A Tale of Four Functions and Their Relationships with the Device: Extending Implementation Intention Theory

Abstract - This paper proposes a model, which extends the theory of planned behavior and implementation intention theory (1) to capture user evaluation at the functional level; (2) to investigate the distinct role of pleasure for different hedonic levels; (3) and to examine the interrelationships among intentions in a multifunctional device. The model is applied to study intention to use the functions of phone, organizer, camera and MP3 player in smartphones. A survey with more than 200 respondents shows how the antecedents varied among functions. In particular, pleasure shows much stronger effects for high-hedonic functions than low-hedonic functions. However, high-hedonic functions do not contribute to overall intention to use a smartphone. The different effects of individual functions on the overall device suggest important practical implications. The research model can be applied to specific devices to better understand the important functions.

Index Term **- Media convergence, smartphone, relationships among intention, function-based analysis, hedonic, multifunctional device**

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> …arming mobile professionals with the tools to work on the go…you can view and edit native Microsoft Word, Excel, and PowerPoint…deliver your e-mail with support for up to eight e-mail accounts…Now, let's have some fun, shall we? To fulfill your entertainment zones, [the device] equipped with Pocket Tunes for listening to your favorite tunes, as well as podcasts. The bottom line: [the device] offers a winning package of wireless connectivity, productivity tools, and fun for users of all kinds. [1].

The comment above from CNET is one of many customer reviews on a multifunction device. It describes the reviewer's assessment for each of the function. Some functions such as the office suite and the email client provided by the device are for work-related/productivity purposes (i.e., utilitarian); others such as pocket tunes and games are for fun-related usage (i.e., hedonic). Multifunction-based analyses will become increasingly important because modern technologies are merging and integrating many different functions into a single system, such as described above.

Other examples are mobile phones that include digital image capture and processing; digital cameras which include storage devices, GPS hardware; and laptops which include webcams, fingerprint sensor and wireless devices (e.g., Bluetooth, Wi-Fi, infrared red). Visa was working with Android (a software platform for mobile devices) and Nokia to integrate their credit card and phone [2]. Through such convergence, consumers could obtain real-time notification of their credit card activity, and the locator is able to show places in close proximity to stores and ATM which accept Visa cards. Consequently, a unitary evaluation may not be able to capture the full picture.

To our knowledge, there are very few studies examining the adoption of individual functions of multifunctional device and their relationships with the overall device. For instance, user adoption models such as the theory of planned behavior (TPB) and technology acceptance model (TAM) have been widely used to measure the adoption of a system, such as email, personal computer, and spreadsheet systems holistically [3], [4], [5]. These studies have not looked into the relationships among intentions at the

functional level and examined how intentions at the functional level contribute to the understanding of the acceptance of the overall device.

Due to the scarcity of studies in this area, additional work that analyzes various functions individually and the relationships among these functions of such a device would be necessary. Such knowledge can be applied in practice to differentiate functions that are important or unimportant to the overall intention to use a device. Promotional efforts can then be concentrated on the important functions. This approach can be used by companies marketing a device, or by organizations that want to promote their applications.

This study takes the approach of assessing four different functions in the smartphone: telephone, organizer, camera and mp3 player. Our research objectives are threefold: first, we apply the extended TPB to the function level, so as to capture user evaluation for each function. Second, we take into account the hedonic perception of the functions and investigate the distinct role of pleasure for different hedonic levels. Last, based on the implementation intention theory, we examine the relationships among intentions in various functions within the smartphone.

The remaining sections are organized as follows. The first section introduces the background of smartphone, subsequently it reviews how research has moved from examining one intention to analyzing multiple intentions. This is followed by reviewing the implementation intention theory, which provides a theoretical explanation on the relationships among intentions. The subsequent section reviews the TRA/TPB and its extension to incorporate emotional factors. The methodology section describes the instrument development and data collection, followed by the data analysis section. The subsequent section discusses the findings, limitations, and implications. The paper is concluded with some suggestions for future research.

Background

Smartphone

A smartphone is a PC-mobile convergence handheld device. It is a phone with many other functions such as a calendar, task list, organizer, word processor, game, browser, GPS (global positioning system)

and mp3 player. Thus, it is also known as a PDA phone (PDA which includes a phone function) [6] [7]. We use the terms smartphone and PDA interchangeably.

Many professions, including business, education [8], engineering [9] and healthcare [10], have been using smartphone extensively. Smartphones not only "arm professionals with the tools to work on the go", but also "provide them with fun at the same time" [1]. Smartphone sales and users have been increasing very quickly over recent years [11], [12] [13], [14], [15]. [11]-[15].

Extending Intention

Intention -- which often serves as a proxy for behavior -- has been examined by many theories such as the theory of reasoned action [16], theory of planned behavior [17], technology acceptance model [4], [18] and expectation disconfirmation theory [19], [20]. Though new technologies incorporate many functions, user acceptance studies of new systems continue to treat systems in a holistic manner such as to examine intention to use e-commerce websites instead of intention to search and purchase from the websites. Interest is increasing in studying intentions at a functional level.

Our review of user acceptance studies examining intention shows that these studies have progressed through three stages. In the first stage, researchers looked at the overall perception of the system and only one overall behavioral intention was measured [21], [22], [23] [24] [25], [26] [21]-[26]. In this stage, researchers looked at the overall perception of the system. In the second stage, functions are analyzed separately, and intention for each function is measured [27],[28]. In the third stage, the relationships between intentions across functions were considered [29], [30]. For instance, [29] and [30] used implementation intention theory to study relationships between search and purchase intentions. In the next section, we extend the third stage by examining the relationships among intentions among functions and their effects on overall intention by applying the same implementation intention theory.

Implementation Intentions

Implementation intention extended the theory of planned behavior by including an implemental phase by setting plans to initiate the relevant actions [31], [32], [33], [34] [31]-[34]. These plans specify when,

where, and how actions should be taken to achieve the intention. For instance, in the TPB, intention takes the form “I intend to lose weight” or "I intend to use a smartphone" – a general statement of a goal. Gollwitzer [32] showed that the formation of implementation intentions by specifying when and where a particular intention can be achieved increases the likelihood that a behavior can be carried out. For instance, in an experimental study which involves writing a report during a vacation showed that students which formed implementation intentions actually wrote the report twice more than those who did not.

Earlier studies have concentrated on implementation intentions in terms of “when and where goal-directed action (i.e., intention) should be taken” [34, p. 593]. Recent studies have focused on how the intended action should be carried out. But studies have not yet looked into how the subgoals (i.e., various sub-intentions) influence the overall goal (i.e., overall intention). For instance, a study by Verpanken and Faes [34] showed how sub-goals such as consuming less fatty snacks, cutting down on fast food, eating more vegetables and fruit could contribute to the overall intention of losing weight (see Figure 1).

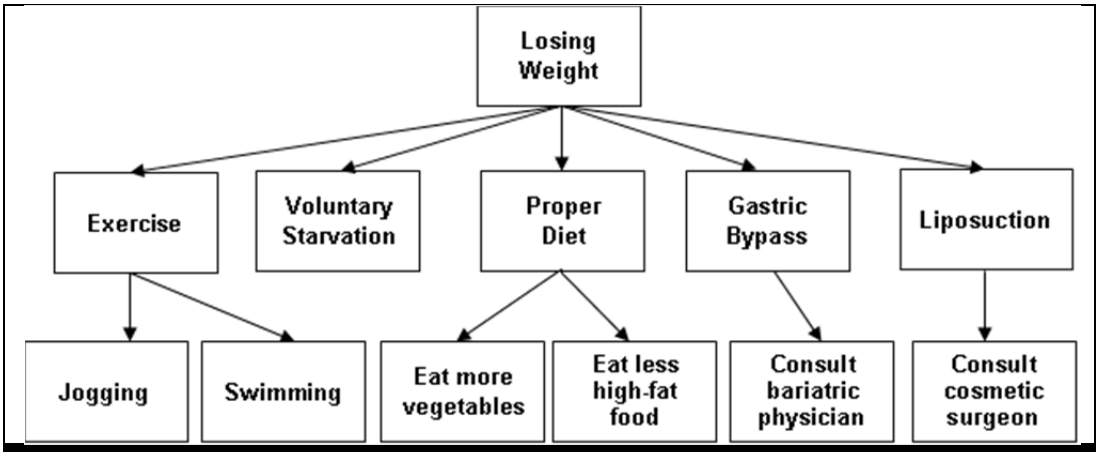

Figure 1. An Example of an Overall Goal of Losing Weight

As for the case of the smartphone, it is also important to show how phone, organizer, mp3 and camera functions could contribute to the overall usage of the smartphone. We would argue that identifying the most significant subgoals, which substantially influence the overall goal, is important as the overall intention could be targeted more efficiently. Four common functions of the smartphone are investigated in this study: organizer (to manage personal information), phone (to make and receive calls), camera (to take

pictures or video), and MP3 player (to store and play music). More advanced functions such as GPS and Wi-Fi were not included, as a smartphone with such functions was still expensive and not common when the study was conducted.

