from 73 of individuals were analyzed. Due to the employed method of network sampling, the actual response rate cannot be calculated as it is unknown how many individuals have been reached.

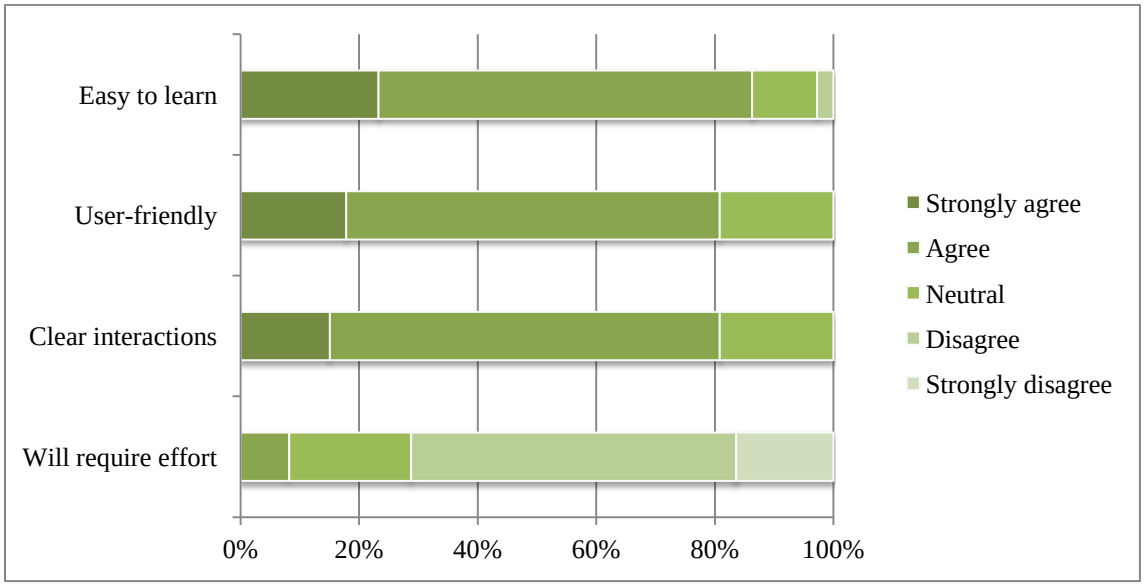
The respondents (n=73) were almost equally distributed regarding gender, with 51 percent being male and 49 percent female and age of the respondents ranged from 18 through 30, with a mean of 26. Results on a question regarding education leaned towards the higher educational levels, as 44 percent indicated to have a Bachelor's degree and 38 percent said to have achieved a Master's degree. The remaining 17 percent of the respondents had a college degree or lower. Approximately two-third of the respondents had had a Smartphone for less than six months; the remaining one-third had not yet purchased a Smartphone at the time of data-collection, but reported an intention to do so.

5.1.2 Respondents' scores on factor indicators

Guiding by the calculated average of the three multi-items on which perceived usefulness was based, over 65 percent of the respondents expected a Smartphone to be useful. Perceptions were especially high with regard to ease of use: over 80 percent of the respondents (averaged over the four items measuring PEOU) expected Smartphone use to be clear, user-friendly and easy to learn (see figure I, p.32). Even higher were scores on perceived entertainment: the average score over the three items to measure PE was 89 percent. Over 94 percent of respondents indicated to agree or strongly agree with the statement that Smartphone use would be enjoyable. The scores on both apprehensiveness and social pressure were lower. Less than half of the participants (40%) indicated that they trust their personal information to be secure in a Smartphone. Additionally, 37 percent of respondents were worried about their

privacy being affected by using a Smartphone. With respect to social influences, it is noticeable that a majority of nearly 70 percent of respondents either disagrees or strongly disagrees with the statement that people with a Smartphone have more prestige than those without one. Also, 50 percent does not find a Smartphone to be a status symbol. Detailed information on the distribution of respondents' perceptions regarding the individual indicators can be found in Appendix B.

Figure I. *distribution of perceptions with regard to ease of use*



(Note that the fourth item has been worded 'negatively')

5.1.3 Reliability

To determine internal reliability of the multi-items used to measure the five TAM-constructs, Cronbach's alpha was calculated for each one. Internal reliability refers to "the degree to which measures are free from error and therefore yield consistent results". (Peterson, 1994, as cited by Mishra & Bhaskar, 2010). Cronbach's alpha is a popular test to determine internal consistency among a group of multi-items which are meant to measure a single construct, as it is used in this study. According to the literature, a rate of 0.70 or higher is considered acceptable (Nunnally 1978; Mishra & Bhaskarm, 2010) The results of the calculations, as shown in table I on the following page, reveal that the scores for all five multi-items equaled or exceeded 0.70 and thus measured the respective constructs with sufficient reliability. Consequently, no individual item needed to be removed from the survey results before proceeding with further analysis.

Table I. *Cronbach's alpha for the five used constructs*

Construct	**Cronbach's *α***
Perceived usefulness	.79
Perceived ease of use	.72
Perceived entertainment	.70
Apprehensiveness	.72
Social pressure	.70

Subsequently, validity of the five constructs was to be tested. As mentioned, these constructs were intended to be measured by five multi-items, one of which was operationalized by four indicators (perceived ease of use), the remaining four were made up of three indicators (questions). To verify whether these indicators as a total had correctly and uniformly measured the respective factors they were intended to measure, factor analysis was applied to the entire group of 16 indicators. This test not only enabled to check for coherence, it also allowed for generation of composite variables representing each construct. The cumulative factor solution represented 68.37 percent of data variance. The results of the factor analysis show that each individual item had a loading of 0.585 or higher (up to 0.867) on its corresponding construct (see table II), with factor loadings below 0.5 suppressed). None of the items loaded on other factors (with loadings over 0.5) than on the ones hypothesized. This lends support to the validity of the presented measures for the five constructs; perceived ease of use (PEOU), perceived usefulness (PU), social pressure (SP), apprehensiveness (App), and perceived entertainment (PE)).

Table II. *Factor loadings on all respective items for the five constructs*

	Components				
Items	1	2	3	4	5
PEOU 1	.794				
PEOU 2	.749				
PEOU 3	.708				
PEOU 4	.627				
PU 1		.867			
PU 2		.859			
PU 3		.709			
SP 1			.827		
SP 2			.659		
SP 3			.585		
App 1				.863	
App 2				.861	
App 3				.610	
PE 1					.746
PE 2					.718
PE 3					.686

PEOU = perceived ease of use; PU = perceived usefulness; SP = social pressure, App = apprehensiveness; PE = perceived entertainment.

5.1.4 Hypotheses testing

Based on the factor analysis, respondents' scores on the five multi-item constructs were thus converted into one composite score for each construct to facilitate further analysis. A number of negatively worded items were re-coded before calculating composite scores, in order to achieve univocal outcomes and to avoid confusion later on in the analysis process. As explained earlier (see segment 4.1.3), the score for respondents' usage intention was calculated on the basis of their usage indications of various functionalities offered by Smartphones (see survey question no. 1, Appendix A). The scores for all items were added up and divided by the number of items (14), resulting in one score for usage per respondent.

Regression analysis was subsequently performed on overall usage intention (dependent variable) and the five constructs (independent variables) to test for causal relationships as hypothesized earlier and as expected on the basis of related TAM-research as previously discussed. The results of the regression are provided in table III below.

Table III. *Regression results*

Dependent variable:	**Adjusted R2:**
Usage intention	.13

Independent variables	**Beta**	**t**	**Sig.**
Perceived Ease of Use	.06	0.57	.568
Perceived Usefulness	.32	2.87	.005
Social Pressure	.04	0.38	.708
Apprehensiveness	.00	0.04	.965
Perceived Entertainment	.30	2.71	.009

As shown by the regression results in table III, both perceived usefulness and perceived entertainment had a significant effect on usage intention ($\beta = .32$, /p/ $\leq .01$ and $\beta = .30$, /p/ $< .01$), and is consistent with the research model. In spite of the low adjusted R^2 (.133), the research thus supports hypothesis 1 and hypothesis 2 (i.e. 'perceived usefulness will have a direct effect on usage intention' and 'perceived entertainment will have a direct effect on usage intention'). It can be noted that adjusted R^2 rises to .164 when only perceived usefulness and perceived entertainment are tested for their effect on usage intention. However, the results show no significant direct effect for social pressure on usage intention, although this had been theorized to exist: hypothesis 3 ('social pressure will have a direct effect on usage intention') is therefore not supported by the results. Neither apprehensiveness nor perceived ease of use show significant impact on usage intention, but these factors were expected to influence usage intention *indirectly*, via either perceived usefulness or perceived entertainment. These results therefore do not call for rejection (or support) of any of the hypotheses.

To further explore any relations among the variables, correlations analysis was first performed on both variables which exhibited a significant effect on usage intention (perceived usefulness and perceived entertainment), paired with all remaining variables. The results (table IV, following page) show additional correlation between perceived usefulness and social pressure ($r = .334$, /p/ $< .01$), and correlations of perceived entertainment with perceived ease of use ($r = .272$, /p/ $< .05$), social pressure ($r = .255$, /p/ $< .05$), and apprehensiveness ($r = .284$, /p/ $< .05$).

Table IV. *Correlations for PU and PE with all five constructs*

		PU	PEOU	PE	SP	App
PU	Pearson Correlation	-	.014	.026	**.334**	.193
	Sig. (2-tailed)		.909	.830	**.004**	.103
PE	Pearson Correlation	.026	**.272**	-	**.255**	**.284**
	Sig. (2-tailed)	.830	**.020**		**.030**	**.015**

PEOU = perceived ease of use; PU = perceived usefulness; SP = social pressure, App = apprehensiveness; PE = perceived entertainment.

Thus, the correlation results not only hinted towards the hypothesized effects of both perceived ease of use *and* apprehensiveness on perceived entertainment, but also towards additional effects. Contrary to expectations, no significant correlation was found between perceived ease of use and perceived usefulness. Moreover, apprehensiveness and perceived usefulness also exhibited no significant correlation. The lack of such correlations thus argues for rejection of both hypothesis 4a and hypothesis 5a, which respectively stated that perceived ease of use and apprehensiveness would have an indirect effect on usage intention through perceived usefulness.

