User Experience and the Multi-Stage Adoption of Mobile Apps

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Abstract

The adoption of technology has always been of interest to academicians and practitioners of the field of Management Information System. This is so because without proper and adequate adoption, technology-no matter how beneficial or advanced it may be-will be of little value to users. Numerous researches, such as the researches of the Technology Acceptance Model (TAM) or the Unified Theory of Acceptance and Use of Technology (UTAUT), had been conducted to understand the human nature in association with the adoption or rejection of technologies that have bombarded the users. The coming of smart technologies (i.e., smart phones and devices), however, seems to have fundamentally changed the environment for adoption. The ubiquity combined with mobility of technology, especially when it comes to mobile apps, seem to make the old PC era of two-stage-pre and post-adoption models obsolete. A new model of adoption that identifies the determinants of technology acceptance and continuance is needed for the smart age. To this end, this paper undertakes an empirical study, by analyzing 229 users of Social Networking Service (SNS) mobile apps, to identify the role of user experience on the multi-stage adoption of technology, and provides results that User Experience (UX) plays the crucial role of bridging the separate stages of pre and post adoption of technologies. The paper concludes by providing practical implications of the new model as it relates to mobile apps and technologies, and recommendations for further studies to get a better understanding of technology adoption in the smart age.

Keywords : Technology Adoption, Acceptance, Continuance, Mobile Apps, User Experience

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1. Introduction

We are living in the Smart Age. It started with the introduction of smart phones in 2007, which came to be known as 'a PC in your hand', and mobile applications installed on these smart phones, that altered the way we work, play, and ultimately live. An online research firm, eMarketer, estimated there will be 1.75 billion smart phone users in 2014 and that number is expected to grow to 2.5 billions by 2017. Gartner estimated that the number of mobile apps downloads per user is over 70 and that number is expected to grow to over 100, as well. The situation in Korea is even more dramatic. According to Yonhap News Agency, smart phone distribution rate in Korea is number 1 (67.5%) compared to the rest of the world. The number of mobile apps downloaded per smart phone is more than 50 [KISA, 2013].

These mobile apps (of which, apps is a concatenation of 'applications') downloaded into smart devices such as smart phones and smart pads and are very similar to regular software applications residing on PCs that we have on our desks, except that they run not on Windows operating systems (OS) of PC, but on advanced operating systems including iOS (Apple) and Android (Google). As such, they are easy to use (requires no booting time, but a single touch of a fingertip starts the program), as the name imply they are mobile which allow for an easy transport anywhere a person can go, immediate, and finally with the advance in Wi-Fi (Wireless Fidelity), 3G/4G LTE (Long-Term Evolution) and other wireless communication technologies the mobile apps are connected allowing for ubiquitous networking any time of day.

In other words, they make our current world truly mobile and smart. It is not a surprise that Mobile Apps have been consistently rated number 2 in Top 10 Strategic Technology for the past 4 years [Gartner, 2011~2014]. But technology is technology. These 50 mobile apps installed and regularly used must compete with more than a million other mobile apps in Apple's AppStore, Google's Play, or other proprietary app stores. Everyday, new or better apps are added to the app stores that constantly entice the users to switch. To forego the old and relish with the new, despite a mobile app's powerful functions and features, it needs to be adopted and used before it can be of any good to any user. According to the Service-Dominant Logic, it is in usage that there is value to users (Value-in-Use) and this value will continue to change over time [Vargo, 2004, 2008; Sanstrom, 2008; Gronroos, 2012]. The adoption models we currently have, however, do not seem to adequately capture of phenomena we experience in our new age of smart technologies.

The importance of adoption-acceptance and continuance of information technology usage-has spurred academicians and practitioners on a quest to develop appropriate models and theories to adequately explain the adoption phenomenon since the early 70's and 80's. The Management Information System scholars borrowed heavily from already existing models and theories from social science, namely the theory of reasoned action (TRA) and later the theory of planned behavior (TPB) by Ajzen and Fishbein

[Ajzen and Fishbein, 1973; Ajzen, 1991].