We view using smartphone as the overall goal of *managing daily activities* that cover *work, communication and entertainment*, and using its functions, which cover one part of the overall goal as sub-goals. For instance, using the phone function covers *only* the communication activity and using the organizer covers *only* the scheduling of work. Use of the phone, mp3, camera and organizer contributes to the overall use of the smartphone. This is similar to different approaches including jogging, swimming, eating more vegetables, and eating less high fat food contribute to the overall goal of losing weight (Figure 1). Therefore, we view that the overall usage of the smartphone is the top goal. Examining how different functions contribute to the usage of overall device is similar to examining how different approaches of reducing weight contribute to the overall goal of losing weight. For instance, does jogging contribute more to losing weight? Does the phone usage contribute more to the usage of the smartphone? Therefore, we hypothesize:

H1: Intention at the functional level (i.e., phone, organizer, camera, mp3 player) will have a positive effect on the overall intention of the device (i.e., smartphone).

The Theory of Planned Behavior (TPB)

The theory of planned behavior (TPB) is extended from the theory of reasoned action (TRA) which has been used widely to predict intention and behavior [16], [35], [36]. Four constructs in TRA are attitude, subjective norm, intention and behavior. TRA hypothesizes that behavior is influenced by one's intention to perform the behavior. Intention, on the other hand, is influenced by one's attitude (i.e., a positive or negative evaluation about performing the behavior), and subjective norm (i.e., perceived social influence whether to perform or not to perform behavior) (see Figure 2). In a meta-analysis study of TRA, Sheppard et al. [36] showed strong support for the overall predictive utility of TRA.

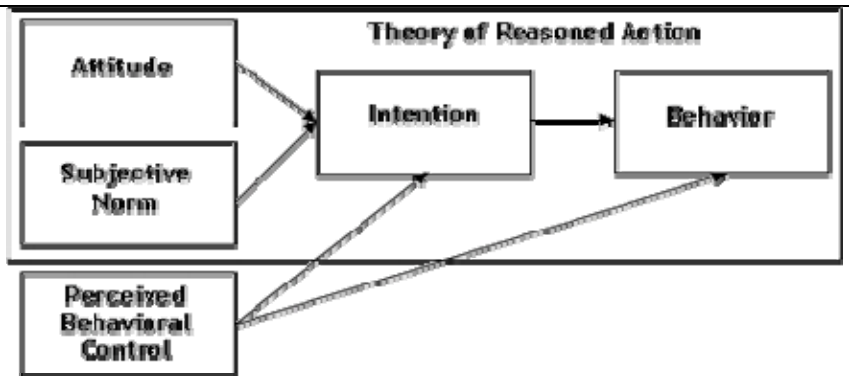

Figure 2. Theory of Reasoned Action and Theory of Planned Behavior (Fishbein and Ajzen 1980; Ajzen 1991)

The TRA, however, could not fully explain behavior that is not entirely under volitional control [17]. Therefore perceived behavioral control (PBC) is added to form the TPB to predict both intention and behavior (see Figure 2). PBC represents the constraints on behavior and refers to the "perceived ease or difficulty of performing a behavior" [17, p. 188]. Studies applying the TPB also receive considerable supports for predicting intention and behavior [17], [37], [38].

User acceptance studies applying the TPB consistently showed that attitude has the strongest effect on intention [21], [22], [23], [24], [25], [26], [29]. The link between PBC and intention also has been consistent. The effect of subjective norm on intention, however, has been inconsistent (e.g., [22], [24], [29]). These results are consistent with the TPB meta-analysis conducted by Armitage and Conner [39]. They showed that the correlation between subjective norm and intention is much weaker than the relationships between attitude-intention, and between PBC-intention. They also pointed out that the insignificant results of the link between subjective norm and intention from various studies do not "present sufficient evidence to warrant discarding the construct" (p. 482). Therefore, we hypothesize the significant relationship between attitude, subjective norm, perceived behavioral control and intention at the functional level:

H2: Attitude for a particular function (i.e., phone, organizer, camera, mp3 player) has a positive effect on intention to use that function.

H3: Subjective Norm for a particular function (i.e., phone, organizer, camera, mp3 player) has a positive effect on intention to use that function

H4: Perceived Behavioral Control for a particular function (i.e., phone, organizer, camera, mp3 player) has a positive effect on intention to use that function

Emotion

Some researchers argued that constructs such as attitude, subjective norm, and perceived behavioral control are based on the information people have about the world which is represented by their beliefs and evaluations [40], [41], [42], [43], [44]. These beliefs and evaluations affect intention and subsequently behavior. This approach is based on human information processing capabilities, and neglects the role of emotion. Emotion could drive or stimulate behavior, thus it is a very important factor which may affect intentions and behaviors.

Research has shown that emotion may complement attitude in explaining intentions and behaviors (e.g., [45], [46], [47]). Recently, interests in observing emotion as an additional variable in the TPB have resurged [42], [44], [48]. Studies showed that emotion provides an additional explanation over and above that offered by the TPB constructs. For instance, in a study looking at exercise intention, researchers found that emotion contributed an increment of 5 percent in the variance of intention after constructs in the TPB have been controlled [41]. Emotion has been found to enhance intention in a study examining the purchase of lottery tickets [49]. The effects of emotion have been confirmed in studies of eating junk food, using soft drugs, and drinking alcohol [44]. Richard et al. [50] also found that emotion have a significant additional effect on intention to use contraceptives. Similarly, Parker et al. [51] showed that emotion is a significant predictor for committing driving violations. Emotion has also been found to moderate the relationship between intention and behavior [40].

Though these studies showed that emotion is an important factor explaining intentions and behaviors in the TPB, different approaches were applied in operationalizing emotion. Some researchers operationalized emotion by applying a measure which is used to tap beliefs and evaluations (e.g., [51], [52]). For instance, in a study examining intention to commit driving violations, Parker et al. [51] used

beliefs and evaluations about commit driving violations including drinking and driving, close following, overtaking and speeding. Emotion was measured by asking respondents whether the speeding would make them feel sorry (likely/not likely). Others operationalized emotion by applying a measure similar to attitude [44], [50]. For instance, Richard et al. [44] measured attitude by asking respondents "eating junk food is pleasant/unpleasant". For the emotion, they asked respondents "after eating junk food, I feel pleasant / unpleasant". Still others measured emotion using more specific affective terms such as regret, pleasure, and guilt [42], [44], [48]. In this study, we apply the specific pleasure construct to measure emotion. This operationalization is similar to the latter, and may provide a better convergent and discriminant validity.

Previous studies have also identified many different emotional factors, such as perceived enjoyment, anxiety, playfulness, pleasure and arousal [53], [54], [55], [56]. This paper adopts the pleasure construct, which is one of the basic emotional states of Circumplex Model of Affect [57]. Russell [57] proposed three basic emotional states—pleasure, arousal and dominance. While dominance was suggested by later studies as unsuitable for representing pure affective responses, pleasure and arousal were confirmed as two primary dimensions of emotion [58], [59]. Pleasure refers to the degree to which a user feels good or happy with the target object, while arousal refers to the degree to which a user feels excited, stimulated or active [57]. The significance of the Circumplex Model of Affect is that diverse emotional constructs can be classified based on the two continuous, orthogonal dimensions: *pleasantness—unpleasantness* dimension (i.e., representing pleasure), and *arousal—sleepiness* dimension (i.e., representing arousal) [57]. For example, enjoyment can be mapped to the quadrant characterized by arousal and pleasure [54]. Thus, pleasure or arousal is preferred to enjoyment as a cleaner indicator of affective responses to using the target technology. As arousal was suggested not salient for intention [54], it is excluded in this study. Therefore, we hypothesize that:

H5: Pleasure for a particular function (i.e., phone, organizer, camera, mp3 player) has a positive effect on intention for the function

Previous research has also suggested that the predictive importance of emotional factors for intention depends largely on the primary purpose of the system [53], [54], [55], [56]. However, formal tests have not been done to evaluate the effects of basic emotional dimensions on consumers' intention for hedonic and utilitarian applications. To fill this void, this study investigates the effects of pleasure for high versus low hedonic smartphone functions. Although each function of the smartphone may provide a mix of hedonic and utilitarian value, this paper focuses on the hedonic dimension as pleasure is more related to hedonic than utilitarian dimension. Accordingly, the four smartphone functions might fall into two groups: high-hedonic functions and low-hedonic functions.

Hedonic products serve primarily affective or sensory gratification purposes [60], and the value of a hedonic system is a function of the degree to which a user experiences fun when using the system [56]. Hence, it is logical to expect that affective responses would be a stronger predictor for intention to use functions of higher hedonic value. Studies on consumer behavior have demonstrated that choosing a game software over a grammar-checking software is mainly driven by affective responses (i.e., pleasure or arousal) rather than cognitive responses (i.e., usefulness) [58]. There is similar evidence from user acceptance research. For example, Nysveen et al. [61] found that perceived enjoyment and perceived expressiveness were stronger motivations for using experiential services (i.e., high hedonic) than using goal-oriented mobile services (i.e., low hedonic). Fang et al. [53] found that perceived playfulness affected user intention to use mobile phone when the tasks are playing games, but did not affect user intention when the tasks are transactions or general tasks. We expect that the difference would hold in the context of this study: when the functions are higher in hedonic value, pleasure will be a more important predictor of intention. Hence, we hypothesize that:

H6: Pleasure has a stronger effect on intention for high-hedonic functions than for low-hedonic functions.