Regression analysis was subsequently applied to social pressure paired with perceived usefulness, to determine whether the former had any effect on the latter. The same was done with perceived ease of use, social pressure and apprehensiveness (as independent variables), together with perceived entertainment (as the dependent variable). Table V (below) and VI (on the following page) show the resulting values.

Table V. *Regression results – PU with Social pressure*

Dependent variable:	**Adjusted R^2:**
Perceived Usefulness	.099

Independent variable	**Beta**	**t**	**Sig.**
Social Pressure	.33	2.98	.004

Although R-squared is rather low, the regression analysis shows a significant and positive effect of social pressure on perceived usefulness ($\beta = .33$, $/p/ \leq .01$). This does not support or reject any of the hypotheses, as social pressure was only theorized to directly influence usage intention, in line with previous research. However, this outcome is consistent to that of other studies (Venkatesh & Davis, 2000; Cho, 2011), in which similar effects of social pressure on perceived usefulness were found. This leads to believe that this result could be expected in future similar research.

Table VI. *Regression results – PE with PEOU, Social Pressure and Apprehensiveness*

Dependent variable:	**Adjusted R^2:**
Perceived Entertainment	.163

Independent variable	**Beta**	**t**	**Sig.**
Perceived ease of use	.31	2.69	.009
Social Pressure	.27	2.34	.022
Apprehensiveness	.16	1.37	.174

Table VI shows that a significant effect exists of perceived ease of use on perceived entertainment ($\beta = .31$, $/p/ \leq .01$). This therefore supports hypothesis 4b, which theorized that perceived ease of use would have an indirect effect on usage intention through perceived entertainment. Additionally, social pressure was also found to have an impact on perceived entertainment ($\beta = .27$, $/p/ \leq .05$), which had not been hypothesized. Together, the two constructs of perceived ease of use and social pressure, explain 15 percent of variance in perceived entertainment. The effect of perceived ease of use on perceived entertainment is thus shown to be stronger than that of social pressure on that same factor.

The third variable however, apprehensiveness, does not show a significant direct impact on perceived entertainment. These findings thereupon suggest rejection of hypothesis 5b (i.e. 'apprehensiveness will have an indirect effect on usage intention through perceived entertainment'), although the two variables did exhibit a significant correlation (as demonstrated earlier, see table IV). For this reason, another correlation test was performed, checking for correlations between apprehensiveness and any of the remaining variables. This could reveal any indirect effects of apprehensiveness on perceived usefulness or perceived entertainment, either through perceived ease of use or social pressure (see table VII).

Table VII. *Correlations for Apprehensiveness with all five constructs*

		PU	PEOU	PE	SP	App
Apprehensiveness	Pearson Correlation	.193	.153	.284	**.286**	-
	Sig. (2-tailed)	.103	.197	.015	**.014**	

PEOU = perceived ease of use; PU = perceived usefulness; SP = social pressure, App = apprehensiveness; PE = perceived entertainment.

As shown, the test results demonstrate a correlation between social pressure and apprehensiveness (r = .286, /p/ < .05), which in turn called for another regression analysis to be performed, testing apprehensiveness for a direct effect on social pressure (table VIII)

Table VIII: *Regression results*

Dependent variables:	**Adjusted R^2:**
Social pressure	.069

Independent variable	**Beta**	**t**	**Sig.**
Apprehensiveness	.29	2.52	.014

Evidently, apprehensiveness did indeed exhibit a significant effect on social pressure (β = .29, /p/ ≤ .05) with an adjusted R^2 of .069. It could be argued that this result offers some support for hypothesis 5b, as social pressure has in turn been found to affect perceived entertainment and a correlation between apprehensiveness and perceived entertainment has also been demonstrated. Apprehensiveness appears to have an effect on perceived entertainment, although small and in an indirect manner. This outcome seems to argue for support of hypothesis 5b, yet with some reservations.

5.1.5 Effect of demographic factors

The initial model as proposed by Kwon and Chidambaram (2000) suggested relations between demographic factors and the three constructs of ease of use, apprehensiveness and social pressure. Except for a correlation between age and social pressure, no significant evidence was found for these relations in the previous studies. Similar analyses were performed for the study at hand and as expected, the results showed no significant correlations between respondents' individual characteristics (gender, age and education) and perceived ease of use, social pressure or apprehensiveness (see table IX).

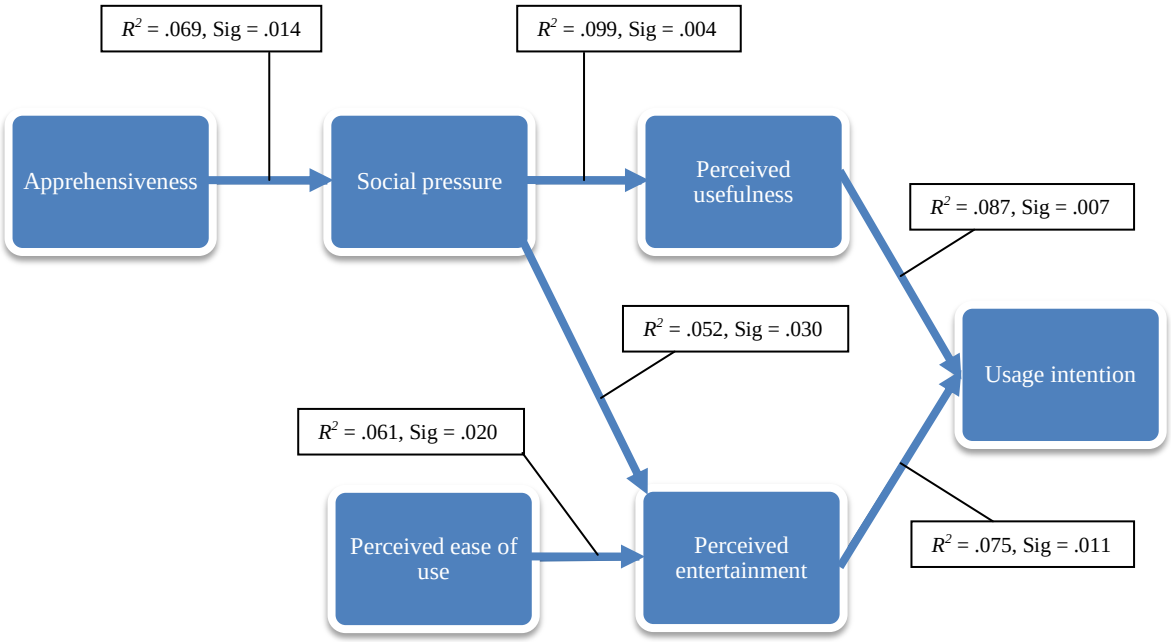
Table IX: *Correlations for demographic factors with PEOU, SP and App*

		PEOU	SP	App
Gender	Pearson Correlation	-,040	,136	-,077
	Sig. (2-tailed)	,736	,252	,518
Age	Pearson Correlation	-,247	,015	-,052
	Sig. (2-tailed)	,035	,897	,664
Education	Pearson Correlation	,044	,064	,010
	Sig. (2-tailed)	,709	,591	,934

PEOU = perceived ease of use, SP = social pressure, App = apprehensiveness

Based on the discussed results, the model is visualized in a manner proposed by Kwon and Chidambaram (2000), yet with its own distinctions (figure II, below).

Figure II. *Proposed model after research*



5.2 Results analysis of website users comments

Visitor comment segments of two websites, Kieskeurig.nl and Tweakers.net, were analyzed in order to gain insight into which Smartphone properties and features are of concern to their prospect users.

5.2.1. Results Kieskeurig.nl

For Kieskeurig.nl, a product and price comparison website, analysis focused on website visitor questions regarding the ten (at that time) most popular Smartphones on Kieskeurig (Apple iPhone 4, HTC Wildfire, BlackBerry 8520, Samsung Galaxy Ace, HTC Desire HD, Sony-Ericsson Xperia X10 Mini, Nokia N8, Samsung Galaxy S, HTC Desire Z, and BlackBerry 9800[1]). All comments regarding Smartphone features were filtered and accumulated, which lead to the list as presented in table X. The categories in the list were formed while analyzing.

Table X: *Smartphone features and properties – Kieskeurig.nl*

Smartphone feature/property	Frequency	Percentage
Battery life	22	16,2%
Build quality	17	12,5%
Applications	15	11,0%
Keyboard type/functionality	14	10,3%
Display properties	12	8,8%
Price/phone plan	10	7,4%
E-mail/agenda/contacts synchronization	7	5,1%
Wi-Fi connectivity	7	5,1%
Camera specifications	7	5,1%
Sound quality	6	4,4%
Other	19	14,1%
Total	136	100,0%

The list reveals that the Smartphone battery is the most frequently recurring theme. The comments that fall within this category are rather straightforward and unequivocal: people want a battery that lasts ‘long’ under ‘regular’ use (with ‘long’ generally meaning longer than 24 hours). Over 16 percent of all comments regarded battery life, as shown in table 14. Visitors complain about battery life of their current phones or ask whether the battery of a certain phone will enable them to use the phone for more than one day without having to

[1] The complete list of URL’s for the ten most popular phones at Kieskeurig.nl can be found in appendix B.

recharge, as they have ‘heard’ that Smartphone batteries generally run out quickly (in a day or, under extensive use, in a couple of hours even).

The second most recurring category, *build quality*, contains comments on the toughness or solidity of a Smartphone, yet such comments occasionally overlapped with aesthetics. Individuals for instance mentioned the ruggedness and (aesthetic) appeal of a metal body or disapproved a certain design because of the use of ‘cheap plastic’ which made it look flimsy. However, on Kieskeurig.nl, comments purely on build quality were abundant and for that reason, the distinction was preserved. Comments purely regarding device design (aesthetics) were scarce and were eventually categorized under *other* in the list in table X.