The TRA suggests that behavior is heavily influenced by attitude, which in turn, is influenced by the person's belief and demonstrates with the famous cause-effect relationship of human behavior [Ajzen and Fishbein, 1973; Ajzen, 1991] : Belief → Attitude → Intention → Behavior. The above relationship can be explained as : A person's belief or core values will influence a person's attitude about a certain action, which in turn, will influence the person's intention about the action, which in turn, will influence the actual behavior of that action.

Rooted on this relationship, Fred Davis proposed the Technology Acceptance Model (TAM) in 1989, which suggested that the Perceived Ease of Use (PEOU) and Perceived Usefulness (PU) are the major predictors of Intention to Use the technology, which will predict the actual Usage Behavior [Davis, 1989].

Out of this TAM came many empirical researches, including Task-Technology Fit (TTF) [Goodhue and Thompson, 1995]; TAM2, an expansion on TAM [Venkatesh and Davis, 2000]; and culminating in the Unified Theory of Acceptance and Use of Technology (UTAUT), which combined 8 existing theories on adoption into one single theory of adoption [Venkatesh et al., 2003].

The main issue with these models and theories, however, are that they are all based on the framework of two-stage adoption. They are the byproducts of bygone era-the mainframe, PC, and Web era. These models and almost all of empirical studies done prior to 2001, were focused on Pre-Adoption or the Acceptance Stage -the antecedents before and up to Intention to Use-with a few exception such as DeLone and McLean IS Success Model. After 2001, there were some researches that were focused on Post-Adoption or the Continuance Stage-the predictors of Intention for Continued Usage.

Nonetheless, these models and theories fail short of adequately explaining certain phenomena, such as the Intention-Disusage, or the Acceptance-Discontinuance discrepancies. They also fail to explain the switch over to competing technologies or the eventual termination of usage. When it comes to mobile apps, users don't spend time forming a certain attitude concerning the trialability of a new product, but they just TRY it and see for themselves if the apps meet their expectations. Between Pre and Post Adoption, there is a fuzzy area of Interim adoption stage. If the experience from the trial is satisfactory, the user will go on using the app; and if not, the app will most likely be deleted from the smart phone.

The existing models, thus, are not adequate to explain this adoption phenomenon of mobile apps. This is what this research has set out to test and validate : A new multi-stage technology adoption model which can better explain the adoption of mobile apps in the smart age.

To help bridge the two stages of pre and post, a new construct of User Experience has been introduced in this paper. Although User Experience lacks attention in prior researchers, it nevertheless helps to form the multi-stage adoption model, which is built upon the models of Technology Acceptance Model (TAM) [Davis, 1989] and the Extended Expectation-Confirma-

tion Theory (ECT) of IS Continuance [Bhattacherjee, 2011]. The empirical study of the model is performed with 229 users of Social Networking and Communication Services (SNS) mobile apps.

This paper consists of the following sections : the next section reviews the distinguishing features of mobile apps and prior researches. In the third section, we present our research design and model. The fourth section explains the process of research data collection and analysis. And in the final section, we conclude the research and provide limitations and future research issues.

2. Theoretical Background

2.1 Mobile Apps in the Smart Age

Smart phones, come to known as 'a PC in your hand', and mobile apps installed on these smart phones will continue to be important-at least for the near distant future. According to the survey (of 4,000 users) of smart phone usage by Korea Internet and Security Agency (KISA) in 2012, 66.2% of smart phone users stated they use smart phone because they wanted to use mobile apps in the smart phones. The average number of mobile apps installed in a smart phone is 46, and of these, the number of mobile apps that users primarily use is 12 [KISA, 2012]. The top 5 mobile apps downloaded are Games and Entertainment (79.7%), Music (32.4%), Utility (30.8%), Communication (30.5%), and Map and Navigation (30.3%). And according to Falaki et al. [2010] the number of applications used by users vary from 10~90, with the median being roughly around 50. <Table 1> shows the number of smart phone users and mobile apps downloads from 2012 to 2017, as estimated by Gartner and eMarketer.