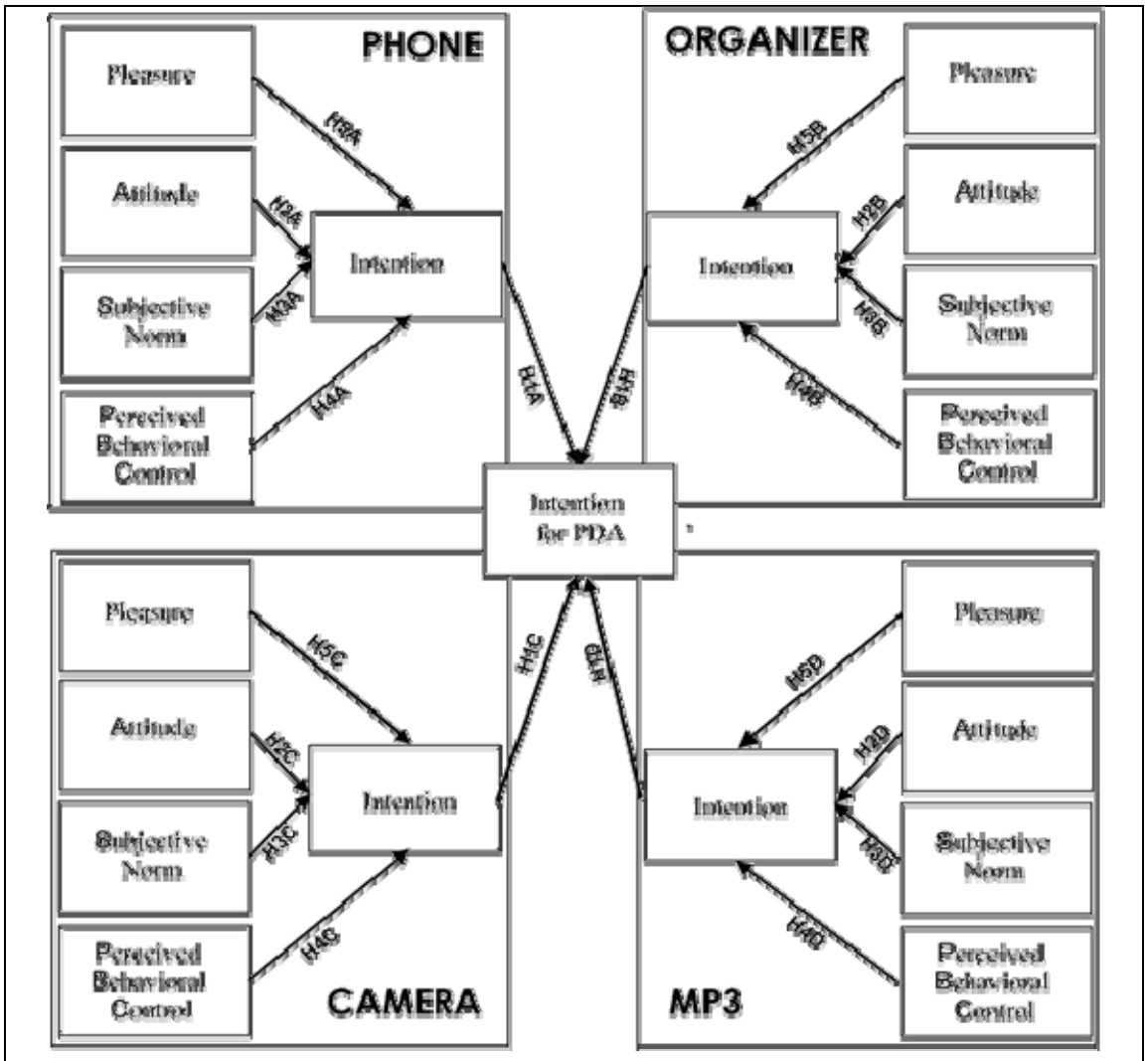

Figure 3. The Proposed Extension of the Theory of Planned Behavior and Implementation Intention

Figure 3 summarizes the hypothesized relationships among the constructs in the TPB. Each function (i.e., the phone, organizer, camera and mp3 player) will be examined once with the model. Subsequently, the beta-coefficients and R-squares will be compared across functions with low and high hedonic values. To simplify the graphic, H6 is not illustrated here.

Methodology

Consistent with prior research in emotion and user acceptance (e.g., [3], [38], [42], [54], [62], [63]), a survey was employed for data collection. Instrument development and survey administration are discussed in the following sections.

Instrument Development

Most instruments were adapted from previous research. Specifically, two items for intention, two items for subjective norm, four items for perceived behavioral control (PBC), and four items for attitude were adapted from Ajzen and Fishbein [64]. Items for pleasure were adapted from Kim et al. [54]. High vs. low hedonic functions were determined by the functions' hedonic value, based on the cumulative scores of individual ratings. Individual perception of a function's hedonic value was measured by an item generated from prior marketing literature [65], [66], which asks the respondent whether he/she thinks that function is hedonic or not. The meaning of hedonic was provided in the questionnaire, and was clarified by the interviewers when the subjects had difficulty understanding the term. Following the scale guidelines of the theory of reasoned action [64], the adapted questions were specific and consistent with respect to action (intention to use), target (smartphone function), context (work and life), and time (in the next 4 weeks). All items except the hedonic question were rated using a 7-point Likert scales. Questions about respondent characteristics were also included in the questionnaire.

The questionnaire was pre-tested by two experienced researchers and a small group of doctoral students. The purpose of the pretest was to check the content validity and to enhance the clarity and readability of the questionnaire. In addition, a pilot test was conducted to further check the reliability and validity. We invited 30 respondents from a major smartphone retail outlet. Except for the last item from PBC and ATT, the results suggested all items adequate reliability and validity. Due to the length of questionnaire (i.e., four sets of instrument for four functions), we adopted only three items for PBC and ATT, and retained other items from the pilot study. This practice is consistent with the principle of measurement that multiple indicators for a latent factors are randomly "sampled from the conceptual

domain" [67, p. 181], and with prior research that used enhanced measurement scales (e.g., [29, p. 127], [68, p. 13], [69, p. 524]). The final questionnaire is shown in Appendix A.

Data Collection

A customer intercept survey was conducted in a large Asian city with a population of 4 million. Customer intercept survey was employed in this study due to its advantage of higher response rate [70], given the length of our questionnaire. The venue chosen included three major IT shopping malls located across the city and three customer service centers for major smartphone brands as these are the very likely places mobile device adopters would visit. The survey was conducted for a two-week period by two trained researchers who intercepted subjects passing by to request if they would be willing to participate in a brief research study. After an initial screening to check eligibility requirements (i.e., whether the subject owned a smartphone), subjects were asked to participate in the survey. To improve the response rate, an incentive of about US$7 cash was offered to each respondent upon his/her completion of the questionnaire. After the survey, additional cash of about US$70 was provided to two respondents with valid answers via a lucky draw.

The survey was administered to 240 subjects, and finally 213 responses were usable. Among the respondents, 161 were male (75.6%) and 52 were female (24.4%). The respondents' age ranged from 13 to 64 years old, with an average of 33 years. Specifically, the average of males was 34 years and that of females was 32. Professions indicated by the respondents mainly include: senior manager, technician, engineer, educator, consultant, students and self-employed. Since official reports on local smartphone users are unavailable at the time of this study, we referred to results of a recent survey of smartphone users in USA, Europe and Russia [14]. The survey by Newsland showed that smartphone users were mostly males in all surveyed regions (male users range from 58% to 78%). More than 50% of smartphone users in Europe and the US were between the ages of 30 and 50. In addition, it reported that a vast majority of respondents belong to the business sphere and refer themselves to different levels of management. Occupations popular among smartphone users were: business owners, managers, students,

temporary unemployed and others. A comparison shows that the demographics of our respondents and that of Newsland survey are similar. Hence, the obtained sample of this study may be regarded as reasonably representative of smartphone users.

Data Analysis

Data was analyzed using PLSgraph version 3.0. For the measurement model, convergent validity was assessed by individual item reliability (i.e., standardized loadings of 0.707 or greater are needed) and construct validity (i.e., composite reliability). Discriminant validity was assessed by examining whether the average variance extracted (AVE) values were larger than the required value of 0.70 and whether the square root of the AVE value of each construct was greater than its correlations with the other constructs [29], [71].

Measurement Model

Construct reliability (i.e., composite reliability) was measured by the square of summation of factor loadings divided by the sum of square of summation of factor loadings and summation of error variances [68], [71]. All composite reliability values were above 0.90 and AVE values were above 0.80, larger than the required value of 0.70 and 0.50 respectively [68], [72]. Standardized loadings were all above 0.88, larger than the required value of 0.70, and were statistically significant. Please see Table 1 and Appendix B for convergent and discriminant validity respectively.

