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Personality and technology acceptance: the influence of personality factors on the core constructs of the Technology Acceptance Model

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The Technology Acceptance Model (TAM) is one of the most used models in information science. Although several studies investigate the relationship between individual difference variables and TAM, none are conclusive about the relationship between personality and the TAM constructs. The current study seeks to investigate the degree to which users' assessments of the core constructs of TAM are influenced by their personality as measured by a short version of the IPIP Big Five inventory. A web-based survey method was used where users ($n = 1004$) read a description of a software tool before completing personality and TAM inventories. The results indicate that personality influence behavioural intention (BI) both directly and mediated through the TAM beliefs. Personality can also influence the TAM beliefs without influencing BI. Extraversion has significant, positive relations to BI and this relation is fully mediated by the TAM beliefs. Emotional stability is related to BI, but this relation is not mediated by the TAM beliefs. Openness to experience is significantly and positively related to perceived ease of use, but does not influence BI.

Keywords: Technology Acceptance Model; personality; Big Five; survey

1. Introduction

The Technology Acceptance Model (TAM, Davis 1989) is used to investigate user acceptance of technology. TAM and similar models (e.g. TAM2, UTAUT) have been thoroughly described in the literature (e.g. Venkatesh *et al.* 2003), and TAM is one of the most widely used models in information science (King and He 2006). TAM predicts user acceptance of a technology based upon estimation of three core constructs, perceived usefulness (PU), perceived ease of use (PeU) and behavioural intention (BI). Put simply, the model suggests that people who intend to use a particular technology end up using this technology to a larger extent than those who do not, and that people who find a technology useful and easy to use will intend to use it.

These three constructs and their interrelations have been investigated in numerous studies and the results support the reliability of the constructs and the basic relations between them. In a meta-analysis based upon 88 journal articles, King and He (2006) concluded that the PU and BI measures were highly reliable, that the influence of PU on BI was strong and that PeU mostly influenced BI through PU. This finding is similar to that of earlier reviews (e.g. Lee *et al.* 2003, Legris *et al.*

2003). However, in some circumstances constructs other than PU and PeU may play a significant part in technology acceptance. A number of studies have demonstrated the importance of group pressure or subjective norm (SN) in user acceptance of technology especially in mandatory settings (Venkatesh *et al.* 2003). In a meta-analysis of the impact of SN, Schepers and Wetzels (2007) concluded that SN has a significant and large effect on both PU and BI, which implies that users' acceptance of technology appears to be influenced by the opinions of others.

The constructs PU, PeU, SN and BI represent the users' subjective perception of the technology's usefulness, how easy it is to use, the influence of others, and their propensity to use the technology at a later time. Thus, these constructs reflect both the technology in question and the more or less stable cognitive and behavioural tendencies of the users. Commonly such tendencies are described by reference to personality, defined as 'the dynamic organization within the individual of those psycho physiological systems that determine his characteristic behaviour and thought' (Allport 1961, p. 28). This definition could include 'individual differences' and/or traits, i.e. the characteristics that make people behave differently (Agarwal and Prasad 1999).

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Personality has been shown to be associated with technology in various ways. In general, it appears that the personality dimension often characterised as 'extraversion–introversion' is related to many aspects of human–computer interaction (e.g. Pocius 1991). People's use of the Internet has been specifically investigated in relation to this concept. For instance, Hamburger and Ben-Artzi (2000) showed that the extraversion and neuroticism (emotional stability) dimensions were related to use of different Internet services. For men, extraversion was positively related to social use, while neuroticism was negatively related to use of information services. For women, however, extraversion was negatively related to social use, while neuroticism was positively related to social use. An investigation of how these personality traits were related to feelings of loneliness and Internet use supported the notion that personality (i.e. a disposition towards loneliness) predicts Internet use (Amichai-Hamburger and Ben-Artzi 2003), and refuted the claims that use of the Internet causes people to experience loneliness (e.g. Kraut *et al*. 1998). Also, Swickert and colleagues showed that personality moderates the relationship between computer use and experiences of social support, although only modest association was found between personality and computer use (Swickert *et al*. 2002).

Recently, McElroy *et al*. (2007) investigated the effect of personality on Internet use. They conceptualised personality both through the Big Five model measured with the revised NEO Personality Inventory, and as cognitive style measured with the Meyer-Briggs Type Indicator (MBTI). Internet use was measured with three instruments. The first instrument measured Internet use including frequency and comfort in using different Internet services, for instance surfing, chatting and looking up information. The second instrument measured buying and willingness to buy, while the third instrument measured selling and willingness to sell on the Internet. Their main finding was that the Big Five personality dimensions were a better predictor of Internet use than cognitive style. Further their results showed that, before controlling for computer anxiety and self-efficacy, extraversion and openness to experience predicted Internet use, openness to experience predicted buying on the Internet, while neuroticism or emotional stability predicted selling. After controlling for computer anxiety and self-efficacy, neuroticism predicted both Internet buying and selling, while openness to experience predicted Internet use. Also, neuroticism had a near significant relation to Internet use. McElroy *et al*. suggest introducing Big Five personality factors into models of technology acceptance and adoption as an avenue for research (op. cit. p. 818).

Some attempts have been made to investigate how personality could influence adoption of new technologies and innovations. A study by Walczuch *et al*. (2007) investigated the influence of technology-specific personality dimensions, taken from the Technology Readiness Index (TRI; Parasuraman 2000), on technology adoption. The results indicated that personality traits were involved in the adoption process of information technology, and that the 'optimism' dimension of the TRI had the strongest impact on technology adoption through its positive impact on PeU and PU. However, the innovativeness, the insecurity, and the discomfort dimensions all had significant relations to PU, PEU or both.