One of the reasons for the abundance of mobile apps is because of its ease of download into smart phones from 'Apps Stores.' An app store, which is accessible from any smart phone with

〈Table 1〉 Smartphone Users and Downloads, Worldwide, 2012~ 2017 (Billions)

	2012	2013	2014	2015	2016	2017
Total Population	7.01	7.09	7.17	7.25	7.31	7.39
Mobile Phone Users	4.08	4.33	4.55	4.77	4.95	5.13
Smartphone Users	**1.13**	**1.43**	**1.75**	**2.03**	**2.28**	**2.50**
Mobile App Downloads	**64.0**	**102.1**	**138.8**	**179.6**	**224.8**	**268.7**
Smart : Mobile Percentage	27.7%	33.0%	38.5%	42.6%	46.1%	48.7%
% of Population (Mobile Phone Users)	58.2%	61.1%	63.5%	65.8%	67.7%	69.4%
% of Population (Smartphone Users)	16.1%	20.2%	24.4%	28.0%	31.2%	33.8%
Mobile App Downloads Per Smart Phone User	**56.6**	**71.4**	**79.3**	**88.4**	**98.6**	**107.5**

Source : Gartner [2013], Gartner Says Mobile App Stores Will See Annual Downloads Reach 102Billion in 2013
eMarketer Report : Smartphone Users and Penetration Worldwide, 20112~2017 (Billions).

mobile connectivity, is a virtual store where apps are downloaded either for a nominal price or for free. The application of mobile apps in business and professional areas such as manufacturing, healthcare, education, and entertainment are growing as well.

A great number of empirical researches related to adoption of mobile technologies were conducted a few years after the introduction of smart phones in 2007 [Park et al., 2010; Chung and Lee, 2011; Taylor et al., 2011, Wang et al., 2011, 2012, Han et al., 2013; Choi, 2013]. These researches, however, are all grounded on existing models or frameworks, especially the pre-adoption stage. A review of existing models is warranted to see how successfully they can be applied or fail short to adequately explain the phenomena of smart age.

The distinguishing features, in comparison with technologies of PC-Era, are explained next.

1) **Ease of Use** : It is unbelievably ease to use smart phone and mobile apps in comparison to the applications of the past PC-era. With one touch, a user could download an app, and with one touch, a user could start and use an app. Just with one touch, a user could do many things that he or she could not possibly have done with a stand-alone PC application or Web application. It has changed the paradigm of computer users. One touch has become a new standard! Ease of Use (EOU) used to be a key antecedent of user's intention to adopt a new technology [Davis, 1989]. Not anymore. Ease of Use has become a given factor, now.

2) **Mobile** : Smart phones are mobile, and thus mobile apps, as the name implies, are also mobile. A user can access the mobile apps anytime, anyplace, with any device, or at least the theory goes. With mobile access, many of antecedents, such as facilitating condition or enabling environment [Venkatesh et al., 2003; Rogers, 2003], are not as important as before. Being mobile also hints at being easy, as well as, being relatively useful-the two fundamental antecedents of Technology Acceptance Model (TAM) which has been the foundation of many technology adoption studies up to the edge of smart age.

3) **Connected** : With mobile apps comes connection. Enter the age of advanced networking and social network, and the rise of word of mouth communication. Mobile apps with high speed connection, such as LTE and 4G, allow a user to be connected into the "network" 24 hours a day. Not only does a user have connection and access to any information that is located on the internet, the user is hard wired with the likes of KakaoTalk, Naver Band, Twitter, and Facebook to freely engage in open discussion with anyone in the world. The whole world can be an audience to a smart phone user. Social networking and communication, has turned out to be an extremely important factor in the age of smart technologies [Goyette et al., 2010; Oh et al., 2012; Kawakami et al., 2013].