Statistic tests were conducted to identify high-hedonic functions and low-hedonic functions. Since hedonic value is dichotomous, Friedman test (i.e., a non-parametric statistical test for detecting differences in treatments across multiple test attempts) was used. The result shows that the four functions had significant differences in hedonic value (χ^2=140, p<.001) (in Table 2). Post-hoc tests were further conducted to determine which groups differ. Wilcoxon signed-rank test (i.e., a non-parametric alternative to the paired Student's t-test) was applied. The result showed three significantly different groups in terms of hedonic perception: organizer is the lowest (M=0.39), phone is the medium (M=0.55), and camera

(M=0.80) and mp3 player (M=0.82) are the highest (shown in Table 2). Prior research has used the mean-split approach to differentiate respondents into high vs. low categories (e.g., [73, p. 95], [74, p. 949]). Following this approach, we grouped phone and organizer as low-hedonic functions, and the camera and mp3 player as high-hedonic functions.

Table 1. Convergent Validity (Composite Reliability, Std Loading; Average Variance Extracted)

Phone Function (CR=Composite Reliability; AVE=Average Variance Extracted)													
Construct	ATT (CR=0.94 AVE=0.85)			SN (CR=0.97 AVE=0.94)		PBC (CR=0.94 AVE=0.83)			PLE (CR=0.96 AVE=0.89)			INT CR=0.98 AVE=0.96)	
Mean (S.D.)	5.44 (-1.39)			5.24 (-1.53)		5.92 (-1.13)			5.27 (-1.35)			5.87 (-1.36)	
Item	ATT1	ATT2	ATT3	SN1	SN2	PBC1	PBC2	PBC3	PLE1	PLE2	PLE3	INT1	INT2
Loading	0.95	0.92	0.89	0.98	0.96	0.91	0.93	0.89	0.92	0.97	0.94	0.97	0.99
Organizer Function													
Construct	ATT (CR=0.95 AVE=0.86)			SN (CR=0.94 AVE=0.88)		PBC (CR=0.92 AVE=0.79)			PLE (CR=0.95 AVE=0.87)			INT (CR=0.97 AVE=0.94)	
Mean (S.D.)	5.29 (-1.19)			4.54 (-1.45)		5.35 (-1.23)			5.17 (-1.32)			5.37 (-1.48)	
Item	ATT1	ATT2	ATT3	SN1	SN2	PBC1	PBC2	PBC3	PLE1	PLE2	PLE3	INT1	INT2
Loading	0.93	0.94	0.92	0.95	0.93	0.94	0.9	0.82	0.92	0.94	0.94	0.97	0.97
Camera Function													
Construct	ATT (CR=0.97 AVE=0.90)			SN (CR=0.98 AVE=0.96)		PBC (CR=0.94 AVE=0.85)			PLE (CR=0.97 AVE=0.92)			INT (CR=0.98 AVE=0.97)	
Mean (S.D.)	4.87 (-1.5)			3.95 (-1.71)		5.26 (-1.5)			4.58 (-1.57)			4.27 (-1.82)	
Item	ATT1	ATT2	ATT3	SN1	SN2	PBC1	PBC2	PBC3	PLE1	PLE2	PLE3	INT1	INT2
Loading	0.97	0.93	0.95	0.97	0.99	0.95	0.93	0.88	0.96	0.95	0.96	0.98	0.99
MP3 Function													
Construct	ATT (CR=0.98 AVE=0.94)			SN (CR=0.99 AVE=0.98)		PBC (CR=0.96 AVE=0.90)			PLE (CR=0.98 AVE=0.93)			INT (CR=0.98 AVE=0.98)	
Mean (S.D.)	4.93 (-1.59)			3.81 (-1.96)		5.11 (-1.81)			4.85 (-1.61)			4.34 (-1.96)	
Item	ATT1	ATT2	ATT3	SN1	SN2	PBC1	PBC2	PBC3	PLE1	PLE2	PLE3	INT1	INT2
Loading	0.97	0.99	0.95	0.99	0.99	0.98	0.92	0.94	0.95	0.97	0.98	0.99	1

Table 2. Respondents' Hedonic Perception of the Four Functions

	PH	OR	CM	MP	Chi-square	p-value
Friedman Test ranks	2.85	2.44	3.46	3.51	166 (df=4)	.000
Mean (Std)	.55 (.50)	.39 (.49)	.80 (.40)	.82 (.39)	N.A.	N.A.

Wilcoxon Signed-rank	PH>OR	CM>OR	MP>OR	CM>PH	MP>PH	MP>CM
P value	.000	.000	.000	.000	.000	.505
Note: PH=Phone; OR=Organizer; CM=Camera; MP=MP3.						

Structural Model

With adequate measurement models, the hypotheses were tested by examining the structural models. Figure 4 presents the relevant path coefficients and R-squares for low hedonic and high hedonic functions respectively. R-squares for intention were 50%, 57%, 62%, and 69% for phone, organizer, camera and mp3 players respectively.

All the proposed paths were significant except for (1) the path from pleasure to intention for two low-hedonic functions -- phone and organizer; and also (2) the path from subjective norm to intention for two low-hedonic functions -- phone and organizer; and (3) the path from perceived behavior control to intention for two high-hedonic functions – camera and mp3; and lastly (4) the path from intention at the functional level to the overall intention for two high-hedonic functions – camera and mp3. Specifically, attitude had a significant effect on intention for all functions ($p< 0.01$); thus, H2 is supported. Pleasure significantly predicted intention for all high-hedonic functions, so H6 is fully supported.

Subjective norm and pleasure had significant effects on intention only for high-hedonic functions. On the other hand, perceived behavior control had a significant effect on intention only for low-hedonic functions. Similarly, only intention for low-hedonic functions had a significant effect on overall intention to use the device. Hence, H1, H3, H4, and H5 are partially supported. Table 3 summarizes the hypothesis testing results.