Given these findings, surprisingly few studies have investigated the relation between general personality constructs and TAM constructs. A rationale for not investigating personality as part of TAM research could be the assumption that personality does not influence intention directly, but is mediated by the beliefs included in the model (i.e. PU, PeU and social norms). This is a reasonable hypothesis as Ajzen and Fishbein (1975 cited Agarwal and Prasad 1999) explicitly stated that they saw personality as an external factor to the theory of reasoned action: 'Indeed, in the theory of reasoned action [...] upon which TAM is based, personality was identified explicitly as a type of exogenous or external variable' (Agarwal and Prasad 1999, p. 366). Furthermore, some studies of the relation between individual differences (including personality), and TAM constructs have indicated that the relation between individual differences and intention is mediated by the belief constructs. Agarwal and Prasad (1999) hypothesised that PU and PeU mediated the effect of individual differences on BI. They showed that this is the case for demographic and situational individual differences by testing models where individual differences have both direct and indirect effects on BI to shift from a command-driven computer interface to a GUI-driven interface. However, they did not include personality traits in their study. Karahanna *et al*. (2002) investigated the effects of three specific personality traits on perceived relative advantage of a group support system. These traits were oral-and written-communication apprehension, computer anxiety and personal innovativeness. They found that these traits have substantial effect on the perceived relative advantage of the system. This finding is in line with that of Agarwal and Prasad (1999), and suggests that the model with beliefs mediating the effects of individual differences also holds for personality traits as long as these are domain specific. However, Karahanna *et al*. did not use the TAM model specifically and the finding could only partly be taken as evidence for the mediating role of PU.

Barkhi and Wallace (2007) investigated the effect of general personality traits on the TAM constructs SN, PEU, PU and BI in relation to online buying. This study was built upon Jung's personality theory, as measured by the MBTI. The authors stated that there was no prior research to build on in hypothesising the relation between MBTI and TAM. Their results showed that personality traits have an effect on SN and on PeU. More specifically, they found evidence for a positive relation between the extraversion–introversion dimension and SN, a positive relation between the judging–perceiving dimension and SN, and a positive relation between the intuitive–sensing dimension and PeU. No significant relation was found between the thinking–feeling dimension and PU. However, they did not test a model with direct effects between MBTI constructs and BI, thus this study could also be taken only as partial evidence for the full mediation hypothesis.

While the three studies reviewed above suggest that the TAM beliefs PU, PeU and SN mediate between individual differences and BI, they are not conclusive about the relation between personality and the TAM constructs. Concretely, Agarwal and Prasad (1999) did not investigate personality, while Karahanna *et al.* (2002) investigated personality but none of the TAM beliefs (PU, PeU, SN and BI). Lastly, Barkhi and Wallace (2007) investigated both personality and the TAM constructs, but did not test mediation directly as they did not establish that personality dimensions have any relation with BI in the first place. Thus, while these studies suggest that the TAM beliefs fully mediate the effects of personality on BI, the question remains unanswered.

Some studies also throw doubt on the full mediation hypothesis. Agarwal and Karahanna (2000) investigated the effect of 'cognitive absorption' (CA; assumed to be a personality trait) on the TAM constructs PeU, PU and BI in the context of general Internet use. They found that CA not only strongly influenced both PeU and PU but also found that this construct influenced BI directly.

Nov and Ye (2008, 2009) also reported findings that were somewhat at odds with the full mediation hypothesis. They investigated the effect of resistance to change (RTC) on intention to use a digital library. They found a significant relation between RTC and effort expectancy (a construct parallel to PeU), but no significant relation between RTC and BI. The study by Walczuch *et al.* (2007) could also be interpreted similarly. The respondents in this study were asked to rate the system they used the most. This makes it possible to hypothesise that BI would be rather uniform, and similar across different levels of PU/PeU, if it had been included in the study. Thus, this study could be regarded as an example of a situation where personality dimensions influence TAM beliefs, but not BI. Lastly, Yi *et al.* (2006) investigated two measures of individual innovativeness, Personal Innovativeness in IT (PIIT), and Adopter Category Innovativeness, in two different settings: online buying practice and PDA adoption. They found that TAM beliefs partially mediated the effects of ACT measures on BI in both situations. The effect of PIIT was fully mediated by the TAM beliefs in the PDA adoption study and partly mediated the effect in the online buying study. They also tested a moderation hypothesis, but found no support for moderation in any of the four setups.

The results of these studies indicate that there is good reason to assume that the TAM beliefs PU, PeU and SN do not fully mediate all personality constructs effects on BI in all settings. We will argue that there are also good theoretical reasons to believe that the TAM beliefs will not always mediate the effects of personality on BI. We will present three scenarios that serve to illustrate this: the standard case, the misalignment case, and the rating case.

1.1. The standard case

TAM predicts technology adoption to the degree that the users know both the technology they evaluate and their own interests and abilities. It is the users' perception of the technology that is at the core of this evaluation. The prospective users' personality enters into this picture by subtly altering the prospective users' affinity to the technology in question. While this affinity is expressed in BI and actual use, it is formed by the evaluations the prospective user makes. As has been demonstrated repeatedly, the TAM beliefs appear central to these evaluations because they explain a large part of the variance in BI. Thus, analyses of relationships between variables should show predictable patterns. For instance, a service appealing to extraverts should reveal a relation between extraversion and BI, while a service appealing to people high in agreeableness should reveal a relation between agreeableness and BI, and so on. Also, we would expect that the personality specific appeal of this service or technology would be revealed in a relation between the personality dimension in question and the TAM beliefs (PU, PeU or SN). If extraverts are more inclined to use social technology than introverts, we would expect them to report that this technology is more useful for them. In fact, the argument is that extraverts have a higher BI than introverts because they evaluate the system differently on PU, PeU and SN than introverts. Thus, it is at the core of the TAM that the beliefs fully mediate the effect of personality

on BI. If so, it is also evident that the relation between a personality dimension and BI cannot be assumed to be invariant over technologies. It should be perfectly possible to find a positive relation between, for instance, extraversion and BI in one study, and a negative relation in another if the technology in question is different.

1.2. The misalignment case

While the above is the standard case, it is also possible that some personality dimensions have a direct relation to BI that is more or less unrelated to the service or product in question. For example, McElroy et al. (2007) found a clear negative relation between emotional stability and willingness to buy and sell on the Internet. The results tie in with the suggestion that emotionally unstable people sometimes use shopping to regulate their moods (Bosnjak et al. 2007), and reports indicating that level of self-regulation is related to online shopping activity (LaRose and Eastin 2002). Given this interpretation of the results of McElroy et al., it is tempting to speculate that they could translate into a more general relation between emotional stability and behaviour that has a regulatory function. In this case, a relation between emotional stability and BI would be expected for systems that support behaviour with a regulatory function. It is not evident that this effect on BI should be mediated through PU, PEU or SN. Rather, it could be argued that when behaviour is motivated by mood regulation, the motivation will be unrelated to the PU of a system that presumably is made for some other purpose than self-regulation. The finding that CA has a direct effect on intention to use the Internet (Agarwal and Karahanna 2000) could be of a similar character. CA is a construct with parallels to flow, absorption and cognitive engagement, and could be seen as a measure of intrinsic motivation. Specifically, the PU measure focused on usefulness in relation to college work (Agarwal and Karhanna, op. cit.). It is not hard to imagine that college students high in CA find areas other than schoolwork to be absorbing, given the multitude of services and information found online. Thus, in this type of situation, we would expect a direct unmediated effect of personality on BI. This full or partial decoupling of beliefs and intention points to a situation where the system is used for a secondary purpose not fully covered by the TAM beliefs. In such cases of 'misalignment' between technology and purposes, one would not expect that the system-specific and primary-purpose TAM beliefs fully mediate the effect of the personality construct on BI.