The third category is compounded of a very broad selection of comments with one common aspects: in one way or another, they all regard applications (‘apps’: the special task-dedicated software (programs) that can be installed on Smartphones). For instance, individuals enquired after the availability of specific applications (such as *Skype* or *Whatsapp*) for the device they intended to purchase, or wanted to know whether certain apps could be used without Internet connection.

The fourth largest category, *keyboard*, mainly contains comments regarding keyboard type: on-screen touch keypads (being ‘non-physical’ emulations of a genuine keyboard) or real, tangible keyboards, which come in various forms (readily available or to be revealed by means of a sliding mechanism). Some of these comments showed overlap with issues that were categorized under build quality, as individuals enquired after, or showed concerns about the durability of keyboard sliding mechanisms.

The four categories mentioned above each contain more than ten percent of issues that resulted from analysis. The remaining (named) categories hold between four and ten percent of most frequently recurring issues. Questions regarding the size or resolution of Smartphone displays, or on the display technique (e.g. LCD, AMOLED), were all classed under ‘display’, along with questions about the workings of the display (accuracy, amount of pressure needed to operate the screen, response delays after touching, et cetera). Other recurring issues are the sale prices of a device and subscription options from carriers. Either way, these issues concerns financial consideration and were therefore classed under the same category.

Various questions were raised regarding synchronization. These questions concerned email synchronization in general and (Microsoft) Outlook synchronization specifically, with visitors stressing the importance of this feature to synchronize emails, contact information and agenda (settings) between a computer and the Smartphone. As a visitor states: “My current Samsung i9000...[was] a total drama. Before I chuck it away, I want to know for sure whether

the iPhone 4 indeed will synchronize properly" (Frits51, 2011, March 1). Comments and questions like these were categorized under *e-mail/agenda/contacts synchronization*.

Furthermore, a number of individuals (n=7) asked whether the device of their liking was capable of connecting to a wireless network (categorized under 'Wi-Fi connectivity) and an equal number of people enquired about camera specifications (e.g. amount of megapixels, image quality). The final distinct category, 'sound quality' contains comments and questions regarding sound volume and quality of both the internal and external speaker, be it with phone calls (voice) or playback of music, videos, et cetera. The content of the categories as discussed above, together make up for over 85 percent of all analyzed user utterances. The remaining 14 percent concerned widely varying issues (such as GPS-signal quality, data storage capacity, Internet browsing speed) which did not recur more than twice and did not fall within any of the above categories. For practical reason, they have here been classed under 'other'.

5.2.2. Results Tweakers.net

The analysis of ten news articles on Tweakers.net[2] revealed similar issues to be at play, but it also showed differences in categories and frequency with which certain issues recurred. The results can be found below, in table XI.

Table XI: *Smartphone features and properties – Tweakers.net*

Feature/property	Frequency	Percentage
Battery life	24	12,2%
Design	21	10,7%
Display	18	9,2%
Performance	17	8,7%
Keyboard type/functionality	15	7,7%
Device size/weight	14	7,1%
Price/phone plan	12	6,1%
Operating system	12	6,1%
Camera specifications	11	5,6%
Firmware update frequency	9	4,6%
Build quality, materials used	8	4,1%
Sound quality/volume	6	3,1%
Other	29	14,8%
Total	196	100,0%

[2] The complete list of URL's for the ten news articles from Tweakers.net can be found in appendix B.

Here, *battery life* appeared to be the major issue as well (with over 12 percent of all comments), for the same straightforward reasons as given by visitors of Kieskeurig: Smartphone batteries are considered or expected to run out of energy too quickly. Slightly contrary to what was observed on Kieskeurig, visitors of Tweakers.net were more concerned with the *design* of Smartphones (10.7 percent of the comments) than with the *build quality or materials used* (addressed by only 4.1 percent of all comments). This could be due to the nature of both sites: in news articles on Tweakers, users frequently comment on newly announced Smartphones of which, in general, not much is known about build quality yet. Kieskeurig offers a base of experienced users to whom newcomers can pose questions regarding issues such as reliability or build quality.

Similar to what was found on Kieskeurig, issues belonging to the categories of *display* and *keyboard properties* are abundant. Comments on Tweakers regarding keyboards mainly make the distinction between physical and on-screen keyboards. Here, the tenor seems to be that physical keyboards are preferred for typing extensive texts and the on-screen variants for shorter amounts of text; preference seems to depend on the (main) purpose for which a potential buyer wants to purchase a Smartphone. Items from two other categories found in the Kieskeurig list, *device price or phone plan*, and *camera specifications* were also found to be recurring items on Tweakers, all generally for the same reasons.

On the other hand, *Smartphone performance*, *operating system* and *firmware update frequency* are issues that recurred much more frequently on Tweakers than they did on Kieskeurig (if at all). This seems to confirm what has been suggested earlier and might thus (partly) be due to the nature of the audience of both websites: the IT-interested visitor of Tweakers is likely to exhibit a stronger interest in the hardware and software specifics of a Smartphone than is the 'average consumer' of Kieskeurig. Regarding this bias of Tweakers users towards technical specifications, the largest category out of these three particularly stands out: *performance*. This category is absent in the list of Kieskeurig items, yet it is the fourth largest category for Tweakers. It mainly contains remarks about properties of the CPU (central processing unit, i.e. the 'microprocessor') and the amount of RAM (the Smartphone's 'working memory', which enables it run multiple applications at the same time – roughly put: the more RAM, the better a system performs). In contrast to the utterances on Kieskeurig, these technical properties bear much importance to the visitor of Tweakers.net and many indicate that they expect newly released phone to surpass previous ones in terms of processing speeds, or in broader terms, 'performance'. In most comment sections on Tweakers, dual-core CPUs is a frequently recurring theme, since that is currently considered to be 'top of the line'.

Visitors for instance state that they are prepared to wait for models yet to be released that will have such a CPU, instead of purchasing one that actually has been released but does not hold a dual-core processor (Sinister81, 2011, March 3).

To wind up with, the final category of the list is equal to the last on the list of Kieskeurig and regards sound quality and volume, with the same explanation applying. The categories as listed in table XI together make up for over 85 percent of all analyzed comments. Similarly to the results of Kieskeurig.nl, the remaining comments concerned widely varying issues and were accumulated within the final category of 'other'.

5.2.3. Requirements segment of survey

The two category lists which resulted from analysis of comments on both Kieskeurig.nl and Tweakers.net were subsequently merged into one list, in order to realize an aggregate on which the ensuing survey segment could be based. For this segment, the ten most frequently recurring items from this ultimate list of Smartphone features and properties were used. The category of 'applications' was excluded because, as explained, this category contained widely divergent issues which only had their application-related nature in common. Although the importance of issues that fell within this category is clear, it was deemed too complex a category to address by (closed) survey questions. However, because of its apparent importance, diversity and complexity, it can be a target of future research.

The two categories of *design* and *build quality/materials used* were merged into one for survey implementation. This is justified by the overlap between both categories and enabled for broader coverage of items without adding extra survey items. Furthermore, *brand* (e.g. Apple, HTC, Samsung) was included as a factor, although this was not categorized as a frequently recurring issue. However, because most analyzed sources regarded specific Smartphones (either in a Tweakers news article or on a Kieskeurig product page), the issue of Smartphone brands was suspected to be underrepresented. To illustrate: on Kieskeurig for example, preference for a specific brand is already implicitly expressed by asking questions on the dedicated page. This was not quantified during the analysis (as it was not explicit), but considered relevant nonetheless and therefore not to be left out when asking survey respondents for their requirements towards Smartphones.

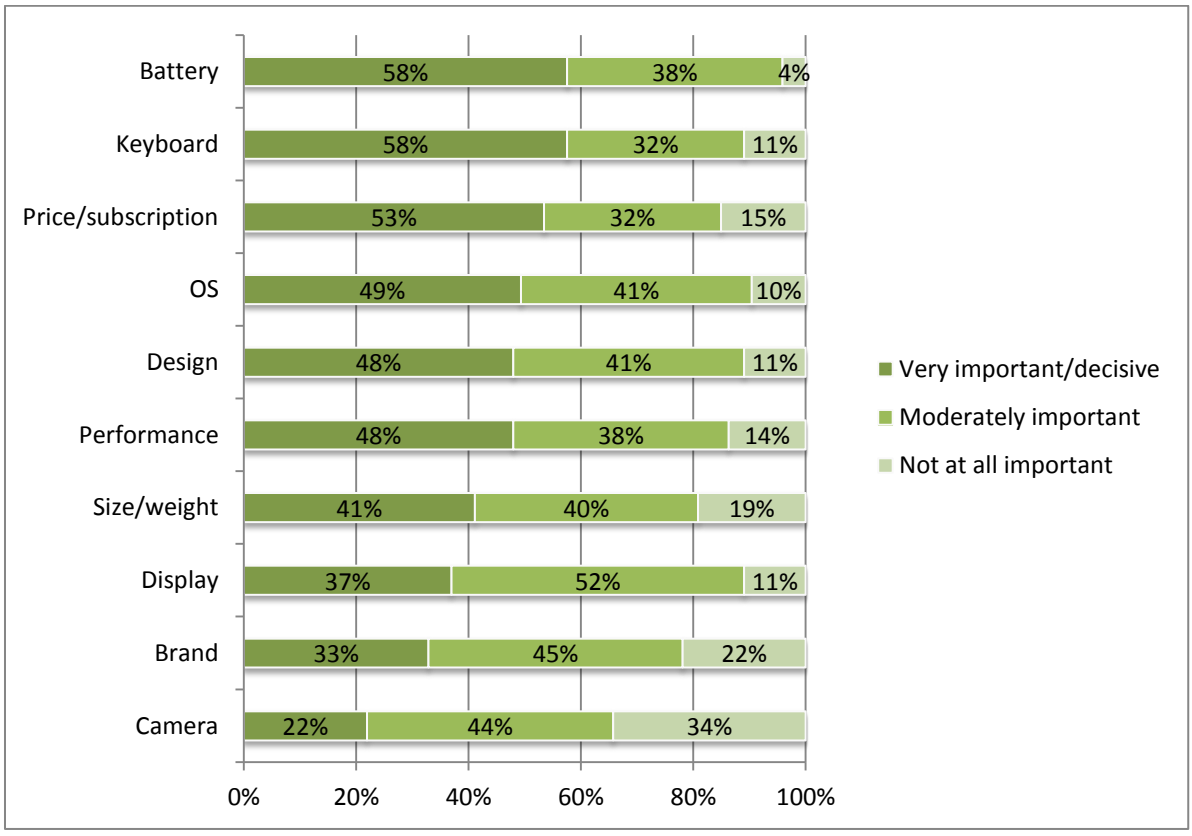
The ten items eventually used in the survey segment concerned the following issues, in order from most recurring to less recurring: battery life, display, keyboard, brand, camera, design, display, keyboard, operating system, performance, price, and size/weight. Their exact

wording can be found in Appendix I, question 9.