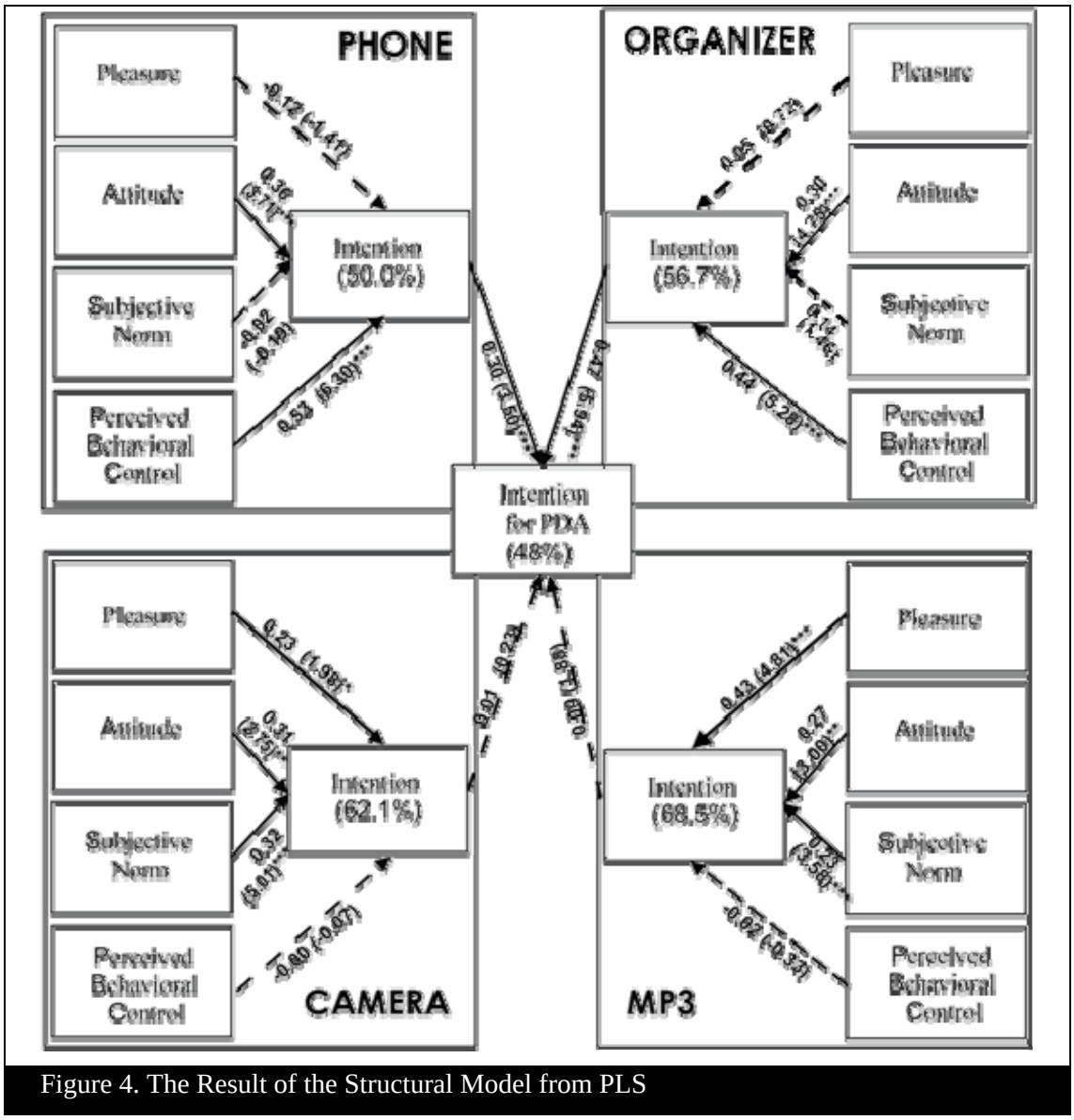

Figure 4. The Result of the Structural Model from PLS

Table 3. Results of Hypothesis Testing

	Phone	Organizer	Camera	Mp3	Supported
H1: $INT_{function} \rightarrow INT_{overall}$	0.30***	0.47***	0.09	0.01	Yes (only low-hedonic functions)
H2: ATT →INT	0.36***	0.30***	0.27***	0.31***	Yes (all functions)
H3: SN→INT	-0.02	0.14	0.23***	0.32***	Yes (only high-hedonic functions)
H4: PBC→INT	0.53***	0.44***	-0.02	-0.00	Yes (only low-hedonic functions)
H5: PLE→INT	-0.12	0.05	0.43***	0.23*	Yes (only high-hedonic functions)
H6: $PLE\text{-}INTR_{high\ R} > PLE\text{-}INTR_{lowR}$	Please see above (i.e., only high-hedonic functions are significant)				Yes
* significant at p< 0.05; ** significant at p< 0.01; *** significant at p < 0.001					

Discussion

Key findings

For each function, the proposed model demonstrated a good fit with the data. Most of the hypotheses were supported, and the model also explained about 48 percent to 69 percent of the variance for the dependent variable. This level of explanatory power is comparable to other user acceptance studies [56], [75], and the TPB studies specifically. For instance, recent user acceptance studies applying the TPB showed that the explained variance in intentions ranged from 50 to 60 percent [23], [26], [29]. The following paragraphs discuss some interesting findings.

Firstly, only intentions to use low-hedonic functions have effects on the overall intention while intentions to use high-hedonic functions do not have any effects at all. Though the TPB variables for high-hedonic functions (i.e., camera and mp3) explained higher levels of variances in intentions than those for low-hedonic functions, interestingly these intentions did not affect the overall intention.

Secondly, the effects of attitude on intention were consistent and stable across functions. The magnitude of its influence was consistently larger than or equal to other predictors for all functions. This provides evidence that attitude remains the most important driver for users' intention for hybrid systems that serve multiple purposes. This result is consistent with studies in the TRA and the TPB (please see Sheppard et al. [36] for the TRA meta-analysis and Armitage and Conner [39] for the TPB meta-analysis).

Thirdly, perceived behavioral control (PBC) has effects on intentions only for low-hedonic functions. In contrast, subjective norm and pleasure have effects on intentions only for high-hedonic functions. The contrast shows the different antecedents that are important for low-hedonic and high-hedonic functions. The non-significant influence of pleasure for the phone and the organizer are expected as the adoption literature has also indicated that users' adoption of low-hedonic applications is dominated by cognitive predictors (e.g., [5], [25], [75]). Our hypothesis about the relative importance of intrinsic motivation for high-hedonic functions was also supported. This finding provides further evidence that users demonstrate affective bases for intention to use features that provide more self-fulfilling value [76].

Limitations

Before discussing the contributions of this study to research and practice, we first acknowledge some limitations. Since data was collected using a mall intercept method, the results of this study may be somewhat limited to users in a modern city. Therefore, the generalization of the results to other individuals may require caution. In addition, the binary scale for hedonic perception may simplify the hedonic evaluation of functions. For future improvement, a more sensitive 7 point-scale with 1 being "primarily for functional use" and 7 being "primarily for entertainment use" employed by Kemp [58] or multiple-item instrument with semantic differential scales by Wakefield and Whitten [77] would be suggested.

Implications for Multifunctional Systems and Communication Technology Research

The results of this study showed that users' behavior of an integrated device is more complex than that of a simple technology. For example, the effects of pleasure, subjective norm and perceived behavioral control on intention varied across functions. Consequently, a general holistic evaluation of hybrid systems, as is usually done in the past, will not be able to capture a full picture, and may yield inappropriate conclusions. The functional-level analyses will increasingly become more important, especially when functions within the device become inter-dependent [78]. For instance, teleworkers not only can use the phone function to communicate with their colleagues as they used to [79], but they can also use the camera function for teleconferencing. An example is the smartphone by Samsung, which allows lecturers not only to edit their PowerPoint slide, but also to project it on the screen/wall [80]. As media convergence continues, much research is needed for communication technology research, specifically in user acceptance of multifunctional devices.

Moreover, the research design characteristics of a multifunctional device have strong impacts on communication technology research. As a device has many different functions, validating constructs by using different functions of one integrated system and within the same group of subjects has several advantages.

First, confounding factors in different systems are precluded. For instance, if the study were to test four different systems (e.g., phone, organizer, mp3 and camera from four different systems), the results could be attributed to extraneous factors such as different brands, different user interfaces, different colors, or different sound system of these systems. Similarly, if the study were to test two different websites (e.g., a movie website and a university course website), or were to use two different subject groups (e.g., [81]), the result would be attributed to extraneous factors besides hedonic difference, such as reputation, information quality, and group differences. Second, due to the characteristics of a multifunctional device, the result in this study has a high degree of internal validity. We are confident that the significant and non-significant effects from independent variables to dependent variables are due to differences in functions. For instance, the non-significant effects of subjective norm on phone and organizer (i.e., functions used extensively) are well-grounded. Though past research has provided the theoretical rationale for this link, and showed that the effects of subjective norm wear out with experience by examining multiple organizations, and several systems [82], this study uses a single case and system to verify this link and precludes other potential effects.

Lastly, the research design characteristics and methods from this study have significant implications for communication technology as a reference discipline for the emerging role of user acceptance of multifunctional devices.

Implications for the Theory of Planned Behavior and the Implementation Intention Theory

Previous research in user acceptance has mostly looked at different functions “independently without any attempt to capture the extent of their relationships” [29, p. 118]. This paper follows the call to understand distinct functions in a multifunctional device and examine the interrelationships among them using the TPB. This paper contributes to the social psychology literature by extending the TPB, specifically by theoretically broadening the TPB to include an emotional construct and by deepening the theory to examine the interrelationships among intentions (e.g., [38]).

This study also advances the implementation intention theory. Previous studies mostly focused on *when* and *where* to perform the target behavior e.g., [30] [31], [32], [33], [34] . Though specifying *where* and *when* to perform a particular behavior is effective in facilitating the initiation of the behavior, implementation intention focusing on *how* is necessary when intention can be achieved through different courses of sub-goals such as in the usage of a multifunctional system. A study by Verpanken and Faes [34] has taken the attempt to examine how sub-goals or sub-intentions, such as consuming less fatty snacks, cutting down on fast food, and eating more vegetables and fruit, contribute to the overall intention of having a healthier diet. However, their study has not identified which sub-intentions are more important. We argue that specifying *how*, and identifying which is the most important sub-intention influencing the overall intention are important, and could provide a significant contribution to practitioners, as explained in the following paragraphs.

Implications for Practice

The result in this study shows that two sub-intentions (i.e., intention to use camera and mp3) did not contribute to the overall intention to use the device. Though the predictors account for more explained variances in these two intentions, they did not have any effects on the overall intention. This result shows that our model provides a better understanding on factors and functions, which could influence intention to use the overall device than previous models. Compared to the current studies of user acceptance studies, where only the overall device (e.g., Apple's iPhone instead of each function in the device) is observed, assessing separate functions allows us to examine each function in detail. More importantly, our model further shows which functions are important.

To illustrate the importance of our model, we draw the lesson learnt from the early handheld computing industry. Specifically, over a decade ago, Perugini [83] showed several promising mobile technologies and personal digital assistants such as Apple's Newton, AT&T's Eo, Casio's Zoomer and Motorola's Envoy [84] which later proved to be unsuccessful in receiving user acceptance [85], [86]. Though using the Technology Acceptance and Market Success Model (TAMSM) may be able to explain

why “the Apple Newton failed in the market in spite of its initial positive reception” [87, p. 65], evaluating the initial perception of the overall device using the TAMSM only shows whether the overall device is useful and easy to use. Similarly, accessing functions in the Apple Newton could only show which functions have the highest or lowest perceived usefulness. If our model is applied to assess the acceptance of the Apple Newton, we will understand not only the overall device, but also the relationship between functions and the overall device. Therefore, manufacturers and developers of multifunctional devices such as Windows Mobile, iPhone, and Symbian are urged to not only examine the overall device, but to observe which functions have significant effects on the overall device by applying our proposed model.