1.3. The rating case

Lastly, personality influences people's expectations and evaluations. A person high in optimism or openness to experience is almost expected to evaluate a system as easier to use and more useful than a person low in these traits, especially for systems with which an evaluator has little experience. Similarly, a user with a high score on agreeableness might give the system a high rating on PU and PeU out of kindness or conformity. Thus, personality might have a relation to the TAM construct because it influences the rating behaviour of the user (Barrick and Mount 1996). This type of relation between personality dimensions and TAM constructs could give rise to a pattern where relations are found between the TAM beliefs (PU, PeU and SN) and a personality dimension, but not between BI and the same dimension. The results from Walczuch et al. (2007) could be an example of this type of relation between personality and TAM constructs.

Unfortunately, there is no reason to believe that these three situations (i.e. the standard case, the misalignment case and the rating case) are mutually exclusive. For instance, it is easy to conceive of a situation where the last type of influence is overlaid on the first type. In that case, a partial mediation would be expected.

The three types of situations described are an elaborate conjecture about the relation between the personality dimensions and the TAM constructs. From this, it follows that full mediation is a special case, albeit probably the most frequently one, and also that we should not expect invariant relations between personality dimensions and TAM beliefs regardless of technologies. While the hypothesis is too broad for easy testing it allows for predictions that can be tested.

1.4. Hypotheses

We have employed the Big Five personality model to characterise personality since this personality model has been demonstrated as better at explaining variance in Internet use than the MBTI (McElroy et al., op. cit.). Further, the Five Factor model can claim comprehensiveness due to empirical studies of the relations between the model and all other personality models, including the MBTI (Wiggins and Trapnell 1997). The Big Five dimensions are often referred to as openness to experience (sometimes called intelligence or imagination), conscientiousness, extraversion, agreeableness and emotional stability (or reversed neuroticism).

Predictions about the relations between TAM constructs and personality dimensions need to take into consideration the technology in question. In this

study the users did not actually use the technology but based their evaluations on a text description. The main reason for using a description instead of employing an actual technology was to obtain a large and representative sample without incurring prohibitive costs. Obviously, reading a description of the technology is different from using the technology, and this difference could very well result in a weak relation between BI and actual use. However, since the purpose of this study is to investigate the relations between TAM constructs and personality, the negative effects the method might have on the relation between BI and actual use are overshadowed by the ability to use a large and near representative sample. The description emphasised that the technology's main purpose was to give secure and easy access to digital things like music, pictures and documents across a range of platforms, especially PC and mobile phones. The technology could also be used to share these things between friends. The description was open when it came to the actual user interface, giving few cues as to how easy or difficult the technology would be to use. The technology was novel at the time of the study. The description given to the users can be seen in Appendix 1.

We believe the technology description is thorough enough to allow for an evaluation of usefulness, if the user has experience with the inferred type of digital content and terminals. It is reasonable to assume that the technology would appeal to users high in contentiousness since the technology is described as something that secures and keeps order in digital content. However, this depends on the users being interested in this type of digital content in the first place. The application area is diverse and cross-platform (mobile phones and PCs), with a focus on handling music and pictures, including sharing with friends. There is no reason to believe that conscientiousness is related to this application domain. However, based on the findings of McElroy *et al.* (2007) and Hamburger and Ben-Artzi (2000), extraversion could be related to interest in this application domain, since extraversion is found to be associated with both social use of the Internet and information search. Consequently, we suggest that interest in the application domain per se is related to extraversion. Conscientiousness is related to BI in so far as the user is interested in the application domain. Thus, we hypothesise that conscientiousness interacts with interest in the application domain in predicting BI.

These effects are substantial in the sense that they relate personality to the application domain of the technology. As such, they comply with the standard case, and we hypothesise that the effects are mediated by the TAM beliefs PU, PeU and SN. A further reason to hypothesise that the effect of extraversion is mediated through PeU and PU is that optimism has been shown to relate positively to PeU and PU (Walczuch *et al.* 2007), and several studies have shown a positive relation between optimism and extraversion (e.g. Marshall *et al.* 1992, Williams 1992). This leads us to propose the following hypotheses:

> H1: *Extraversion has a positive relation to BI.*
> H2: *The effect of extraversion on BI is mediated by the TAM beliefs: PU, PeU and SN.*
> H3: *Conscientiousness is positively related to BI for individuals interested in the application domain.*
> H4: *The interaction effect of conscientiousness and interest on BI is mediated by the TAM beliefs, PU, PeU and SN.*

Earlier it was suggested that self-regulation could be the mechanism responsible for the relation between emotional stability and online buying and selling. Emotional stability has been shown to be related to general Internet use, but also to social use and information searches (Hamburger and Ben-Artzi 2000, McElroy *et al.* 2007). If self-regulation is the underlying mechanism in all these instances it could signify that online behaviour in general serves regulatory functions. If that were the case, we would also assume that emotional stability should be related to BI given the service description in the present study. This would be an example of the misalignment case, in which case we should also expect that the effect on BI is unmediated. Based on this the following hypotheses are proposed:

> H5: *Emotional stability has a negative relation to BI.*
> H6: *The effect of emotional stability on BI is unmediated by PU, PeU and SN.*

The technology description does not indicate how easy it will be to use this particular application. Thus, any differences between users with respect to PeU are probably heavily influenced by the users' individual characteristics. Openness to experience is an obvious candidate as this personality trait characterise an individual's approach to new situations. This suggests the following hypothesis:

> H7: *Openness to experience has a positive relation to PeU.*

This relation is an example of the rating case, since it is based on the user's rating behaviour. Thus, it does not imply a relation between openness to experience and BI.