5.2.4 Survey results for requirements

This survey segment received a total of 73 valid responses on all ten items. Answers were to be provided by means of a three-point scale, ranging from ‘not at all important’ to ‘very important’. The results are displayed in figure XII.

Figure XII: *survey results of requirements*



The outcomes first of all confirm the importance of battery life to Smartphone buyers: 42 respondents (58 percent) indicated that battery life is very important when deciding on a Smartphone purchase. Only 4 percent of the respondents find this aspect not important at all, which is lowest score of all items for ‘unimportant’.

The two categories of *keyboard*, and *design and build quality* also showed high scores, with respectively 58 and 53 percent of respondents indicating these issues to be of great importance, confirming the result from the analysis of both Kieskeurig and Tweakers articles.

OS (operating system) exhibits higher scores (in comparison with other items on the list) than it did in the website analysis results. This might be due by the nature of the websites, at which a preference for a specific operating system is already implicitly stated by directing ones attention to a specific phone. Another noticeable difference between the survey results and the website analysis results is the indicated importance of display properties, which only comes in eighth position on the result list. Although interesting, these difference are hard to explain, which might argue for the need of further investigation.

5.2.5 Relations between TAM-constructs and Smartphone requirements

Because of the explorative character of this part of the study, no hypotheses were formed. Still is it interesting to see in what way the requirements are related to the constructs of the Technology Acceptance Model as used for this study. A motivation for inclusion of the requirement segment within the survey was that this would facilitate further examination of those requirements combined with the TAM-constructs. After all, data on both TAM and Smartphone requirements had now been gathered among one and the same group of respondents.

In order to explore any relations, correlations were calculated for the Smartphone properties surveyed together with the five constructs of perceived usefulness, perceived entertainment, perceived ease of use, social pressure, and apprehensiveness. No correlations were for any of the Smartphone properties with PU, PEOU or SP. However, both apprehensiveness and perceived entertainment exhibited various correlations with Smartphone properties, as shown in table XIII below.

Table XIII: *Correlations of requirements with App. and PE*

		Brand	Battery	Camera	Display	Size/wght	Perf.	Keyboard
App	Pearson Corr.	,257			,289	,233		
	Sig. (2-tailed)	,028			,013	,047		
PE	Pearson Corr.		*,217*	,297	,275		,318	,239
	Sig. (2-tailed)		*,065*	,011	,019		,006	,042

App=apprehensiveness; PE = perceived entertainment, Perf=performance

Apprehensiveness thus correlates with *brand*, *display size* and *size/weight*. Some relations are hard to explain without further research available, but for instance the correlation between apprehensiveness and *brand* might be based on user's perceptions of the (lack of) care for

privacy associated with a particular brand. Arguably more interesting are the correlations between perceived entertainment on one side and *battery* and *performance* on the other, for instance. It seems reasonable to argue that a long battery life might have a positive relation with the entertainment someone may experience from a Smartphone. A battery that needs recharging twice a day, might very well, to a certain extent, impede a feeling of entertainment being formed. In a similar way, the relation between performance and perceived entertainment appears to be an obvious one, as bad system performance would arguably have a negative effect on the extent to which one perceives a Smartphone to be entertaining. Summarizing, the analysis and subsequent survey lead to some interesting results, arguing for further investigation thereof and of the various correlations between them.

6. Discussion

The main purpose of the present research was to examine the determinants of Smartphone acceptance among young people, using an adapted version of the Technology Acceptance Model, which is intended to account for the various factors that come into play when examining technology acceptance outside professional environments. The research results lend partial support for use of the adapted Technology Acceptance Model to explain Smartphone adoption.

6.1 TAM-survey outcome interpreted

Both perceived usefulness and perceived entertainment were found to affect usage intention, thus confirming hypothesis 1 and 2 which theorized such influences to exist. The effect of perceived usefulness appears to be slightly stronger, but the difference is negligible and it can be argued that both constructs affect usage intention to an equal extent. Hence, when an individual believes that a Smartphone will serve to make daily life easier and make him or her more productive or effective in daily life, the likelihood of Smartphone adoption increases. A similar mechanism also applies to perceived entertainment and usage intention: the more an individual thinks device use will be fun, the greater the chance of adoption. Both constructs together explain over 16 percent of usage intention.

Contrary to expectations, no direct effect of social pressure on usage intention was found and consequently, hypothesis 3 (theorizing this effect to be present) had to be rejected. In line with Kwon and Chidambaram (2000), hypothesis 3 posed that individuals would decide to adopt a Smartphone to gain in social status. In such a direct way, this mechanism appears to be irrelevant for Smartphone adoption by young people. However, social influences were found to have a small yet significant effect on perceived usefulness, in correspondence to the results of previous research of Venkatesh and Davis (2000) and Cho (2011). Despite the fact that social pressure did not affect usage intention directly, it can be argued that it does exhibit an indirect effect on usage intention through perceived– which had not been theorized.

Additionally, although with a smaller effect, perceived entertainment was also found to be influenced by social pressure. Individuals may tend to project their experienced social influences onto the perceived level of entertainment and usefulness of a device, in this case a Smartphone. Ergo, if an individual for instance believes that a Smartphone provides with prestige, or that his peers (friends) believe that Smartphones lead to an increase in social

status, this might lead to an increase in his perceptions of the device's use. A similar mechanism might apply to the effect of social pressure on perceived entertainment. At the same time, individuals might tend to incorporate (what they think are) their peer's views into their own, a process referred to as 'internalization' by Venkatesh and Davis. "If [someone] suggests that a particular system might be useful, a person may come to believe that it actually is useful, and in turn form an intention to use it" (2000, p. 189). Similar suggestions with regard to the level of entertainment might lead to similar outcomes.

The workings behind the construct of perceived ease of use also did not fully match the hypothesized effects. Hypothesis 4a posed that perceived ease of use would have an indirect effect on usage intention through perceived usefulness, yet remarkably no such effect was found in the present TAM-study. Hence, the hypothesis had to be rejected. It should be noted that this effect was consistently found to be present in numerous other studies and appears to be a solid factor within TAM-research through time (e.g. Davis, 1989; Kwon & Chidambaram, 2000; Park & Chen, 2007; Venkatesh & Davis, 2000). An explanation for the lack of said effect might partially lie in the difference between voluntary and mandatory system usage. Originally, the Technology Acceptance Model was aimed at system adoption within professional environments, with system use often being of a mandatory nature. And even when system use was considered voluntary, as in Venkatesh and Davis' research on the extended TAM (2000), such a system still served a work-related purpose. Although the use is considered voluntary, the purpose still exhibits a mandatory nature: either way, work needs to be done, be it by adopting a new system or not. However, when considering Smartphone adoption for personal purposes, outside of a work environment, the eventual 'purpose' of adoption could be regarded as much more informal and noncommittal. Hence, a particular degree of perceived complexity (or *lack* of ease of use) might lead to non-adoption sooner when system use is more voluntary, as is the case for consumers, than it would when system use still has mandatory aspects. Users in voluntary settings would simply choose not to use the system. Moreover, various studies have shown ease of use to be of greater importance in mandatory settings than in voluntary settings (e.g. Adamson & Shine, 2003; Brown, Massey, Montoya-Weiss & Burkman, 2002). Additionally, the absence of said affect might support the argument that ease of use is less of an issue with regard to 'the current Smartphone'. As shown in the introductory segment, Smartphone diffusion is extensive and considering the steady and rapid evolvement of such devices, consumers perhaps think of modern day Smartphones as (almost) inherently user-friendly. Survey results seem to support this suggestion, since a vast majority of the respondents perceived Smartphones to be user-

friendly. Over 80 percent of all respondents indicated to expect that interactions with a Smartphone would be clear and understandable and that learning to use such a device would be easy (see figure I of segment 5.1, p. 32)

Perceived ease of use was also theorized to directly affect perceived entertainment, for which small but significance evidence was indeed found. The presence of this effect implies that anyone who perceives a Smartphone to be easy to use consequently expects low or no obstruction to feel entertained by such a device. Vice versa, when an individual perceives a Smartphone as being complex and not easy to use, it becomes less likely that this person expects a Smartphone to be entertaining. It is striking that ease of use does have an effect on perceived entertainment but not on perceived usefulness. This could be explained by the suggestion that perceived entertainment has a higher 'critical barrier' for ease of use to have effect, i.e., perhaps usefulness suffers less from perceived complexity than PE, as a system might still be able to increase productivity or efficiency, yet do so in a less entertaining manner. No decisive answer can be given however, which is ample reason to suggest more thorough research towards this aspect.