4) **Immediate** : Users of mobile app could gain access to data, product, or information almost immediately. This immediacy also applies to downloading of mobile apps from

various app stores such as Apple's AppStore, Google's Play Store, and Samsung's Apps. This immediacy of gaining access to mobile apps also has a profound implication on adoption of technologies. In the mainframe, PC, or even Web era, it was not so an easy task to try out a software product before a full acceptance and usage. But with immediate nature of mobile apps, a user could immediately try out (thus, perform a trial use of) a mobile app that she hears from her friends or colleagues through the word of mouth communication.

The combination of ease of use, mobility, ubiquitous connection, and immediacy has been the right ingredient to mushroom the use of these mobile apps ever since the introduction of iPhones in 2007 by Apple. Although the PCs' are not completely dead, yet, more and more people are buying smart phones now days, than the PCs. The Wintel era-dominated by PCs using Microsoft's Windows operating system and Intel's microchips-is drawing to a close [The Economist, 2011]. Morgan Stanly, an investment bank, estimated that in 2011 combined shipments of smart phones and tablets will overtake those of personal computers (PCs) [The Economist, 2011]. The importance of mobile apps have gone unnoticed by Gartner, as they have ranked mobile apps to be ranked in the top 10 strategic technology trends for the past 5 years [Gartner, 2010~2014]. Gartner defines strategic technology as a technology that has the potential to significantly disrupt or impact an individual or enterprise in the next three years.

2.2 Technology Adoption Models

The researches and prior literature in the areas of Management Information System (MIS) are saturated with models and theories of the adoption of technologies, such as the Technology Acceptance Model (TAM), Innovation Diffusion Theory (IDT), Unified Theory of Acceptance and Use Technology (UTAUT), or Social Influence Model (SIM). Although they all seem valuable in their own right and in their own technological environment in which they were originally devised, none seem to quite able to explain the phenomenon of rapid expansion or sudden stagnation (disusage) of particular mobile apps.

The mobile apps, by their nature are easy to use, mobile (accessible), connected, and immediate. To understand how these characteristics affect adoption process, the literature review of top 10 relevant technology adoption models are reviewed. The following section explains the previous models and theories on technology adoption, and the critical shortcomings as they relate to the explanation of mobile apps. <Table 2> covers 10 most relevant prior models and theories on technology adoption, concluding with the Expectation-Confirmation Theory (ECT).

From the summary of models (<Table 3>), it is apparent that many models focus on pre-adoption and deal with pre-adoption variables. The focus on Interim-Adoption (or the stage between pre and post) is very limited with the exception of Service Quality Model (SQM) and

〈Table 2〉 Top 10 Models of Technology Adoption

No.	Main Author	Adoption Model/Research Title	Journal	Year
1	Ajzen and Fishbein	Theory of Reason Action (TRA) and Theory of Planned Behavior (TPB)	JPSP	1973 1985
2	Davis	Technology Acceptance Model (TAM)	MISQ	1989
3	Dishaw	Task-Technology Fit (TTF)	I and M	1999
4	Venkatesh	Unified Theory of Acceptance and Use of Technology (UTAUT)	MISQ	2003
5	DeLone and McLean	IS Success Model (ISSM); and 10 Year Update	ISR JMIS	1992 2003
6	Vannoy et al.	Social Influence Model (SIM)	CACM	2010
7	Rogers	Diffusion of Innovation Theory (DIT) (5th Edition)	Book	2003
8	Parasuraman	Service Quality Model (SQM)	JM	1985
9	Kano	Kano Model (KANO)	JJSQC	1984
10	Bhattacherjee	Expectation-Confirmation Theory (ECT)	MISQ	2001