2. Method

2.1. Sample

The sample was drawn from the web panel of a statistical bureau. This panel consisted of about 30,000 Norwegians and was controlled with regards to deviances from the normal population. One thousand and four participants over the age of 15 years were randomly sampled from the panel (505 females, 499 males). The mean age of the participants was 44.75 years (SD = 16.06 years). The statistical bureau recruited the participants and conducted the study. The participants did not get any reward for their participation.

2.2. Procedure

Respondents who agreed to participate received an email with a link to a web page. When they opened the link they got to read a description of the technology and had to complete a questionnaire. The technology description was of a software tool designed to take care of digital contents like images, music, and files. This description outlined the product's functions and usage areas, and pointed out that it was usable both on mobile phones and on PCs. A figure accompanied the description. The product description can be seen in Appendix 1. The respondents were asked to read the description before answering the questions in the questionnaire.

2.3. Materials and construct measurement

The Big Five items were measured by a 20-item version of the International Personality Item Pool (IPIP) of questions (Goldberg 1999). The TAM constructs PeU, SN and BI were measured using items from already established scales (Ajzen and Fishbein 1980, Davis 1989, Venkatesh *et al.* 2003). The PU measure had to be modified from the original since it would be close to meaningless to ask how the system in question would affect the respondents' work. Following the recommendations of Heijden (2004), we constructed items that attempted to preserve the utilitarian nature of the PU scale, for instance the services' ability to help preserve and take care of the respondents' digital belongings. Since the TAM measures deviated somewhat from the published scales, the measures were subjected to a factor analysis.

All scales were translated into Norwegian and checked by three competent speakers of English and Norwegian, before they were pre-tested on eight subjects. Minor changes in wording were performed on some of the items in order to increase comprehension. A five-point Likert scale was used, where the participants indicated their agreement (5) or disagreement (1) with the proposition in question. The Big Five items are shown in Appendix 2 and the TAM items in Table 1.

A measure of interest in the application domain was constructed using a 20-item questionnaire covering importance of different aspects of mobile telephony, like listening to radio and music, good audio quality, easy texting, reading email, using the mobile as a modem for PC, etc. Four of these questions were intended to measure interest in the application domain, 'download and listen to music', 'listen to radio', 'download and play games' and 'take pictures'. The

Table 1. Factor analysis of the TAM items (only loadings greater than 0.300 are shown).

	Factor			
	PeU	PU	BI	SN
(PeU2) To learn to operate the product will be easy for me.	0.865			
(PeU4) Overall, I think I will find the product easy to use.	0.791			
(PeU1) It would be easy for me to become skilful in using the product.	0.734			
(PeU3) My interaction with the product will be clear and understandable.	0.711			
(PeU5) I will find it easy to get the product to do what I want to do.	0.642			
(PU4) The product will help me keep track of my digital belongings.		0.721	0.378	
(PU3) The product will be useful for guarding my digital belongings.	0.337	0.717	0.326	
(PU5) Overall, the product will help in guarding my digital belongings.		0.696	0.355	
(PU1) The product will ensure that my digital belongings will not get lost.		0.615		
(PU7) It is important to me to safeguard my digital belongings.	0.352	0.488		
(PU6) The product will save time for me.		0.402	0.335	0.336
(PU2) It does not matter if I lose my digital belongings.				
(BI4) I intend to use the product when it enters the market.		0.351	0.768	
(BI3) I intend to use the product regularly when it enters the market.	0.319	0.358	0.732	
(BI2) I plan on getting hold of the product when it enters the market.	0.336	0.356	0.722	
(SN2) People who influence my behaviour will think that I should use the system.				0.836
(SN1) People who are important to me think that I should use the product.				0.701
(SN3) The product will become a status symbol among people I know.				0.642

Note: PeU, perceived ease of use; PU, perceived usefulness; BI, behavioural intention to use; SN, subjective norm.

respondents were asked to indicate how important the functionality was for them on a five-point scale ranging from unimportant to important.

2.4. Measurement model

A principal components factor analysis with Varimax rotation was performed on the TAM items. The factor analysis was restricted to four factors. The factors explained 64% of the variance in the material. The resulting factor matrix is shown in Table 1. The factor solution was adequately defined with no large cross loadings. Items with high cross loadings were deleted (PeU5, PU2, PU6 and PU7).

A principal components factor analysis with Varimax rotation was performed on the 20 interest items. The analysis indicated three factors with Eigenvalues over 1, of which one was the application domain factor. The factor structure was clean with no large cross loadings. All four application domain items loaded highly on the application interest factor.

Descriptive statistics and Cronbach's alpha values are presented in Table 2. The alpha values were satisfactory for the TAM constructs and for the interest in the application domain construct. The alpha values for the Big Five dimensions were low. In particular, agreeableness had low reliability with Cronbach's alpha below 0.5. Consequently, agreeableness was removed from further analysis. The remaining indexes were included in the analyses since the items were taken from a thoroughly validated scale. Also, it has been suggested that alphas above 0.6 are adequate for exploratory purposes (George and Mallery 2003).

2.5. Analysis

The hypotheses specified relations between BI and the B5 traits that are both mediated (H1 and H3) and unmediated (H5), as well as a relation between the TAM beliefs and B5 traits that was hypothesised to have no effect on BI (H7). In order to test the mediation hypotheses (H2 and H4), we followed the three-step procedure outlined by Baron and Kenny (1986). In step 1, the relation between Big Five dimensions and BI will be established. In step 2, the relation between the TAM beliefs and BI will be established, and in step 3, we will investigate the change in the relation between Big Five dimensions and BI when the TAM beliefs (PU, PeU, and SN) are included in the regression. The beliefs will be seen as mediating constructs if (a) a relation is found between a Big Five dimension and BI in step 1, (b) the TAM beliefs are found to have a significant relation to BI in step 2, and (c) the relation found in step 1 either becomes non-significant, or is substantially reduced, in

Table 2. Description of constructs and their correlations.