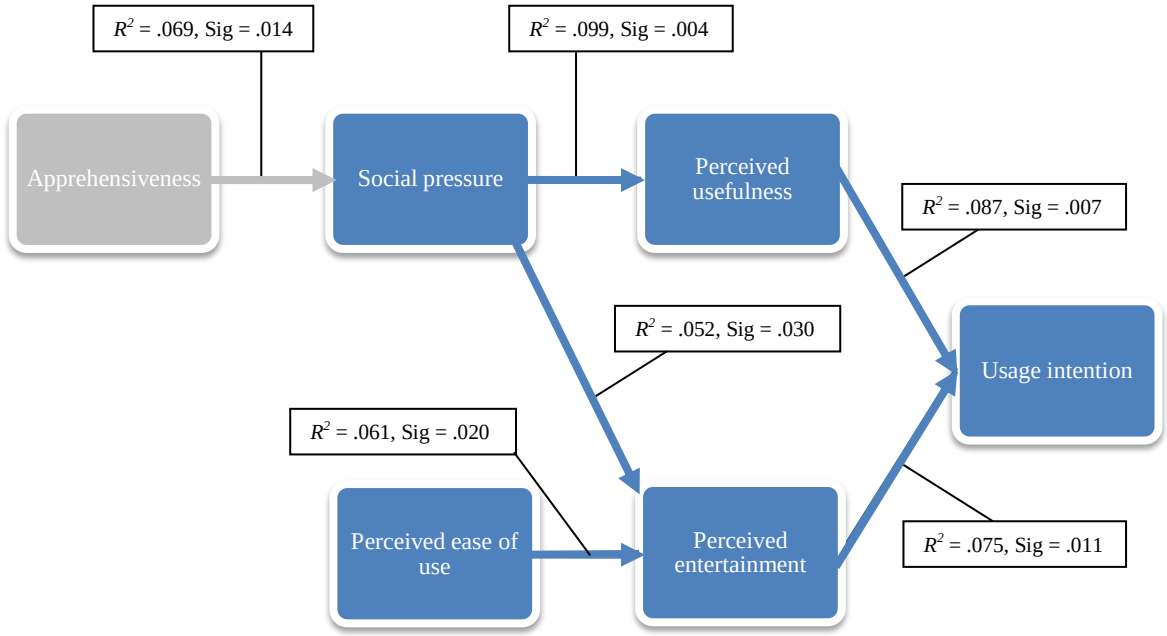
The fifth construct, apprehensiveness, was theorized to affect usage intention through both perceived usefulness (hypothesis 5a) and perceived entertainment (hypothesis 5b). The research results suggest rejection of the former hypothesis, since no correlation between perceived usefulness and apprehensiveness was found. However, the results seem neither to support nor reject the latter hypothesis, regarding the theorized effect of apprehensiveness on perceived entertainment. Regression analysis showed no direct effect of apprehensiveness on perceived entertainment and it was only found to *directly* affect social pressure. Nevertheless, significant correlations were found to exist between apprehensiveness and perceived entertainment, suggesting a relation of some kind between the two constructs. In spite of this, no effect could be explained with only the research results presently available, arguing for further research into these aspects of the model as well.

6.1.2. Recapitulation

To summarize, the main (direct) determinants of usage intention were perceived usefulness and perceived entertainment. Both effects are consistent with other comparable research, as carried out by Kwon and Chidambaram (2000) for instance. The study further demonstrates significant influences of social pressure on perceived usefulness and perceived entertainment, in accordance with the model on which the research was based. Perceived ease of use was

found to have effect on perceived entertainment, and, with due reservations, apprehensiveness showed an effect on social pressure. To conclude, figure I provides a visual representation of the main results of this research (as depicted previously in figure II, segment 5.1.3) taking into account the reservations regarding apprehensiveness, indicated by the grey color.

Figure I: *model representing research finding*



6.2 Smartphone requirement considerations

A number of conclusions can be drawn based on the analysis of users' requirement regarding smartphone features and properties. First of all, a Smartphone's battery life is clearly seen as a very important issue: results of all three analyses (of Kieskeurig.nl, Tweakers.net and the survey segment) unanimously reveal that battery life is of major concern when purchasing such a device. To a lesser extent, this also goes for display specifications and keyboard properties. This does not mean that all prospect users want similar display types or keyboard layouts. For instance, some individuals prefer a physical keyboard for its increased feedback and prefer this feature to type large amounts of texts. Others insist on not having such a 'hardware' keyboard, since it makes the device heavier and perhaps more prone to failure (of sliding mechanisms, for instance). The same goes for displays: some individuals prefer a large display for easier viewing, others prefer a smaller display for its inherent implications for the dimensions of the Smartphone (smaller displays allow for smaller devices). However, the fact remains that these properties were found to be frequently recurring and of high importance

when purchasing a Smartphone.

Another interesting observation regards the importance of what can be called ‘device compatibility’, which concerns several issues regarding synchronization or connection of the Smartphone with computers or other phones. This is not immediately apparent from the results, but can be deduced from various recurring issues, such as the ones that were categorized under *e-mail/agenda/contacts synchronization*. Not only did individuals enquire about the ability of specific Smartphones to synchronize agendas or incoming and outgoing e-mails with Microsoft Outlook, they also were concerned about (Bluetooth) connectivity with car stereos or phone headsets for instance, or enquired about compatibility of devices with file synchronizations software. Hence, the common denominator of these issues is ‘device compatibility’: a Smartphone’s ability to interact with external devices or interfaces. Considering the abundance of technology nowadays, the need for flawless and effortless synchronizations between those technologies (be it laptops, car stereos, home entertainment systems, et cetera) appears to be a pressing issue.

7. Conclusion

The adapted Technology Acceptance Model as used in this research has proven to be of relevance in studying Smartphone adoption by young people. Despite the rather low explained variance of the TAM-constructs on usage intention (R^2 = .133, /p/ < .05), the demonstrated effects were all significant, partially supporting the hypotheses. Furthermore, internal consistency and validity of the constructs measures was verified. Although not all hypotheses were supported, it can be argued that TAM may function as a useful model to examine system adoption outside of professional (work) environments. As discussed, the results of this study call for further research on several model aspects and the relations between those.

7.1 Limitations and directions for future research

Due to limited means and, consequently, the small scale at which this research on prospect Smartphone users was performed, it relied in part on individuals that had already adopted such a device, albeit only recently. In an attempt to counter this issue, survey respondents to which this applied were explicitly requested to provide answers based on their memories from before the actual adoption. Still, the sample composition might have had effect on the research outcomes and therefore, similar research could perhaps be performed on a much larger scale, with the proper means to use a larger sample and focus strictly on prospect adopters. Arguably, the paucity of lowly educated respondents can be seen as another limitation of this research, but it is unknown to what extent the used sample is an accurate representation of the actual population. Hence, future research of greater scale could direct efforts towards construction of a more representative sample. If more age categories were to be included in such a larger scale project, differences might be found in the extent to which certain constructs affect others. For example, social pressure might prove to have a smaller effect (or stronger even) on usefulness in other age groups. Additionally, such research could also incorporate a longitudinal aspect, measuring both usage intention and actual use. That way, the applicability of the Technology Acceptance Model to *actual* Smartphone use could be examined as well.

Considering the low explained variance of the used mode, other factors may be at play in determining usage intention, which also warrants further investigative research. One could think of further examining the importance of an individual's social environment, such as the number of friends or family members that are already using a Smartphone. Cho (2011) has for

instance included this aspect in his research on the adoption of 3G mobile services to act as an indicator for 'perceived critical mass' (along with other indicators, such as the effect of expected penetration rate of the technology in question). A similar construct could be considered for future research on adoption of smartphone or technologies alike.

Regarding prospect users' smartphone requirements, the importance of the various aspects related to applications deserves to be pointed out once more. As discussed, these issues were far too divergent to address by means of closed questions in the survey, but given the frequency with which such issues were mentioned, the topic of Smartphone applications may very well deserve a study on its own (for instance addressing (relations between) the importance of quality, price, memory size needed, update frequency, et cetera).

7.2 Research implications

The present study contributes to the body of literature on smartphone adoption not only by including social influences and apprehensiveness (or technology anxiety) as determinants of usage intention, but also in the respect that it extends the scope of smartphone adoption research beyond professional environments and towards adoption by consumers. The found direct effect of social pressure on perceived usefulness and perceived entertainment seems to illustrate the importance of social influences in the adoption process of such personal devices as smartphones. Additionally, the outcomes of this research put perceived ease of use in a slightly different light, as it was only found to have an effect on perceived entertainment and not on perceived usefulness (which is commonly theorized within TAM studies). The insights gained by this research contribute to the body of literature on system adoption in general, but also provide a rough framework for further explorations into Smartphone adoption, be it by young people or by individuals of all ages.

The results might also prove useful in research on adoption of another relatively new device, namely the tablet computer. This mobile computer, smaller than most laptops but larger than a smartphone, can be regarded as a combination of those two: operated in a similar way as a smartphone (mainly by using a touch screen) yet in size resembling a laptop (making for easier viewing and working than on a smartphone). Examples of tablet computers are the Apple iPad and Samsung Galaxy Tab. Recent sales figures show the popularity of this technology, with global shipments showing a 331 percent increase in the second quarter of 2011, when compared with the same quarter in 2010 (*Strategy Analytics*, 2011). These numbers very much argue for research on the adoption of tablet computers and the present

study can thus provide a basis for such research.

This study might also be helpful in, for instance, marketing communication employed by Smartphone manufacturers and retailers. Taking into account that perceived usefulness and perceived entertainment were found to be the main determinants of usage intention, marketers could pay closer attention to these aspects in their messages, especially considering the high respondent scores on perceived entertainment. Since battery life was found to correlate strongly with perceived entertainment (and considering the influence of perceived entertainment on usage intention), it can be argued that more attention should be directed towards improving battery life of Smartphones. Additionally, efforts could be direct towards decreasing feelings of apprehensiveness. As shown in the results, many respondents exhibit forms of anxiety towards Smartphone usage. Although no clear effects were found between this construct and others (or usage intention, for that matter), based on the low scores on the construct it can still be argued that great improvements can be made on this aspect. Perhaps this anxiety also bears relations with the discussed need for device compatibility: individuals might experience low levels of trust with regard to the safe transferring of their files, for instance. Hence, many questions remain and there seems to be plenty of room for progress for smartphone developers.