〈Table 3〉 Summary of Models and Associated Variables

No.	Models	Variables										
		Pre-Adoption						Interim-Adoption			Post Adoption	
		WOM	EOU	PU	SI	FC	INT	TU	UX	CFM	SAT	CON	IB
1	TRA/TPB		X	X		X	X					X	
2	TAM		X	X									
3	TTF						X						
4	UTAUT		X	X	X	X	X					X	
5	ISSM			X							X	X	X
6	SIM				X								
7	DIT				X	X	X	X					X
8	SQM	X						X			X		
9	KANO			X							X		
10	ECT			X			X			X	X	X	

Legend of Variables :
WOM-Word of Mouth
PU-Perceived Usefulness
FC-Facilitating Condition
TU-Temporary (Interim or Trial) Usage
CFM-Confirmation (of Expectation)
CON-Continued Usage
EOU-Ease of Use
SI-Social Influence
INT-Intention to Use (or Try)
UX-User Experience
SAT-Satisfaction
IB-Impact and Benefits

Expectation-Confirmation Theory (ECT).

Based on the above models and theories of adoption, many empirical researches have been conducted focusing on certain products or technologies. Prior to 2000, however, almost all of empirical researches done were rooted on pre- and post-adoption stages [Ahuja and Thatcher, 2005; Hong et al., 2006; Wu et al., 2007; Spiller et al., 2007; Wu and Kuo, 2008; Saeed and Abdinnour-Helm, 2008; Limayem and Hirt, 2008;

Chiu and Wang, 2008, Vatanasombut et al., 2008; Kettinger et al., 2009; Lankton et al., 2010; Lee, 2005; Park et al., 2007; Suh et al., 2010; Kwahk, 2011; Chung and Lee, 2011; Wang et al., 2012; Choi, 2013; Han et al, 2013]. A review of empirical researches indicates that current researches are devoid of any focus on Interim stage of adoption. However important role mobile apps may play on our lives, even researches focused on mobile apps, themselves, currently are very limited.

2.3 Social Influence and Word of Mouth

Many past researches have been conducted with social influence (or the influence of word of mouth) as the antecedent of technology adoption's intention [Sajjad et al., 2009; Vannoy and Prashant, 2010; Langley et al., 2012]. This is none more true than in the smart age where the nature of ubiquity of technology seem to have a great effect on the initial influence for adoption, especially more so for the factor of virtual or electronic word of mouth (WOM) [Majumdar and Venkataraman, 1998; Oh et al., 2012; Parry et al., 2012]. <Table 4> lists such researches on Social Influence and Word of Mouth.

In the smart age, because of abundance of mobile apps of which they compete with the mindshare of potential users, it may be very hard for an average user to distinguish the difference of a particular mobile app among a sea of other competing products. As such, a user may pay a particular attention to the opinion of others, and more so if that other person is closer or deem important by the user [Robinson, 2012].

2.4 User Experience (UX)

In the article "Welcome to the Experience Economy" of Harvard Business Review (HBR) in 1998, Joseph Pine highlights the importance of customer experience as a competitive factor that a company can differentiate as the goods and services become more commoditized [Pine,

〈Table 4〉 Researches on Social Influence and Word of Mouth

No.	Main Author	Research Title	Journal	Year
1	Majumdar	Network Effects and the Adoption of New Technology : Evidence from the U.S. Telecommunications Industry	SMJ	[1998]
2	Sajjad	Adoption of Information Technology : Measuring Social Influence for Senior Executive's	AJSR	[2009]
3	Vannoy	The Social Influence Model of Technology Adoption	CACM	[2010]
4	Langley	Determinants of Social Contagion during New Product Adoption	JPIM	[2012]
5	Oh,Sehwan	The Effect of Electronic Word-of-Mouth (eWOM) in Mobile Application Downloads : An Empirical Investigation	KMIS Conf.	[2012]
6	Parry	The Effect of Personal and Virtual Word-of-Mouth on Technology Acceptance	JPIM	[2012]
7	Kawakami	Personal Word of Mouth, Virtual Word of Mouth, and Innovation Use	JPIM	[2013a]
8	Kawakami	The Impact of Word of Mouth Sources on the Perceived Usefulness of an Innovation	JPIM	[2013b]