Correlations construct	Mean	Std	n	BI	PU	PeU	SN	Ext	Con	Es	Op	Agr	IAD	C × I
BI	2.8	1	3	0.94										
PU	3.4	0.96	4	0.752**	0.86									
PeU	3.3	0.87	4	0.580**	0.591**	0.87								
SN	2.3	0.9	3	0.527**	0.467**	0.303**	0.90							
Extraversion	3.5	0.68	4	0.109**	0.202**	0.207**	0.040	0.60						
Conscientiousness	3.5	0.73	4	-0.033	-0.025	0.009	-0.026	0.022	0.66					
Emotional stability	3.4	0.73	4	0.064*	0.038	0.085**	-0.099**	0.192**	0.193**	0.68				
Openness to experience	3.7	0.67	4	0.048	0.068*	0.176**	-0.097**	0.376***	0.120**	0.187**	0.59			
Agreeableness	3.9	0.57	4	0.118**	0.154**	0.106**	0.057	0.400**	0.209**	0.139***	0.342**	0.44		
Interest App Dom (IAD)	2.2	0.89	4	0.2580	0.222**	0.285**	0.202**	0.162***	-0.087**	-0.119***	0.030	0.003	0.76	
CxI	7.7	3.47	na	0.2320	0.205**	0.273**	0.180***	0.155***	0.387***	-0.016	0.079*	0.095**	0.865**	na

Note: PeU, perceived ease of use; PU, perceived usefulness; BI, behavioural intention to use; SN, subjective norm; Interest App Dom (IAD), behavioural intention in application domain index; C × I, product of conscientiousness and interest in application domain indexes; Std, standard deviation. n = number of items in construct; N = 1004. Correlations in the off diagonal. Cronbach alpha in the diagonal. **significant at the 0.01 level. *significant at the 0.05 level. Non-marked correlations, not significant from zero.

step 3. The correlation matrix including the TAM constructs, the interaction between conscientiousness and interest in the application domain, and Big Five dimensions give the necessary information to perform steps 1 and 2 in this procedure. A series of multiple regressions could be used to decide step 3. However, this method will become cumbersome when many variables are mediating. Thus, in order to determine step 3, a path analysis with BI as a dependent variable and the Big Five dimensions and TAM beliefs as independent variables was performed. This path analysis would have to include direct paths between the personality dimension and BI, between the personality constructs and the TAM beliefs, and between the TAM beliefs and BI. All personality constructs are set to correlate freely. The TAM model is estimated according to the standard interpretation where PU, PeU, and SN influence BI, PeU influences PU, and SN influences PU and PeU.

Testing the effect of the interaction of conscientiousness and interest on BI cannot be accomplished by investigating the significance of the correlation between the interaction and BI alone. Rather, it requires that both conscientiousness and interest be investigated as main effects together with the interaction. However, since the path analysis described above also involves the TAM beliefs, this approach cannot be followed. In order to test H3, a regression analysis was performed with BI as dependent variable, and conscientiousness, interest in the application domain, and the interaction as independent variables. Hypothesis H3 is supported if the interaction has a significant relation to BI. Hypothesis H4, that the effect of the interaction is mediated, is investigated by using the same procedure as discussed above, given that H3 is supported.

Hypothesis H6 states that emotional stability has a direct and unmediated effect on BI. This hypothesis can be tested following the same procedure as outlined above. A relation between emotional stability and BI both before and after inclusion of the TAM beliefs is necessary in order to give the hypothesis support. The hypothesis is falsified if there is no relation between emotional stability and BI, or if this relation disappears when the TAM beliefs are entered into the regression. Thus, this hypothesis can be tested using the same correlation matrix and path diagram as the one discussed above.

The last hypothesis (H7) states that openness to experience has a positive relation to PeU, but this relation will not influence BI. This hypothesis is falsified if no relation is found between openness to experience and PeU, or if evidence for meditation of an effect of openness to experience on BI by PeU is found. Thus, this hypothesis can also be tested by investigating the correlation matrix, and doing a path analysis involving the personality constructs, the TAM beliefs, and BI.

It is worth noting that the resulting path diagram is not equivalent to a structure model based on the hypotheses. It differs from this model since it includes paths that are supposed to be fully mediated in order to test that they are different from zero.

3. Results

The correlation matrix is shown in Table 2. Extraversion correlated significantly with BI ($r = 0.17$, $p < 0.01$) in support of H1. Also, extraversion was significantly correlated with PU ($r = 0.20$, $p < 0.01$) and PeU ($r = 0.21$, $p < 0.01$), but not with SN ($r = 0.04$, ns).

Emotional stability was significantly correlated with BI ($r = 0.06$, $p < 0.05$). A significant relation to BI was hypothesised; however, it was in the other direction, thus H5 was rejected. Openness to experience had no significant relation to BI ($r = 0.05$, ns). Openness to experience was significantly correlated with PeU ($r = 0.18$, $p < 0.01$), SN ($r = -0.10$, $p < 0.01$) and PU ($r = 0.07$, $p < 0.05$). Since openness to experience was not related to BI, it could not have a mediated effect on BI. However, openness to experience was related to PeU. This supports H7.

In order to test H3, the effect of interaction term between conscientiousness and interest in the application domain (C × I) on BI, a hierarchical regression was performed. In step 1, the regression of BI on conscientiousness and interest in the application domain was tested, while C × I was entered in step 2. This allowed for testing both change in R^2 and the significance of the regression coefficient. The results support H3. R^2 increased significantly from step 1 to step 2 (delta $R^2 = 0.05$, $p < 0.05$), while the final model shows a significant relation between C × I and BI ($\beta = 0.38$, $p < 0.05$). Interest did not reach significance ($\beta = -0.08$, $p <$ ns), while conscientiousness had a significant and negative relation to BI in the final model ($\beta = -0.19$, $p < 0.05$).