Reference list

Abad, M., Diaz, I., Vigo, M. (2010). Acceptance of mobile technology in hedonic scenarios. BCS conference on human-computer interaction, HCI2010. ACM Press Retrieved from http://www.tourgune.org/uploads/tinymce/filemanager/2010_HCI_MARKEL_ARTICULOsec.pdf

Adamson, I., & Shine, J. (2003), "Extending the New Technology Acceptance Model to measure the end user Information Systems satisfaction in a mandatory environment: A bank's treasury. *Technology Analysis & Strategic Management, 15* (4), 441-455. doi: 10.1080/0953732030001360 33

Adverteren (n.d.). Retrieved March 4, 2011, from http://www.kieskeurig.nl/document/29ABC4973CE15299C1256E6A00398EF1

Allen, S., Graupera, V., Lundrigan, L. (2010). *Pro Smartphone cross-platform development: iPhone, BlackBerry, Windows Mobile and Android development and distribution*. New York: Springer Science + Business

Broeckelmann, P. & Groeppel-Klein, A. (2008). Usage of mobile price comparison sites at the point of sale and its influence on consumers' shopping behaviour. *International Review of Retail, Distribution and Consumer Research, 18* (2), 149-166. doi: 10.1080/09593960701868266

Brown, S., Massey, A., Montoya-Weiss, M., & Burkman, J. (2002), Do I really have to? User acceptance of mandatory technology. *European Journal of Information Systems 11*, 283-295. doi: 10.1057/palgrave.ejis.3000438

Bruner, G., & Kumar, A. (2003). Explaining consumer acceptance of handheld Internet devices. *Journal of Business Research 58*, 115-120. doi:10.1016/j.jbusres.2003.08.00

Cisco Visual Networking Index (2010). Retrieved January 16, 2011, from Cisco, http://www.cisco.com/en/US/solutions/collateral/ns341/ns525/ns537/ns705/ns827/white_paper_c11-520862.html

Canalys (2011). Retrieved February 1, 2011, from Canalys, Press releases, http://www.canalys.com/pr/2011/r2011013.html

Chen, L., Gillenson, M., & Sherrell, D. (2002). Enticing online consumers: An extended technology acceptance perspective. *Information & Management , 39* (8), 705-719. doi: 10.1016/S0378-7206(01)00127-6

Childers, T., & Rao, A. (1992) The influence of familial and peer-based reference groups on consumer decisions. *Journal of Consumer Research*, 19, 198–211. Retrieved from: http://www.csom.umn.edu/Assets/71776.pdf

Cho, H. (2011). Theoretical intersections among social influences, beliefs, and intentions in the context of 3G mobile services in Singapore: Decomposing perceived critical mass and subjective norms. *Journal of Communication, 61*, 283–306. doi: 10.1111/j.1460-2466.2010.01532.x

Chung, J., & Tan, F. (2004). Antecedents of perceived playfulness: An exploratory study on user acceptance of general information-searching websites. *Information and Management, 41*, 869-881. doi: 10.1016/j.im.2003.08.016

ComScore (2010). Retrieved January 15, 2011, from ComScore, Press release, http://www.comscore.com/Press_Events/Press_Releases/2010/3/UK_Leads_European_Countries_in_Smartphone_Adoption_with_70_Growth_in_Past_12_Months

ComScore (2011). Retrieved July 10, 2011, from ComScore, Press release http://www.comscore.com/Press_Events/Press_Releases/2011/7/comScore_Reports_May_2011_U.S._Mobile_Subscriber_Market_Share

Davis, F. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly 13*(3), 319-340. Retrieved from http://www.jstor.org/stable/249008

Davis, F., Bagozzi, R., & Warshaw, P. (1989) User acceptance of computer technology: A comparison of two theoretical models. *Management Science 35* (8) 982-1003. Retrieved from http://www.jstor.org/stable/2632151

Davis, F., Bagozzi, R., & Warshaw, P. (1992). Extrinsic and intrinsic motivation to use computers in the workplace. *Journal of Applied Social Psychology, 22,* 1111-1132. doi: 10.1111/j.1559-1816.1992.tb00945.x

Dichter, E. (1964). *Handbook of Consumer Motivations*. New York: McGraw-Hill.

Entner, R. (2010). Smartphones to Overtake Feature Phones in U.S. by 2011. Retrieved February 6, 2011, from NielsenWire, http://blog.nielsen.com/nielsenwire/consumer/smartphones-to-overtake-feature-phones-in-u-s-by-2011/

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention, and behavior: An introduction to theory and research.* Reading, MA: Addison-Wesley Retrieved from http://people.umass.edu/aizen/f&a1975.html

Frits51. (2011, January 6). Re: Apple iPhone 4 16GB [Comment]. Retrieved March 7, 2011, from http://www.kieskeurig.nl/gsm/apple/iphone_4_16gb/reviews/902673/vragen

Folkes, V. (1988). Recent Attribution Research in Consumer Behavior: A Review and New Directions. *Journal of Consumer Research (14)*4, 548-565. Retrieved from http://www.jstor.org/stable/2489160

Igbaria, M. (1993) User Acceptance of Microcomputer Technology: An Empirical Test. *Omega International Journal of. Management Science, 21* (1) 73-90. doi: 10.1016/0305-0483(93)90040-R

Igbaria, M., Parasuraman, S., & Baroudi, J. (1996). A motivational model of microcomputer usage. *Journal of Management Information Systems, 13* (1), 127-143. Retrieved from http://portal.acm.org/citation.cfm?id=1195917

Kieskeurig.nl. (n.d.) Retrieved February 27, 2011, from http://www.sanoma-uitgevers.nl/nl-web-Onze_merken-profielen-Kieskeurig.nl.php

Kim, S., & Garrison, G. (2009). Investigating mobile wireless technology adoption: An extension of the technology acceptance model. *Information Systems Frontiers 11* (3), 323-333. doi: 10.1007/s10796-008-9073-8

Kwon, H., & Chidambaram, L. (2000). A test of the Technology Acceptance Model: The Case of Cellular Telephone Adoption. In: Proceedings of HICSS-34, Hawaii, 2000. Retrieved from http://ieeexplore.ieee.org/xpl/freeabs_all.jsp?arnumber=926607

Lee, K., Tolentino, R., Park G., & Kim, Y. (2010). A Study on Architecture of Malicious Code Blocking Scheme with White List in Smartphone Environment. In T. Vasilakos, K. Sakurai, Y. Xiao, G. Zhao & D. Slezak, (Eds.), Communications in Computer and Information Science. Proceedings of the International Conference on Future Generation Communication and Networking, Jeju Island, Korea (pp 155-163)

Lee, N. (2010). The 411: Feature phones vs. Smartphones. Retrieved February 5, 2011, from CNET, http://www.cnet.com/8301-17918_1-10461614-85.html

Lee, Y., Kozar, K., & Larsen, K. (2003). The Technology Acceptance Model: Past, Present, and Future. *Communications of the AIS, 12,* 752-780. Retrieved from http://aisel.aisnet.org/cais/vol12/iss1/50/

Mobile snapshot (2010). Retrieved January 17, 2011, from Nielsen, Nielsenwire, http://blog.nielsen.com/nielsenwire/online_mobile/mobile-snapshot-smartphones-now-28-of-u-s-cellphone-market/

Moon, J., & Kim, Y. (2001). Extending the TAM for a World-Wide-Web context. *Information and Management, 38,* 217-230. doi: 10.1016/S0378-7206(00)00061-6

Nieuws in Smartphones (n.d.) Retrieved March 4, 2011, from http://tweakers.net/archieven/cat/133/nieuws

Nunnally, J. (1978). Psychometric theory. New York: McGraw-Hill

Park, Y., & Chen, J.V. (2007) Acceptance and adoption of the innovative use of Smartphone. *Industrial Management & Data Systems, 107*(9), 1349-1365. doi: 10.1108/02635570710834009

Pedersen, P. (2005). Adoption of Mobile Internet Services: An Exploratory Study of Mobile Commerce Early Adopters. *Journal of Organizational Computing and Electronic Commerce, 15* (3), 203-222. doi: 10.1207/s15327744joce1503_2

Peterson, R. (1994) A meta-analysis of Cronbach's coefficient alpha. *Journal of Consumer Research, 21*(2), 381-391. doi: http://www.jstor.org/stable/2489828

Preuschat, A. (2011). Netherlands smartphone penetration reaches 42%. Retrieved from Total Telecom, http://www.totaltele.com/view.aspx?ID=466832

Simpson, L. (2009). Smartphones vs Feature Phones: What's the Difference? Retrieved February 7, 2011, from Wireless Week, http://www.wirelessweek.com/Articles/2009/03/Smartphones-vs-Feature-Phones--What%E2%80%99s-the-Difference-/

Sinister81. (2011, March 3). Re: HTC brengt Incredible S uit [Comment]. Retrieved March 9, 2011, from http://tweakers.net/nieuws/73020/htc-brengt-incredible-s-uit.html?mode=nested&max=10&niv=0&order=asc&page=3#reacties

Smartphone (n.d.). Retrieved February 3, 2011, from Phonescoop http://www.phonescoop.com/glossary/term.php?gid=131

Strategy Analytics (2011). Retrieved from Business Wire, *http://www.businesswire.com/news/home/20110721005317/en/Strategy-Analytics-Apple-iOS-Captures-61-Percent*

Susskind, A., & Stefanone, M. (2010) Internet apprehensiveness: An examination of on-line information seeking and purchasing behavior. *Journal of Hospitality and Tourism Technology, 1* (1), 5-29. doi: 10.1108/17579881011022990

The 100 most-visited sites: Netherlands. (2011) Retrieved February 20, 2011, from http://www.google.com/adplanner/static/top100countries/nl.html

Tweakers.net FAQ. (2010) Retrieved June 1, 2011, from http://tweakers.net/reviews/331

Venkatesh, V., & Davis, F. (2000). A theoretical extension of the Technology Acceptance Model: Four longitudinal field studies. *Management Science, 46*(2), 186-204. Retrieved from http://www.jstor.org/pss/2634758

Vijayasarathy, L. (2004). Predicting Consumer Intentions to Use Online Shopping: the Case for an Augmented Technology Acceptance Model. *Information & Management, 41*, 747-762. doi: 10.1016/j.im.2003.08.011

Walczuch, R., Lemmink, J., & Streukens, S. (2007) The effect of service employees' technology readiness on technology acceptance, *Information & Management, 44* (2), 206-215. doi:10.1016/j.im.2006.12.005

Wang, Y., Lin, H., & Luarn, P. (2006) Predicting consumer intention to use mobile service. *Information Systems Journal, 16*, 157–179. doi: 10.1111/j.1365-2575.2006.00213.x

Appendix A

Measurement instrument (survey) as used for the present TAM-study

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Page 1/8

[…]

Please only fill out the questionnaire if you are between 18 and 30 and either have recently purchased your first Smartphone (within the past 6 months), or if you are in the process of (orientation towards) purchasing one. This survey will take approximately 7 minutes to complete.