With the ability to identify important sub-intentions, we can target the overall behavior more effectively. For instance, the results in this study showed that two intentions (intention to use phone and organizer) are the important factors influencing the overall intention to use. In the study by Verpanken and Faes [34], if consuming less fatty snacks and cutting down on fast food were identified to be the most important factors influencing the healthy diet (e.g., the easiest to execute), targeting these sub-intentions could effectively enhance the overall goal. Similarly, if an organization wants to increase PDA use, it should target the use of phone and organizer.

The lesson learnt from the failure of many handheld computing industries in late 90’s is that Palm, Inc was able to survive because the company was able to identify the most important functions such as its synchronization software which was sold to HP and its Graffiti handwriting recognition software which was sold to Apple Newton [88], [89]. For manufacturers and developers of such a device, these results could help them not only to advertise their products better, but also to gain a competitive advantage. For instance, with the full understanding of their product’s strength, they could advertise these important functions as their selling points, and thus they could offer customers greater value than their competitors could.

Similarly, identifying the least important sub-intentions allows us to improve the overall behavior. For instance, if consuming less fatty snacks and cutting down on fast food were identified to be the least

important factors influencing the healthy diet, practitioners and researchers can avoid wasting their resources on these sub-intentions. Therefore, it is very important for manufacturers not only to improve the device either by modifying the least important functions or acquiring better functions from other companies (e.g., Apple), but also by adding more functions which will contribute to the overall intention to use the device. For instance, because the variety of functions and applications which Apple offers in its iPhone, around 3 billion applications have been downloaded and used for marketing, training and increasing productivity [90]. Also, Apple identified that its handwriting recognition programs was difficult to use and minimized the chance of the error by buying Palm's Graffiti software [83], [88], [89]. Many smartphone companies also learnt from the previous lesson that sending faxes using a handheld device is difficult because the users first have to find a phone line to plug it into[83]. The users also need a scanner to acquire the image/document they want to send.

In addition, this study shows users' decision process for adopting individual functions in a multifunctional device. It identifies several cognitive and emotional criteria for user evaluation. Our results show that consumers would assess individual functions of a multifunctional device in terms of the attitude, social influence, perceived behavioral control and emotion.

Attitude is the only factor which has effect on intention for all functions of the smartphone. Consumer attitude toward a product relies on exposure to the product over time (i.e., "a learned predisposition to respond in a consistently favorable or unfavorable manner" [16, p. 6]). Developing a positive attitude toward their existing and new customers can be achieved by increasing their time spent on the device, and ensuring each function meets the needs and desires of consumers e.g., the organizer should be easily synchronized with PC. Efforts could also be made to integrate more useful functions (e.g., video, Wi-Fi, Bluetooth and GPS), or to provide value-added features, such as connection to stereo headsets or infrared keyboard, and accessories for relevant models. These improvements could increase positive attitude toward the product in the long term. This can be complemented with survey study to differentiate the important and unimportant functions that contribute to overall intention.

Since pleasure to some extent determines users' intention, providers could offer features that enhance good feelings of users. Though some functions may be inherently more hedonic than others, attempts can be made so that those less hedonic functions have some elements of fun and are able to alter consumer perceptions. For instance, the default ringtones for the phone and organizer (i.e., schedule reminder) can be set to funny ones. The phone can be advanced with 3G video call where users could literally meet face-to-face with one another. This result also informs organizations that they should encourage use of other apparently irrelevant and even non-work related functions. For instance, when healthcare organizations want to promote use of a healthcare application in PDAs, instead of focusing on that particular application [91], they could simultaneously encourage use of other functions. The same reasoning applies to other types of organizations.

Future Research

Future research may consider different approaches in applying the TPB to functions of an integrated device. For instance, when examining the overall intention, would the effect of the combined pleasures generated from hedonic functions be greater than the effect of the combined usefulness from utilitarian functions? Do users prefer a single device for each function or an integrated device with all functions? Future research can also consider gender differences. The innovation and newer functions in an integrated device will definitely open many interesting research avenues for researchers, especially at a time when the number of adopters is on the rise [12].

Appendix A. Operationalization of Constructs	**Question**
	Attitude Using the [replaceable] function is (a) ATT1 bad idea - good idea ATT2 foolish idea - wise idea ATT3 unfavorable - favorable ATT4 Overall my attitude toward using the [replaceable] function is negative - positive (*)
	Subjective Norm SN1 People important to me think that I should use the [replaceable] function. SN2 People who influence my behavior think I should use the [replaceable] function.
	Perceived Behavioral Control PBC1 I have control over using the [replaceable] function. PBC2 Using the [replaceable] function is up to me. PBC3 I have the knowledge and skills to use the [replaceable] function. PBC4 I can afford the money necessary to use the [replaceable] function (*)
	Pleasure Using the [replaceable] function makes me feel -- PLE1 Unhappy - Happy PLE2 Annoyed - Pleased PLE3 Unsatisfied – Satisfied
	Intention INT1 I intend to use the [replaceable] function in the next 4 weeks. INT2 I plan to use the [replaceable] function within the next 4 weeks.
	Overall Intention INTPDA1 I intend to use the PDA in the next 4 weeks. INTPDA2 I plan to use the PDA within the next 4 weeks.
	Hedonic perception of the function Do you consider the [replaceable] to be hedonic products (e.g., for fun or enjoyment)? (Yes/ No)
Note: [replaceable] indicates that the text was replaced by one of the four functions. ** indicates item was dropped during the pilot study.*	

Appendix B. Correlation Table & Square Root of Average Variance Extracted																					
	Pl_ PH	Pl_ OR	Pl_ MP3	Pl_ CM	Att_ PH	Att_ OR	Att_ MP3	Att_ CM	Sn_ PH	Sn_ OR	Sn_ MP3	Sn_ CM	Pbc_ PH	Pbc_ OR	Pbc_ MP3	Pbc_ CM	In_ PH	In_ OR	In_ MP3	In_ CM	Int PDA
Pl_PH	0.94																				
Pl_OR	0.41	0.93																			
Pl_MP3	0.19	0.22	0.98																		
Pl_CM	0.29	0.22	0.32	0.96																	
Att_PH	0.73	0.39	0.21	0.39	0.92																
Att_OR	0.34	0.64	0.12	0.12	0.43	0.93															
Att_MP3	0.26	0.25	0.85	0.31	0.23	0.15	0.97														
Att_CM	0.28	0.27	0.32	0.87	0.45	0.20	0.32	0.95													
Sn_PH	0.43	0.28	0.13	0.24	0.60	0.32	0.20	0.31	0.97												
Sn_OR	0.28	0.42	0.23	0.30	0.38	0.41	0.25	0.36	0.65	0.94											
Sn_MP3	0.27	0.23	0.67	0.35	0.24	0.13	0.67	0.30	0.29	0.32	0.94										
Sn_CM	0.29	0.25	0.39	0.66	0.39	0.20	0.40	0.67	0.45	0.48	0.51	0.98									
Pbc_PH	0.34	0.23	0.12	0.12	0.51	0.34	0.09	0.19	0.54	0.36	0.10	0.21	0.91								
Pbc_OR	0.13	0.45	0.04	-0.04	0.24	0.51	0.05	-0.01	0.28	0.45	0.05	0.10	0.53	0.89							
Pbc_MP3	0.08	0.25	0.65	0.23	0.16	0.29	0.67	0.21	0.13	0.22	0.57	0.34	0.22	0.25	0.95						
Pbc_CM	0.07	0.15	0.29	0.39	0.26	0.25	0.30	0.42	0.29	0.21	0.23	0.45	0.48	0.36	0.52	0.92					
In_PH	0.28	0.28	0.07	0.15	0.48	0.38	0.06	0.20	0.44	0.31	0.01	0.20	0.42	0.64	0.57	0.17	0.98				
In_OR	0.21	0.48	0.05	0.06	0.33	0.58	0.03	0.10	0.32	0.47	0.01	0.15	0.46	0.69	0.16	0.24	0.53	0.97			
In_MP3	0.29	0.28	0.77	0.30	0.26	0.14	0.74	0.22	0.23	0.32	0.73	0.39	0.12	0.12	0.58	0.23	0.18	0.15	0.99		
In_CM	0.25	0.29	0.39	0.71	0.33	0.22	0.36	0.70	0.38	0.46	0.40	0.68	0.19	0.14	0.29	0.39	0.29	0.17	0.45	0.98	
IntPDA	0.30	0.37	0.10	0.06	0.31	0.45	0.12	0.15	0.30	0.33	0.13	0.16	0.46	0.50	0.18	0.16	0.50	0.72	0.21	0.15	0.98
Note:																					
Construct: Pl=Pleasure; Att=Attitude; Sn=Subjective Norm; Pbc=Perceived Behavioral Control; In=Intention; IntPDA=Intention for PDA																					
Function: PH=Phone; OR=Organizer; MP3=MP3 Player; CM=Camera																					

References

[1] CNET Review. (2007, August 8, 2007). *Palm TX Reviews: PDAs Reviews by CNET*. Available: http://reviews.cnet.com/Palm_TX/4505-3127_7-31546759.html?tag=upidmlp

[2] J. Emigh. (2008, September 26th). *Convergence for the smartphone and credit card is nearer*. Available: http://www.betanews.com/article/Convergence_for_the_smartphone_and_credit_card_is_nearer/1222468955

[3] S. J. Hong, J. Y. L. Thong, and K. Y. Tam, "Understanding continued information technology usage behavior: A comparison of three models in the context of mobile internet," *Decision Support Systems* vol. 42, pp. 1819-1834, 2006.