1998]. The article argued that the economic value has progressed from Extracting Commodities to Making Goods to Delivering Services, and finally to Staging Experiences. The concept has brought a wide spread acceptance from individuals and companies, and triggered many researches in this area (See <Table 5>). The importance of Experience has started many companies to place User Experience into the design of products and services [Goodwin, 2009; Leung, 2010; Sirotkin and McCabe, 2011].

The term 'User Experience' came to mean a variety of things, ranging from traditional usability to beauty, hedonic, affective or experiential aspects of technology use [Hassenzahl 2006]. User Experience is contrasted with the dominant, task and work related 'usability paradigm or the User Interface of Human Computer Interface (HCI) [Hassenzahl 2006]. The primary aspect is the person's experience at the moment experienced [Whiteside and Wixon, 1987]. User Experience, as defined by Hassenzahl and Tractinsky, is a consequence of a user's internal state (predispositions, expectations, needs, motivation, mood, etc.), the characteristics of the designed system (e.g. complexity, purpose, usability, functionality, etc.) and the context (or the environment) within which the interaction occurs (e.g., organizational/social setting, meaningfulness of the activity, voluntariness of use, etc.) [Hassenzahl, 2006].

User Experience (UX) Elements : UX is an overarching experience that consists of all aspects of users' interaction with a product or service, from which users may obtain knowledge, feelings, and skills. The elements of UX are factors that influence UX significantly, and include Usability, Affect, and User Value. Prior to the introduction of the concept of UX, many

〈Table 5〉 Researches on User Experience

No.	Main Author	Research Title	Journal	Year
1	Pine	Welcome to the Experience Economy	HBR	[1998]
2	Hassenzahl	User Experience-A Research Agenda	BIT	[2006]
3	Lindgaard	Attention Web Designers : You have 50 Milliseconds to Make a Good First Impression!	BIT	[2006]
4	Saade	First Impression Last a Lifetime : Effect of Interface Type on Disorientation and Cognitive Load	CHB	[2007]
5	Kim, H. J.	Persuasive Design of Destination Web Sites : An Analysis of First Impression	JTR	[2008]
6	Law	Understanding, Scoping and Defining User Experience : A Survey Approach	HFCS Conf.	[2009]
7	Lee, S. H.	Digital Experience Strategy of Global Traditional Companies	CEOI	[2013a]
8	Lee, S. H.	User Experience Innovation Strategy Through the Application of Digital Technology	SERI	[2013b]
9	Rauschenberger	Efficient Measurement of the User Experience of Interactive Product	IJAIIM	[2013]
10	Wood	Looking Innovative : Exploring the Role of Impression Management in High-Tech Product Adoption and Use	JPIM	[2013]

elements of UX had already been included in research models and theories, such as “Ease of Use” [Davis, 1989] and Usability of Products [Han et al., 2001]. Park et al. [2011] believed the concept of UX to be more extensive than simply usability or affect, and incorporated the element of “User Value” into the definition of UX. To measure User Experience in relation to a product usage or service, a User Experience Questionnaire was developed which consisted of 6 areas with 26 question items in total (See <Table 6>) [Rauschenberger et al., 2013].

The questionnaire which can be used to mea sure the user experience for any interactive products has been applied here in this paper to measure user experience of technology adoption.