A path analysis using AMOS was performed in order to test for mediation. The three personality constructs and the interaction term (C × I) were left to correlate freely. The model fit the data well even if the overall chi square test was significant ($p = .002$, $df = 3$, chi = 14.75, GFI = 996, TLI = 0.947, CFI = 0.99, RMSEA = 0.062, ecvi = 0.81). The results are shown in Figure 1. The relation between extraversion and BI turns non significant while the relation between extraversion and PU ($\beta = 0.07$, $p < 0.05$) and PeU ($\beta = 0.18$, $p < 0.01$) is significant. This supports H2, that the relation between extraversion and BI is fully
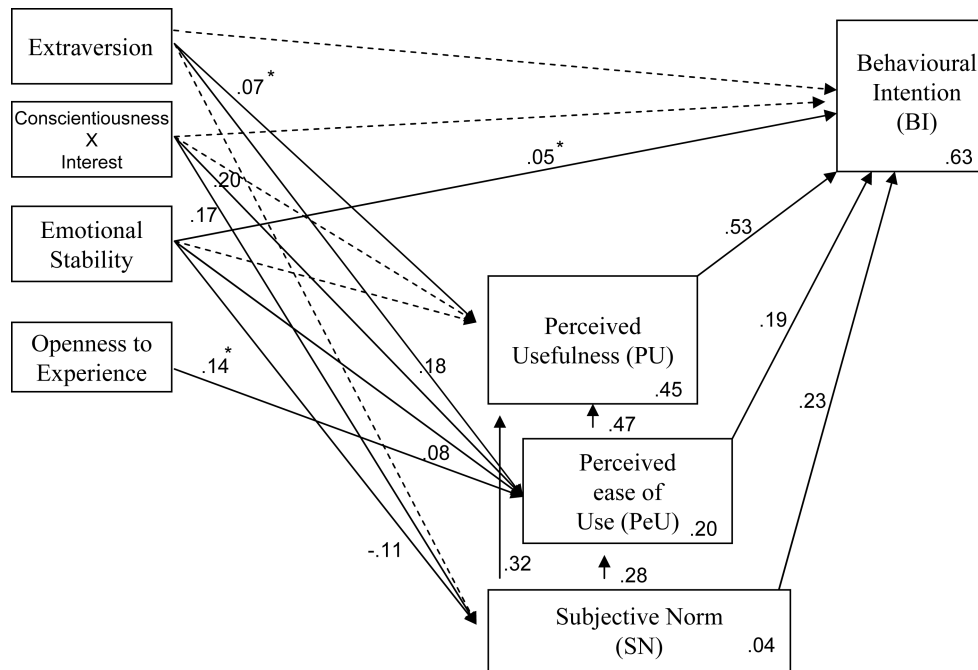
Figure 1. Path diagram showing relation between personality constructs, TAM beliefs and BI. Note: Numbers on lines are standardised beta weights. Numbers in boxes are squared multiple correlations. Punctured lines are non-significant. *$p < 0.05$, non-marked betas significant at $p < 0.01$. Correlations not shown.

mediated by the TAM beliefs. The relation between C × I and BI also turns non significant, while there is a significant relation between C × I and PeU ($\beta = 0.20$, $p < 0.01$) and C × I and SN ($\beta = 0.17$, $p < 0.01$). This indicates that the relation between C × I and BI is fully mediated by the TAM beliefs supporting H4. Emotional stability is significantly related to PeU ($\beta = 0.08$, $p < 0.01$) and SN ($\beta = -0.11$ $p < 0.01$); however, the relation between emotional stability and BI ($\beta = 0.05$, $p < 0.05$) was not affected by including the TAM beliefs. Thus, the relation between this personality construct and BI does not appear to be mediated. This is in support of H6.

A model without the direct paths between extraversion and BI and between the interaction term C × I and BI was tested for fit. The model fit the data well ($p = 0.004$, $df = 5$, chi = 17.59, GFI = 0.99, TLI 966, CFI = 0.99, RMSEA = 0.05, ecvi = 0.079) and better than the model with the direct paths, as indicated both by the ecvi and the other fit indices.

Inspection of the modification indices suggested a significant negative relation between openness to experience and SN ($\beta = -0.12$, $p < 0.01$). This relation indicates that subjects high in openness to experience are less influenced by peer pressure than subjects low in openness to experience. The model fit the data very well when this path is included in the

analysis ($p = 0.38$, $df = 4$, chi = 4.20, GFI = 0.99, TLI = 0.99, CFI = 1.00, RMSEA = 0.007, ecvi = 0.068). The final model is shown in Figure 2. The model explains 63% of the variance in BI. To summarise, the model confirms the general TAM and lends support to the hypotheses tested previously, except H5.

4. Discussion

The results are largely in support of the hypotheses. Extraversion is positively related to BI. This personality trait is also positively related to PU and PeU, and the effect extraversion has on BI turns out to be fully mediated by these beliefs, supporting hypotheses H1 and H2. The interaction between conscientiousness and interest in the application domain is significant in the right direction and this effect is also fully mediated by the TAM beliefs, supporting Hypotheses 3 and 4. Emotional stability has an unmediated effect on BI; however, this effect is in the opposite direction of the one predicted. Thus, H5 is not supported while H6 is. Lastly, openness to experience has a positive effect on PeU, but openness to experience has no relation to BI supporting H7.

The results demonstrate that the Big Five traits have relations to the TAM constructs that cover the three scenarios discussed in the introduction: the standard
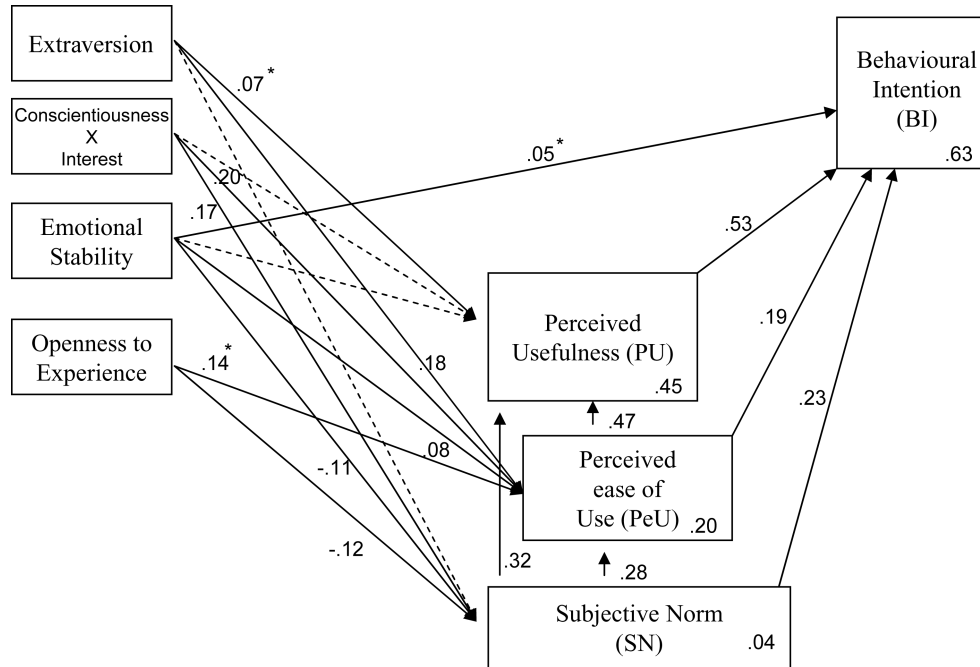
Figure 2. Final model of relations between personality constructs, TAM beliefs and BI. Note: Numbers on lines are standardised beta weights. Numbers in boxes are squared multiple correlations. Punctured lines are non significant. *$p < 0.05$, non-marked betas significant at $p < 0.01$. Correlations not shown.

case, the misaligned case, and the rating case. The relation between extraversion and the interaction between conscientiousness and interest and BI is fully mediated by the TAM beliefs. This is an example of the standard case where the relation between TAM constructs and personality exists because of the subject matter of the application domain. It follows that we should not expect these relations to hold if different application domains are investigated.