[4] F. D. Davis, "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology," *MIS Quarterly*, vol. 13, pp. 319-339, 1989.

[5] F. D. Davis, R. P. Bagozzi, and P. R. Warshaw, "User Acceptance of Computer Technology: A Comparison of Two Theoretical Models," *Management Science*, vol. 35, pp. 982-1002, 1989.

[6] Wikipedia. (2008, Aug 11, 2008). *Wikipedia: Personal Digital Assistant*. Available: http://en.wikipedia.org/wiki/Personal_digital_assistant

[7] R. Baskerville and J. Nandhakumar, "Activating and Perpetuating Virtual Teams: Now That We're Mobile, Where Do We Go?," *IEEE Transactions on Professional Communication*, vol. 50, pp. 17-34, 2007.

[8] S. C. Yuen and P. K. Yuen, "PDAs as educational power tools," *Tech. Directions*, vol. 62, pp. 14-17, 2003.

[9] Y. C. Tseng, T. H. Lai, P. Sadayappan, and Y. B. Lin, "Special issue on mobile computing," *Journal of Information Science and Engineering*, vol. 20, pp. 405-551, 2004.

[10] R. Walton and B. DeRenzi, "Value-Sensitive Design and Health Care in Africa," *IEEE Transactions on Professional Communication*, vol. 52, pp. 346-358, 2009.

[11] Gartner. (2006, April, 07, 2007). *Gartner says worldwide combined PDA and smartphone shipments market grew 57 percent in the first half of 2006*. Available: http://www.gartner.com/it/page.jsp?id=496997

[12] Gartner. (2007, August 12, 2007). *Gartner says windows mobile devices drove worldwide PDA market to 40 percent growth in first quarter of 2007*. Available: http://www.gartner.com/it/page.jsp?id=506328

[13] IDC. (2009, January 12, 2010). *Worldwide Converged Mobile Device (Smartphone) Market Continues To Grow Despite Economic Malaise, Says IDC* Available: http://www.idc.com/getdoc.jsp?containerId=prUS22070109

[14] Newsland. (2007, August 04, 2007). *Newsland published its regular survey of smart mobile device users in USA, Europe and Russia for the first half of 2006*. Available: http://www.newsland.net/UserFiles/File/research_060816-2-eng.pdf

[15] IDC. (2009, January 12, 2010). *Worldwide Mobile Phone Shipments Decline 15.8% in First Quarter, with Growth Stabilizing After a Slow Fourth Quarter Says IDC*. Available: http://www.idc.com/getdoc.jsp?containerId=prUS21821309

[16] M. Fishbein and I. Ajzen, *Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research*. Reading, MA: Addison-Wesley, 1975.

[17] I. Ajzen, "The Theory of Planned Behavior," *Organizational Behavior and Human Decision Processes*, vol. 50, pp. 179-211, 1991.

[18] F. D. Davis, "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology," *MIS Quarterly*, vol. 13, pp. 319-339, 1989.

[19] R. L. Oliver, "A Cognitive Model of the Antecedents and Consequences of Satisfaction Decisions," *Journal of Marketing Research*, vol. 17, pp. 460-469, 1980.

[20] A. Bhattacherjee, "Managerial Influences on Intraorganizational Information Technology Use: A Principal-agent Model," *Decision Sciences*, vol. 29, pp. 139-163, 1998.

[21] S. A. Brown and V. Venkatesh, "A Model of Adoption of Technology in the Household: A Baseline Model Test and Extension Incorporating Household Life Cycle," *MIS Quarterly,* vol. 29, pp. 399-426, 2005.

[22] P. Y. K. Chau and P. J. Hu, "Information Technology Acceptance by Individual Professionals: A Model Comparison Approach," *Decision Sciences,* vol. 32, pp. 699-720, 2001.

[23] J. J. P.-A. Hsieh, A. Rai, and M. Keil, "Understanding Digital Inequality: Comparing Continued Behavioral Models of the Socio-Economically Advantaged and Disadvantaged," *MIS Quarterly,* vol. 32, pp. 97-126, 2008.

[24] K. Mathieson, "Predicting User Intentions: Comparing the Technology Acceptance Model with the Theory of Planned Behavior," *Information Systems Research,* vol. 2, pp. 173-191, 1991.

[25] S. Taylor and P. A. Todd, "Understanding Information Technology Usage: A Test of Competing Models," *Information Systems Research,* vol. 6, pp. 144-176, 1995.

[26] V. Venkatesh, M. G. Morris, and P. L. Ackerman, "A Longitudinal Field Investigation of Gender Differences in Individual Technology Adoption Decision-Making Processes," *Organizational Behavior and Human Decision Processes,* vol. 83, pp. 33-60, 2000.

[27] D. Gefen and D. W. Straub, "The relative importance of perceived ease of use in IS adoption: A study of e-commerce adoption," *Journal of the Association for Information Systems* vol. 1, pp. 1-28., 2000.

[28] J. Lin and H. C. Chan, "Function-based analysis of an E-commerce website," in *Proceedings of the 24th Annual International Conference on Information Systems*, 2003, pp. 475-484.

[29] P. A. Pavlou and M. Fygenson, "Understanding and predicting electronic commerce adoption: An extension of the theory of planned behavior," *MIS Quarterly,* vol. 30, pp. 115-143, 2006.

[30] S. Shim, M. A. Eastlick, S. L. Lotz, and P. Warrington, "An on-line prepurchase intentions model: The role of intention to search," *Journal of Retailing,* vol. 77, pp. 397-416, 2001.

[31] V. Brandstatter, A. Lengfelder, and P. M. Gollwitzer, "Implementation intentions and efficient action initiation," *Journal of Personality and Social Psychology,* vol. 81, pp. 946-960, Nov 2001.

[32] P. M. Gollwitzer, "Goal achievement: The role of intentions," *European Review of Social Psychology,* vol. 4, pp. 141-185, 1993.

[33] H. Heckhausen, *Motivation and action*. Heidelberg: Springer-Verlag, 1991.

[34] B. Verplanken and S. Faes, "Good Intentions, Bad Habits, and Effects of Forming Implementation Intentions on Healthy Eating," *European Journal of Social Psychology,* vol. 29, pp. 591-604, 1999.

[35] I. Ajzen, *Attitudes, Personality, and Behavior*. Chicago: The Dorsey Press, 1988.

[36] B. H. Sheppard, J. Hartwick, and P. R. Warshaw, "The Theory of Reasoned Action: A Meta-Analysis of Past Research with Recommendations for Modifications and Future Research," *Journal of Consumer Research,* vol. 15, pp. 325-343, 1988.

[37] C. J. Armitage and M. Conner, "The Theory of Planned Behaviour: Assessment of Predictive Validity and 'Perceived Control'," *British Journal of Social Psychology,* vol. 38, pp. 35-54, 1999.

[38] M. Perugini and R. P. Bagozzi, "The Role of Desires and Anticipated Emotions in Goal-Directed Behaviours: Broadening and Deepening the Theory of Planned Behaviour," *British Journal of Social Psychology,* vol. 40, pp. 79–98, 2001.

[39] C. J. Armitage and M. Conner, "Efficacy of the Theory of Planned Behaviour: A Meta-Analytic Review," *British Journal of Social Psychology,* vol. 40, pp. 471-499, 2001.

[40] C. Abraham and P. Sheeran, "Acting on intentions: The role of anticipated regret," *British Journal of Health Psychology,* vol. 42, pp. 495-511, 2003.

[41] C. Abraham and P. Sheeran, "Deciding to exercise: The role of anticipated regret," *British Journal of Health Psychology,* vol. 9, pp. 269-278, 2004.

[42] R. P. Bagozzi, H. Baumgartner, and R. Pieters, "Goal-directed Emotions," *Cognition & Emotion,* vol. 12, pp. 1-26, 1998.

[43] M. Corner and C. J. Armitage, "Extending the Theory of Planned Behavior: A Review and Avenues for Further Research," *Journal of Applied Social Psychology,* vol. 28, pp. 1429-1464, 1998.

[44] R. Richard, J. van der Pligt, and N. K. de Vries, "Anticipated affect and behavioral choice," *Basic and Applied Social Psychology,* vol. 18, pp. 111-129, 1996.

[45] R. P. Abelson, D. R. Kinder, M. D. Peters, and S. T. Fiske, "Affective and Sematic Components in Political Person Perception," *Journal of Personality and Social Psychology,* vol. 42, pp. 619-630, 1982.

[46] H. C. Triandis, *Interpersonal Behavior*. Monterey, CA: Brooks/Cole, 1977.

[47] H. C. Triandis, "Values, Attitudes, and Interpersonal Behavior," in *Nebraska Symposium on Motivation, 1979*. vol. 27, J. H.E. Howe and M. M. Page, Eds. Licoln: Unversity of Nebraska Press, 1980, pp. 195-259.