This survey is for academic purposes only and all information given is confidential. The answers you provide will be entirely anonymous and they will not be shared with third parties. Your IP-address will not be distributed or publicized.

[…]

Page 2/8

When filling out this survey, please try to do so while keeping in mind any expectations you had before the actual purchase of a Smartphone.

For the sake of this survey, a rough definition of 'Smartphone' is given below:

'A pocket sized mobile phone with advanced computing ability and (Internet) connectivity, built-in applications, offering features such as a personal digital assistant (PDA), Global Positioning System (GPS), photo/video camera, MP3-player, able to run a multitude of third party applications'

Examples of Smartphones are the Apple iPhone 4, HTC Desire and BlackBerry Bold.

If you have any questions whatsoever, please feel free to contact me at smartphone_survey@hotmail.com.

Page 3/8

1.) Please indicate which of the following possibilities and features, as generally offered by Smartphones, you (would) use.
Note: if you find some features missing, please add them afterwards, in Question no. 2.

	Never	Almost never	Sometimes	Fairly often	Often
Telephone calls	( )	( )	( )	( )	( )
Text messaging (SMS)	( )	( )	( )	( )	( )
Internet browser	( )	( )	( )	( )	( )
E-mail client	( )	( )	( )	( )	( )
Social media connectivity	( )	( )	( )	( )	( )
Camera function	( )	( )	( )	( )	( )
Data synchronization (e.g. backups, addresses, Outlook Agenda)	( )	( )	( )	( )	( )
IM client (e.g. Whatsapp, 'Ping', AIM, MSN Messenger)	( )	( )	( )	( )	( )
Personal information management (contacts, calendar, agenda)	( )	( )	( )	( )	( )
GPS navigation	( )	( )	( )	( )	( )
Games	( )	( )	( )	( )	( )
Music/videos playback	( )	( )	( )	( )	( )
News, weather, traffic information services	( )	( )	( )	( )	( )
Exploration of/experimenting with applications	( )	( )	( )	( )	( )

2.) Additional features or possibilities, if any. Otherwise, please leave open.

	Feature				
		Almost never	Sometimes	Fairly often	Often
1	___	( )	( )	( )	( )
2	___	( )	( )	( )	( )
3	___	( )	( )	( )	( )

3.) I will use a Smartphone for:

[ ] Work-related activities

[ ] Study-related activities

[ ] Personal-related activities

[ ] Other, please specify

Now you will be presented with a series of statements. Please indicate to what extent you agree and try to do so while keeping in mind the expectations you had before the actual purchase of a Smartphone.

4.) Please indicate the extent to which you agree or disagree with each of the following statements.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Using a Smartphone in my day-to-day life would enable me to accomplish tasks more quickly.	( )	( )	( )	( )	( )
Using a Smartphone in my day-to-day life would make me more efficient.	( )	( )	( )	( )	( )
Using a Smartphone would make my day-to-day life easier.	( )	( )	( )	( )	( )

Page 4/8

5.) Please indicate the extent to which you agree or disagree with each of the following statements.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Learning to operate the Smartphone would be easy for me	( )	( )	( )	( )	( )
My interaction with the Smartphone would be clear and understandable	( )	( )	( )	( )	( )
I would find the Smartphone to be user-friendly and flexible to interact with	( )	( )	( )	( )	( )
Interacting with the Smartphone would require a lot of mental effort	( )	( )	( )	( )	( )

6.) Please indicate the extent to which you agree or disagree with each of the following statements.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Using a Smartphone will be enjoyable	( )	( )	( )	( )	( )
Using a Smartphone will be entertaining.	( )	( )	( )	( )	( )
Using a Smartphone will make me want to explore the device further.	( )	( )	( )	( )	( )

Page 5/8

7.) Please indicate the extent to which you agree or disagree with each of the following statements.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I would be comfortable using a Smartphone for storing personal information.	( )	( )	( )	( )	( )
I would trust my data and information to be secure in a Smartphone.	( )	( )	( )	( )	( )
I would worry about my privacy being affected by using a Smartphone.	( )	( )	( )	( )	( )

8.) Please indicate the extent to which you agree or disagree with each of the following statements.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Having a Smartphone will be a status symbol.	( )	( )	( )	( )	( )
People who have a Smartphone have more prestige than those without one.	( )	( )	( )	( )	( )
My decision to purchase a Smartphone has been influenced by friends who already had such a device.	( )	( )	( )	( )	( )

Page 6/8

9.) To what extent are the following features or properties of importance to you when purchasing a Smartphone?

Note: if you find some features or properties missing, please add them afterwards, in Question no. 10.

	Not at all important	Moderately important	Very important
Price/phone plan/subscription	( )	( )	( )
Brand	( )	( )	( )
Operating system (e.g. Android, iOS, Symbian)	( )	( )	( )
Battery life	( )	( )	( )
Camera specifications (e.g. resolution, front-facing)	( )	( )	( )
Display size	( )	( )	( )
Device design (esthetics, materials)	( )	( )	( )
Size/weight	( )	( )	( )
Performance (e.g. CPU-specification, memory size)	( )	( )	( )
Keyboard type (e.g. touchscreen, slide-out QWERTY)	( )	( )	( )

10.) Additional features or properties, if any. Otherwise, please leave open.

	Feature	Importance	
		Moderately important	Very important
1	___	( )	( )
2	___	( )	( )
3	___	( )	( )

11.) Please indicate which one of the following scenarios applies to you.

( ) I currently have a Smartphone *

( ) I am in the process towards purchase of a Smartphone

( ) Other, please specify:

*11a) Please name manufacturer (brand) and model of your Smartphone (e.g. Apple iPhone 4, HTC Desire, etc)

*11b) How long have you been using your Smartphone? (Answer in number of months please)

_____

12.) How did you explore the current offerings on the Smartphone market?
Through:

[ ] Friends, family, relatives

[ ] Product comparison website

[ ] Website with Smartphone news

[ ] Mobile phone store

[ ] Magazine, other print media

[ ] Other:

Page 8/8

13.) Gender

( ) Male

( ) Female

14.) Age

_____

15.) What is your highest level of education?

( ) Some high school / secondary school

( ) High school graduate

( ) College

( ) Bachelor's degree

( ) Master's degree

( ) PhD

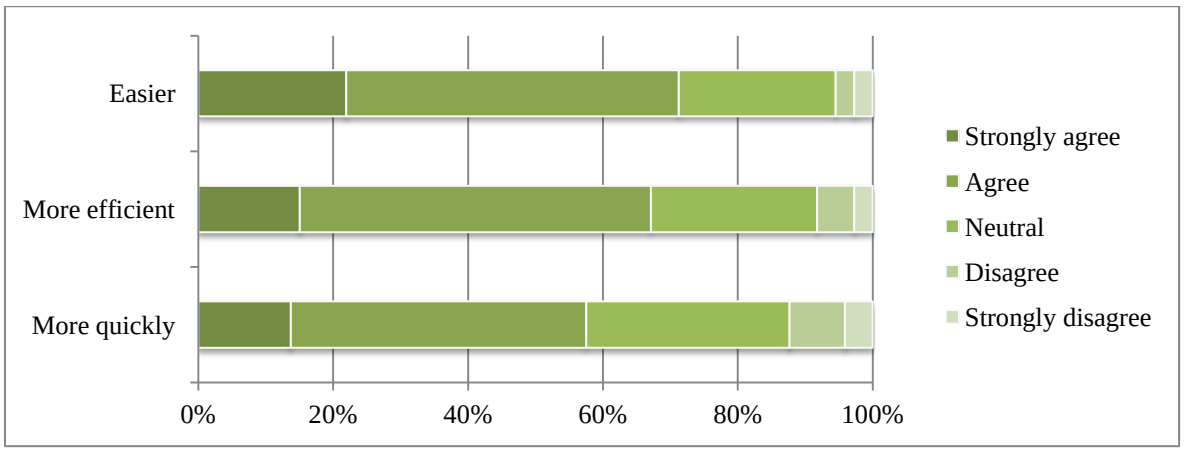
_____

16.) What is your nationality?

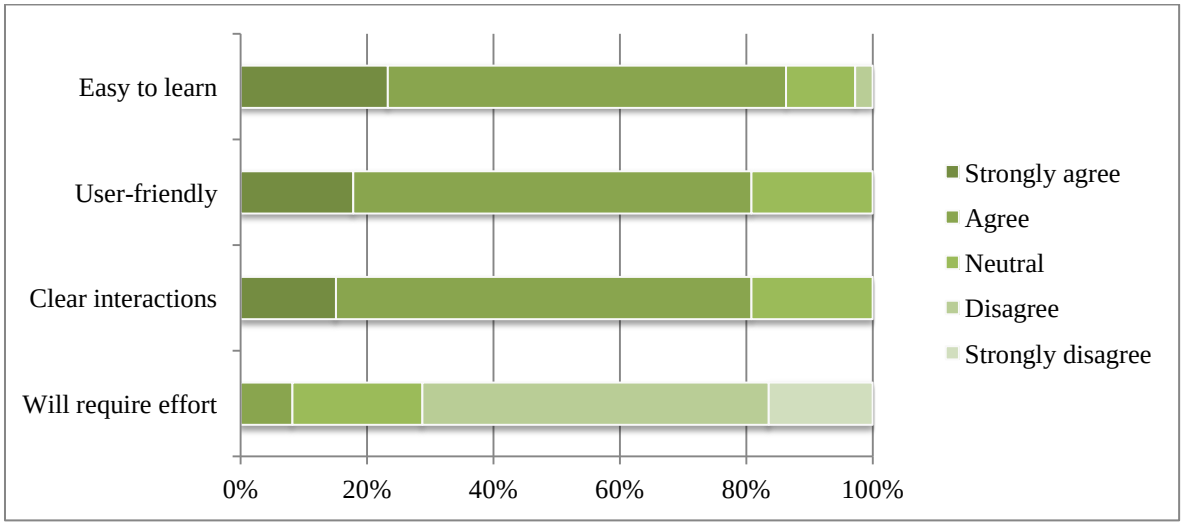
Appendix B

Distribution of respondents' perceptions on multi-items used to measure the five constructs.