The relation between emotional stability and BI was hypothesised to be an example of the misalignment case, that is, of a type where the reason for using the technology could be different from its intended purpose. In keeping with this line of reasoning, a direct, unmediated effect was expected, and this was supported by the results. However, the rationale for proposing this relation (i.e. that emotionally less stable persons will have a higher intention to use the software because of its self-regulatory properties) is not supported as the relation is in the wrong direction. As the evidence for this contention came from online shopping we might conclude that generalising from online shopping to the application domain investigated here is not supported by the data. An explanation for the positive, unmediated relation found between emotional stability and BI in the present study could possibly be the social nature of the application domain, as the application is associated with social computing

and mobile telephony. An explanation along these lines would suggest that emotionally stable individuals are more interested in social use of the Internet than less emotionally stable individuals. From this, we might assume that a relation between BI and emotional stability would not be mediated by the TAM beliefs the way they are operationalised in the present study. PU is operationalised to capture the application's usefulness in organising digital content. This has little direct relevance for social use of media. Thus, while our original reason for assuming an unmediated relation between emotional stability and BI is not supported, we still argue that the results can be taken as an example of the existence of an unmediated effect between personality and BI, in other words an example of the misalignment case.

Openness to experience was hypothesised to have a relation to the TAM in line with the rating case. This implies that the relation is based on the respondents' typical rating behaviour. The results are in line with the hypothesis and suggest that also this type of relation between Big Five dimensions and TAM constructs exists.

Since the application investigated could be specifically associated with social computing and mobile telephony, it might be particularly appealing to socially inclined users. This would also explain the high impact of extraversion on BI in this study. It is probable, as we

have argued, that the pattern of influence from personality traits to technology acceptance will differ depending on the technology or service in question. Thus, our results cannot be taken as evidence for the general importance of extraversion in technology acceptance, but rather for the general importance of personality traits. Investigating the interaction between types of technology and personality is an interesting issue for future research.

McElroy *et al.* (2007) found that controlling for computer anxiety and self-efficacy removed the effect of extraversion on Internet use. No such controls were made in this study. At first sight, it would appear that a large representative sample from a population that conforms to the Norwegian adult population over 15 would guarantee that no biases in relation to these constructs were found. However, since our study employed a web based questionnaire, a bias towards low computer anxiety and high computer self-efficacy (CSE) could be present in the data. If there are any relations between CSE and the B5 traits, it is reasonable to assume that the influence goes from B5 to CSE (Saleem *et al.* 2005). Thus, in order for a sample bias in CSE to have impact on the present results, CSE must interact with the B5 traits in their effect on the TAM beliefs and BI. This cannot be ruled out and is an interesting topic for further research.

An obviously limiting aspect of the current study is that respondents read a description of the product, rather than actually use it. It is conceivable that this makes personality factors more prominent in the evaluation of the technology than would be the case if the respondents had actually used the technology. The effects of personality on the TAM constructs could be different if respondents use the system or product that is being evaluated. While this might limit the applicability of these results, it does not invalidate them. Using hypothetical product descriptions is a commonly utilised paradigm in research on technology acceptance. In fact, this paradigm is in some cases very similar to the actual adoption process, as users often have to buy a product without being able to try it first. Further, this strategy made it possible to investigate a large, heterogeneous sample allowing generalisation beyond a specific business or student population. However, a natural extension of this research would be to investigate the effect of personality factors on technology acceptance in situations where the users actually use the technology.

The results support the contention that the relation between personality and BI is not fully mediated by the TAM beliefs. Personality has effects on BI that are not mediated by TAM constructs, and effects on TAM constructs that are not related to BI. For the many users of TAM and TAM related models in studies of technology acceptance, this result implies that they need to be concerned with the personality of the research participants. A user sample that deviates from the target population in terms of personality can very well give a biased estimate of the populations' attitude towards the technology.

References

Agarwal, R. and Karahanna, E., 2000. Time flies when you're having fun: cognitive absorption and beliefs about information technology usage. *MIS Quarterly*, 23 (4), 665–693.

Agarwal, R. and Prasad, J., 1999. Are individual differences Germane to the acceptance of new information technologies? *Decision Sciences*, 30 (2), 361–392.

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

Allport, G.W., 1961. *Pattern and growth in personality*. NY: Holt, Reinhart and Winston.

Amichai-Hamburger, Y. and Ben-Artzi, E., 2003. Loneliness and Internet use. *Computers in Human Behavior*, 19, 71–80.

Barkhi, R. and Wallace, L., 2007. The impact of personality type on purchasing decisions in virtual stores. *Information Technology and Management*, 8, 313–330.

Baron, R.M. and Kenny, D.A., 1986. The moderator-mediator variable distinction in social psychological research: conceptual, strategic and statistical considerations. *Journal of Personality and Social Psychology*, 51, 1173–1182.

Barrick, M.R. and Mount, M.K., 1996. Effects of impression management and self-deception on the predictive validity of personal constructs. *Journal of Applied Psychology*, 81, 265–272.

Bosnjak, M., Galesic, M., and Tuten, T.L., 2007. Personality determinants of online shopping: explaining online purchase intentions using a hierarchical approach. *Journal of Business Research*, 60 (6), 597–605.

Davis, F.D., 1989. Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13, 319–340.

George, D. and Mallery, P., 2003. *SPSS for Windows step by step: a simple guide and reference. 11.0 update*. 4th ed. Boston, MA: Allyn & Bacon.