[48] J. van der Pligt and N. K. de Vries, "Expectancy-Value models of health behaviour: The role of salience and anticipated affect," *Psychology & Health,* vol. 13, pp. 289-305, 1998.

[49] P. Sheeran and S. Orbell, "Augmenting the Theory of Planned Behavior: Roles for Anticipated Regret and Descriptive Norms," *Journal of Applied Social Psychology,* vol. 29, pp. 2107-2142, 1999.

[50] R. Richard, J. van der Pligt, and N. K. de Vries, "Anticipated Regret and Precautionary Sexual Behavior," *Journal of Applied Social Psychology,* vol. 28, pp. 1411-1428, 1998.

[51] D. Parker, A. S. R. Manstead, S. G. Stradling, J. T. Reason, and J. S. Baxter, "Intention to Commit Driving Violations: An Application of the Theory of Planned Behavior," *Journal of Applied Psychology,* vol. 77, pp. 94-101, 1992.

[52] A. S. R. Manstead and D. Parker, "Evaluating and extending the theory of planned behaviour," in *European Review of Social Psychology*. vol. 6, W. Stroebe and M. Hewstone, Eds. Chichester: Wiley, 1995, pp. 69-95.

[53] X. W. Fang, S. Chan, J. Brzezinski, and S. Xu, "Moderating effects of task type on wireless technology acceptance,," *Journal of Management Information Systems,* vol. 22, pp. 123-157, 2005.

[54] H. W. Kim, H. C. Chan, and Y. P. Chan, "A balanced thinking-feelings model of information systems continuance," *International Journal of Human-computer Studies,* vol. 65, pp. 511-525, 2007.

[55] J. Kim and S. Forsythe, "Hedonic usage of product virtualization technologies in online apparel shopping," *International Journal of Retail & Distribution Management,* vol. 35, pp. 502-514, 2007.

[56] H. Van der Heijden, "User Acceptance of Hedonic Information Systems," *MIS Quarterly,* vol. 28, pp. 695-704, 2004.

[57] J. A. Russell, "A circumplex model of affect," *Journal of Personality and Social Psychology,* vol. 39, pp. 1160–1178, 1980.

[58] D. S. Kempf, "Attitude Formation from Product Trial: Distinct Roles of Cognition and Affect for Hedonic and Functional Products," *Psychology & Marketing,* vol. 16, pp. 35-50, 1999.

[59] H. Mano and R. L. Oliver, "Assessing the Dimensionality and Structure of the Consumption Experience: Evaluation, Feeling, and Satisfaction," *Journal of Consumer Research,* vol. 20, pp. 451-466, 1993.

[60] W. Woods, "Psychological dimensions of consumer decision," *Journal of Marketing,* vol. 24, 1960.

[61] H. Nysveen, P. E. Pedersen, and H. Thorbjørnsen, "Intentions to use mobile services: Antecedents and cross-service comparisons," *Journal of the Academy of Marketing Science,* vol. 33 pp. 1-17, 2005.

[62] J. Y. L. Thong, S. J. Hong, and K. Y. Tam, "The Effects of Post-Adoption Beliefs on the Expectation-Confirmation Model for Information Technology Continuance," *International Journal of Human-Computer Studies,* vol. 64, pp. 799-810, 2006.

[63] R. P. Bagozzi, M. Gopinath, and P. U. Nyer, "The Role of Emotions in Marketing," *Journal of the Academy of Marketing Science,* vol. 27, pp. 184-206, 1999.

[64] I. Ajzen and M. Fishbein, *Understanding Attitudes and Predicting Social Behavior*. Englewood Cliffs, NJ: Prentice Hall, 1980.

[65] R. Batra and O. T. Ahtola, "Measuring the hedonic and utilitarian sources of consumer choice," *Marketing Letters* vol. 2, pp. 159-163, 1991.

[66] M. Strahilevitz and J. G. Myers, "Donations to charity as purchase incentives: How well they work may depend on what you are trying to sell," *Journal of Consumer Research,* vol. 24, pp. 434-446, 1998.

[67] W. L. Neuman, *Social research methods: qualitative and quantitative approaches*, 5th ed. Imprint Boston: Allyn and Bacon, 2006.

[68] D. Gefen, D. W. Straub, and M. C. Boudreau, "Structural Equation Modeling and Regression: Guidelines for Research Practice," *Journal of the Association for Information Systems*, vol. 4, pp. 1-70, 2000.

[69] A. H. Segars and V. Grover, "Re-examining perceived ease of use and usefulness: A confirmatory factor analysis," *MIS Quarterly*, vol. 17, pp. 517-525, 1993.

[70] A. J. Bush and J. F. Hair, "An assessment of mall Intercept as a data collection method,," *Journal of Marketing Research* vol. 22, pp. 158-167, 1985.

[71] W. W. Chin, B. L. Marcolin, and P. R. Newsted, "A Partial Least Squares Latent Variable Modeling Approach for Measuring Interaction Effects: Results from a Monte Carlo Simulation Study and an Electronic Mail Emotion/Adoption Study," *Information Systems Research*, vol. 14, pp. 189-217, 2003.

[72] C. Fornell and D. Larcker, "A Second Generation of Multivariate Analysis: Classification of Methods, and Implications for Marketing Research," in *Review of Marketing*, M. J. Houston, Ed. Chicago: American Marketing Association, 1987, pp. 407-450.

[73] J. Jermiasa and L. Gani, "Response to discussion of ownership structure, contingent fit, and business-unit performance: A research model and empirical evidence," *The International Journal of Accounting*, vol. 40, pp. 93-97, 2005.

[74] S. Y. X. Komiak and I. Benbasat, "The Effects of Personalization and Familiarity on Trust and Adoption of Recommendation Agents," *MIS Quarterly*, vol. 30, pp. 941-960, 2006.

[75] F. D. Davis, R. P. Bagozzi, and P. R. Warshaw, "Extrinsic and intrinsic motivation to use computers in the workplace," *Journal of Applied Social Psychology*, vol. 22, pp. 1111-1132, 1992.

[76] H. Van der Heijden, "On the cognitive-affective structure of attitudes toward information systems," in *Proceedings of the Twenty-Third International Conference on Information System*, 2002, pp. 803–806.

[77] R. L. Wakefield and D. Whitten, "Mobile computing: a user study on hedonic/utilitarian mobile device usage," *European Journal of Information System*, vol. 15, pp. 292-300, 2006.

[78] J. Lin and H. C. Chan, "Understanding the beliefs and intentions in search and purchase functions in an e-commerce website," *IEEE Transactions on Engineering Management*, vol. 56, pp. 106-114, 2009.

[79] C. R. Scott and C. E. Timmerman, "Communication technology use and multiple workplace identifications among organizational teleworkers with varied degrees of virtuality," *IEEE Transactions on Professional Communication*, vol. 42, pp. 240-260, 1999.

[80] Samsung International. (2010, July 30th). *World's First Smart Projector Phone Samsung Galaxy Beam Makes Global Debut in Singapore with StarHub* Available: http://www.samsung.com/us/news/newsRead.do?news_seq=19712&page=1&gltype=globalnews

[81] H. Van der Heijden, "User Acceptance of Hedonic Information Systems," *MIS Quarterly*, vol. 28, pp. 695-704, 2003.

[82] V. Venkatesh and F. D. Davis, "A Theoretical Extension of the Technology Acceptance: Four Longitudinal Field Studies," *Management Science*, vol. 46, pp. 186-204, 2000.

[83] V. Perugini, "Anytime, Anywhere: The Social Impact of Emerging Communication Technology," *IEEE Transactions on Professional Communication*, vol. 39, pp. 4-15, 1996.

[84] H. Stephen and S. W. Wildstrom, "The PDA May Not be DOA After All," in *Business Week*: Bloomberg Businessweek, 1994.

[85] J. Allen, "Handheld Computing Predictions: What Went Wrong?," *Lecture Notes in Computer Science*, vol. 1707, pp. 117-123, 1999.

[86] V. Venkatesh and S. Brown, "User Acceptance of Information Technology: Inside the American Home," in *Proceedings of the Seventeenth International Conference on Information Systems*, 1996, p. 474.

[87] U. N. Umesh, L. Jessup, and M. Q. Hunyb, "Current Issues Faced by Tehcnology Entrepreneurs," *Communications of the ACM*, vol. 50, pp. 60-66, 2007.

[88] Wikipedia. (2010, August 9th, 2010). *Palm, Inc.* Available: http://en.wikipedia.org/wiki/Palm_Computing#Palm_Computing

[89] Wikipedia. (2010, August 9th, 2010). *Graffiti (Palm OS)*. Available: http://en.wikipedia.org/wiki/Graffiti_(Palm_OS)

[90] S. Kendall, M. Nino, and S. Stewart, "Using the iPhone and iPod touch@Work," *Computers in Libraries*, pp. 15-19, March 2010.

[91] H. Liang, Y. Xue, and T. A. Byrd, "PDA Usage in Healthcare Professionals: Testing an Extended Technology Acceptance Model," *International Journal of Mobile Communications*, vol. 1, pp. 372-389, 2003.