Perceived usefulness:
- Using a Smartphone in my day-to-day life would enable me to accomplish tasks more quickly
- Using a Smartphone in my day-to-day life would make me more efficient
- Using a Smartphone would make my day-to-day life easier.



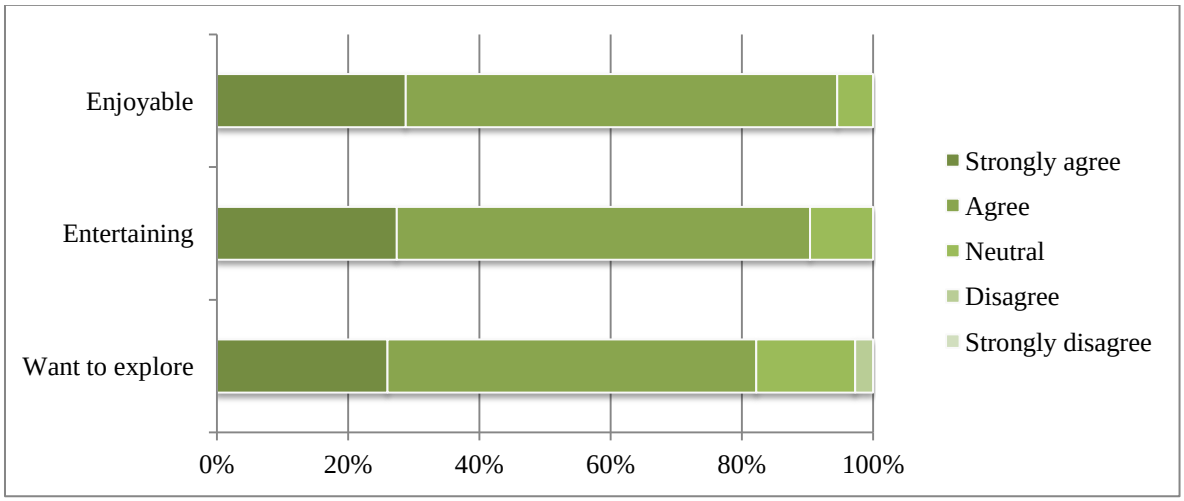
Perceived ease of use:
- Learning to operate the Smartphone would be easy for me
- My interaction with the Smartphone would be clear and understandable
- I would find the Smartphone to be user-friendly and flexible to interact with
- Interacting with the Smartphone would require a lot of mental effort



(Note the negative wording of the fourth item)

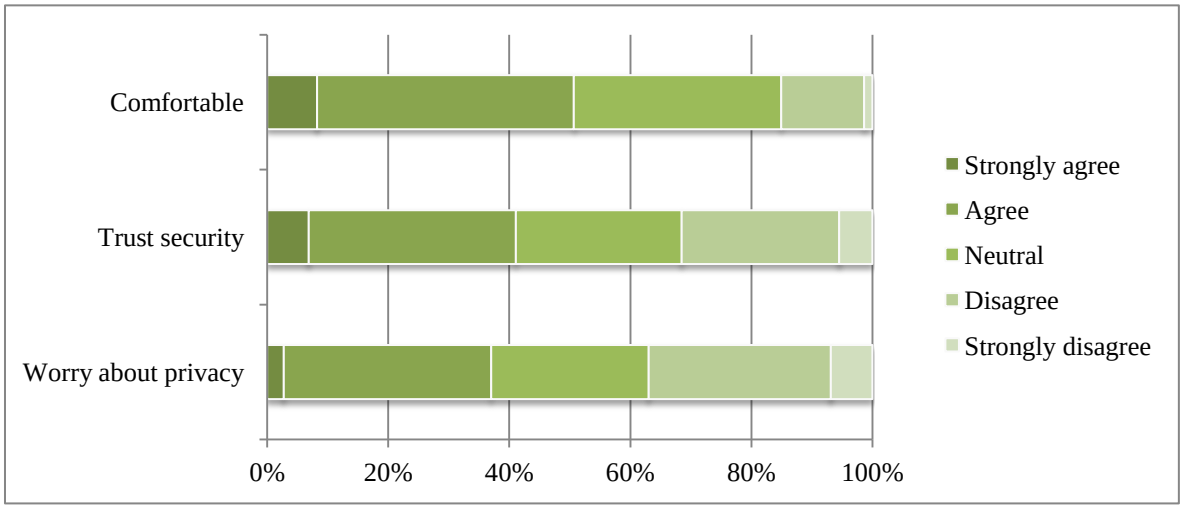
Perceived entertainment

- Using a Smartphone will be enjoyable
- Using a Smartphone will be entertaining
- Using a Smartphone will make me want to explore the device further



Apprehensiveness:

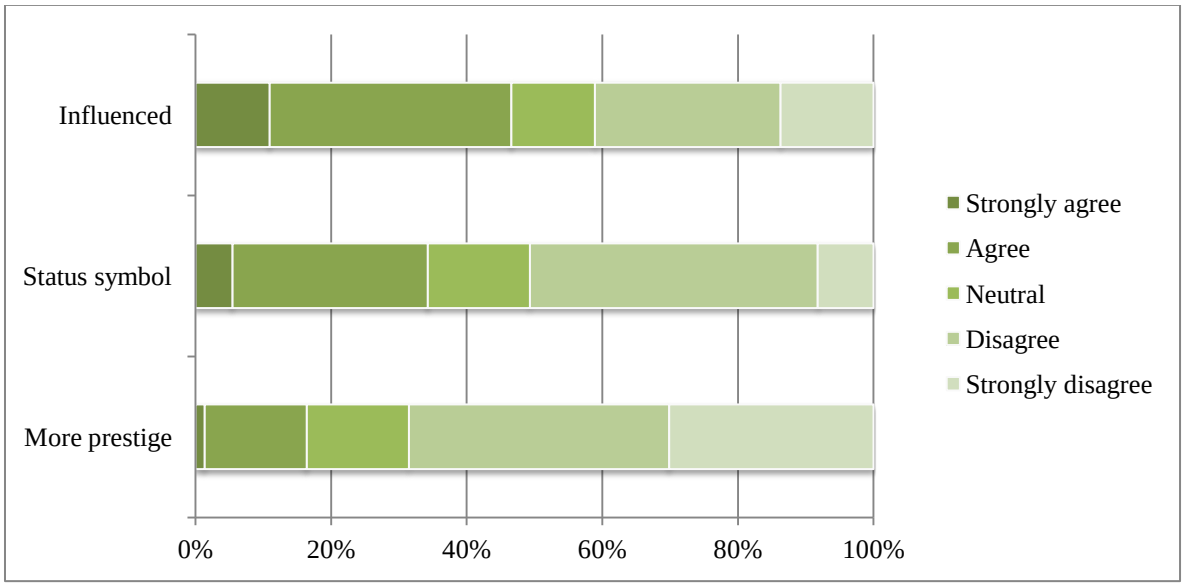
- I would be comfortable using a Smartphone for storing personal information
- I would trust my data and information to be secure in a Smartphone
- I would worry about my privacy being affected by using a Smartphone



(Note the negative wording of the third item)

Social pressure

- Having a Smartphone will be a status symbol
- People who have a Smartphone have more prestige than those without one
- My decision to purchase a Smartphone has been influenced by friends who already had such a device



Appendix C

URL's of the ten most popular Smartphones on Kieskeurig.nl from which the user questions were analysed:

http://www.kieskeurig.nl/gsm/apple/iphone_4_16gb/vragen/902673/
http://www.kieskeurig.nl/gsm/blackberry/8520_curve/vragen/343388/
http://www.kieskeurig.nl/gsm/blackberry/9800_torch/vragen/909483/
http://www.kieskeurig.nl/gsm/htc/desire_hd/vragen/945135/
http://www.kieskeurig.nl/gsm/htc/desire_z/vragen/945137/
http://www.kieskeurig.nl/gsm/htc/wildfire/vragen/900900/
http://www.kieskeurig.nl/gsm/nokia/n8/vragen/899607/
http://www.kieskeurig.nl/gsm/samsung/i9000_galaxy_s_8_gb/vragen/945597/
http://www.kieskeurig.nl/gsm/samsung/s5830_galaxy_ace/vragen/954124/4
http://www.kieskeurig.nl/gsm/sony_ericsson/xperia_x10_mini_pro/vragen/892558/

URL's of the ten news articles on Tweakers.net from which the user comments were analysed:

http://tweakers.net/nieuws/72624/mwc-acer-introduceert-smartphone-met-219-scherm.html
http://tweakers.net/nieuws/72657/mwc-zte-brengt-budgettoestel-met-android-23-uit.html
http://tweakers.net/nieuws/72957/apple-werkt-aan-iphone-met-uitschuifbaar-toetsenbord.html
http://tweakers.net/nieuws/73020/htc-brengt-incredible-s-uit.html
http://tweakers.net/nieuws/73082/samsung-brengt-galaxy-pro-met-toetsenbord-uit.html
http://tweakers.net/nieuws/73250/afbeeldingen-van-drie-nieuwe-htc-smartphones-duiken-op.html
http://tweakers.net/nieuws/73799/nokia-kondigt-symbian-smartphones-x7-en-e6-aan.html
http://tweakers.net/nieuws/73809/htc-kondigt-dualcore-smartphone-sensation-aan.html
http://tweakers.net/nieuws/74028/sony-ericsson-presenteert-walkman-telefoon-met-android.html
http://tweakers.net/nieuws/74186/rim-bevestigt-blackberry-bold-met-touchscreen.html