Goldberg, L.R., 1999. A broad-bandwidth, public domain, personality inventory measuring the lower-level facets of several five-factor models. *In*: I. Mervielde, I. Deary, *et al.*, eds. *Personality psychology in Europe*. Vol. 7. Tilburg, The Netherlands: Tilburg University Press, 7–28.

Hamburger, Y.A. and Ben-Artzi, E., 2000. The relationship between extraversion and neuroticism and different uses of the Internet. *Computers in Human Behavior*, 16, 441–449.

Heijden, H., 2004. User acceptance of hedonic information systems. *MIS Quarterly*, 28, 695–704.

Karahanna, E., *et al.*, 2002. Individual differences and relative advantage: the case of GSS. *Decision Support Systems*, 32 (4), 327–341.

King, W.R. and He, J., 2006. A meta-analysis of the technology acceptance model. *Information & Management*, 43, 740–755.

Kraut, R., *et al*., 1998. Internet paradox: a social technology that reduces social involvement and psychological well-being? *American Psychologist*, 53, 1017–1031.

LaRose, R. and Eastin, M., 2002. Is buying online out of control? Electronic commerce and consumer self-regulation. *Journal of Broadcasting and Electronic Media*, 46 (4), 549–564.

Lee, Y., Kozar, K.A., and Larsen, K.R.T., 2003. The technology acceptance model: past, present, and future. *Communications of the Association for Information Systems*, 12 (50), 752–780.

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

Marshall, G.N., *et al*., 1992. Distinguishing optimism from pessimism: relations to fundamental dimensions of mood and personality. *Journal of Personality and Social Psychology*, 62 (6), 1067–1074.

McElroy, J.C., *et al*., 2007. Dispositional factors in internet use: personality versus cognitive style. *MIS Quarterly*, 31 (4), 809–820.

Nov, O. and Ye, C., 2008. Users' personality and perceived ease of use of digital libraries: the case for resistance to change. *Journal of the American Society for Information Science and Technology*, 59 (5), 845–851.

Nov, O. and Ye, C., 2009. Resistance to change and the adoption of digital libraries: an integrative model. *Journal of the American Society for Information Science and Technology*, 60 (8), 1702–1708.

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

Pocius, K.E., 1991. Personality factors in human-computer interaction: a review of the literature. *Computers in Human Behavior*, 7, 103–135.

Saleem, H., Beudry, A., and Criteau, A.M., 2005. Antecedents of computer self-efficacy: an investigation of the role of personality traits. *Proceedings of the administrative sciences association of Canada (ASAC)*, Toronto, Ontario May 28–31, 2005.

Schepers, J. and Wetzels, M., 2007. A meta-analysis of the technology acceptance model: investigating subjective norm and moderation effects. *Information & Management*, 44, 90–103.

Swickert, R.J., *et al*., 2002. Relationships among Internet use, personality, and social support. *Computers in Human Behavior*, 18, 437–451.

Venkatesh, V., *et al*., 2003. User acceptance of information technology: toward a unifying theory. *MIS Quarterly*, 27 (3), 425–479.

Walczuch, R., Lemmink, J., and Streukens, S., 2007. The effect of service employees' technology readiness on technology acceptance. *Information & Management*, 44, 206–215.

Wiggins, J.S. and Trapnell, P.D., 1997. Personality structure: the return of the Big Five. *In*: R. Hogan, J. Johnson, and S. Briggs, eds. *Handbook of personality psychology*. San Diego, CA: Academic Press, 737–765.

Williams, D.G., 1992. Dispositional optimism, neuroticism, and extraversion. *Personality and Individual Differences*, 13 (4), 475–477.

Yi, M.Y., Fiedler, K.D., and Park, J.S., 2006. Understanding the role of individual innovativeness in the acceptance of IT-based innovations: comparative analyses of models and measures. *Decision Sciences*, 37 (3), 393–426.

Appendix 1

Product description

A description of the 'Digital Vault' (original in Norwegian). The 'Digital Vault' is a new product. The product is a secure area where you may store all your digital belongings. Digital belongings may for instance be pictures, music, videos, address books, data files, etc. The product will collect all your digital belongings in one place. Your digital belongings will be kept safe in the vault regardless of what happens to your PC or cell phone. When you need your digital belongings you may download them to your cell phone or your PC with a few button pushes. You may share the content with others by giving them the key to the vault (Figure A1).

You may download from and upload to the vault from both cell phones and PC. Some services will be attached to the product, for instance picture and music services. The picture service allows you to search for, look at and store pictures. The music service allows for searching, storing and listening to music. In both cases, it is possible to search, store, look/listen and listen from both the cell phone and the PC. The product will be available for newer cell phones and PCs.

Appendix 2

Big Five items used in the survey

(Ext1) I feel comfortable around people.
(Ext2) I talk to a lot of different people at parties.
*(Ext3) I don't like to draw attention to myself.
*(Ext4) I keep in the background.
(Aff1) I am interested in people.
(Aff2) I make people feel at ease.
*(Aff3) I'm not interested in other people's problems.
*(Aff4) I insult people.
(Con1)I am always prepared.
(Con2) I am exacting in my work.
*(Con3) I leave my belongings around.
*(Con4) I often forget to put things back in their proper place.
(OE1) I have a rich vocabulary.
(OE2) I am full of ideas.
*(OE3) I'm not interested in abstract ideas.
*(OE4) I do not have a good imagination.
(ES1) I'm relaxed most of the time.
(ES2) I seldom feel blue.
*(ES3) I worry about things.
*(ES4) I get stressed out easily.

Note: Ext, extraversion items; Aff, affiliation items; Con, conscientiousness items; OE, openness to experience items; ES, emotional stability items; *Items are reverse coded.
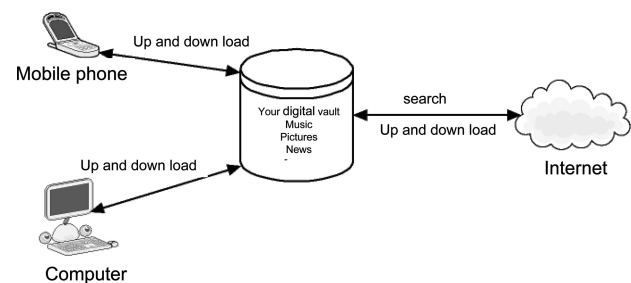

Figure A1.   Illustration from product description.