3. Research Design and Model

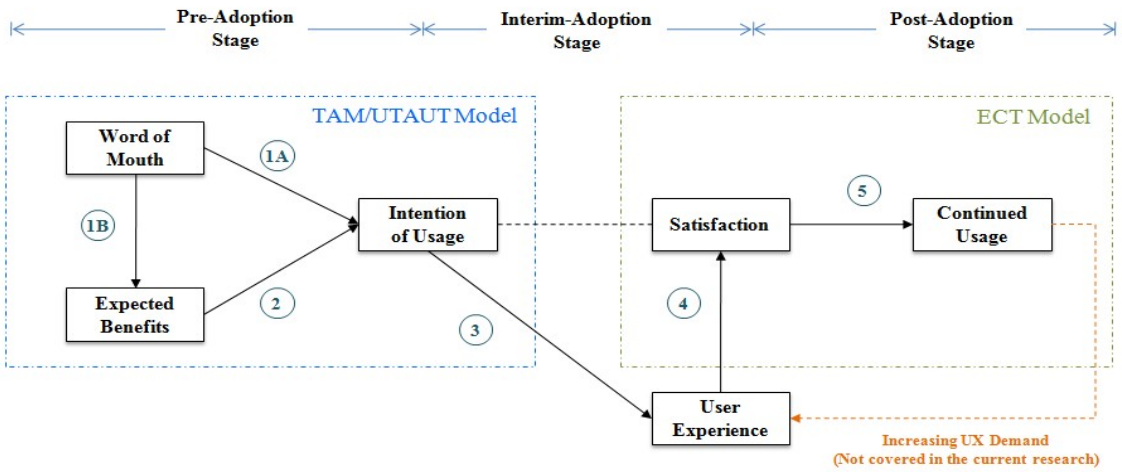
3.1 Research Model

This research proposes a new framework for the adoption of mobile apps (<Figure 1>). The existing two-stage framework of pre- and post-adoption is too restrictive and narrow to adequately account for the changes in technologies and computing environment. It just fails to adequately explain the Intention-Disusage phenomenon which is so apparent in the smart age.

The new framework proposes multiple stages : Pre-Adoption Stage, Interim-Adoption Stage, and Post-Adoption Stage, with a continuous Re-Confirmation stage through a re-confirma-

〈Table 6〉 User Experience Questionnaire (UEQ) and Sub-Elements

Category	Element	Description
Attractiveness	Attractiveness	General impression towards the product. Do users like or dislike the product? This scale is a pure valence dimension. *Items : annoying/enjoyable, good/bad, unlikable/pleasing, unpleasant/pleasant, attractive/unattractive, friendly/unfriendly*
Pragmatic	Efficiency	Is it possible to use the product fast and efficient? Does the user interface looks organized? *Items : fast/slow, inefficient/efficient, impractical/practical, organized/cluttered*
	Perspicuity	Is it easy to understand how to use the product? Is it easy to get familiar with the product? *Items : not understandable/understandable, easy to learn/difficult to learn, complicated/easy, clear/confusing*
	Dependability	Does the user feel in control of the interaction? Is the interaction with the product secure and predicable? *Items : unpredictable/predictable, obstructive/supportive, secure/not secure, meets expectations/does not meet expectations*
Hedonic	Stimulation	Is it interesting and exciting to use the product? Does the user feel motivated to further use the product? *Items : valuable/inferior, boring/exiting, not interesting/interesting, motivating/demotivating*
	Novelty	Is the design of the product innovative and creative? Does the product grab users attention? *Items : creative/dull, inventive/conventional, usual/leading edge, conservative/innovative*



〈Figure 1〉 Multi-Stage Adoption Model

tion loop. The second stage is interim (transient or temporary) in the sense that it is neither complete nor sustainable, but will have to constantly go through an iterative process of re-confirmation of experience, satisfaction, and continued usage. If there is any break from this iterative process, then the adoption will be terminated (meaning the user will move on to a competing product).

Although not included as part of this research, the transient (or temporary) nature of adoption is reflected in the re-confirmation Loop through Increasing UX demand. While a user is in usage of a particular mobile app, she will continually go through an iterative loop of confirmation of her expectations of benefits and resultant experience from the continued usage. A satisfied user will also be willing to have Word of Mouth intentions and spread good words about the particular mobile app [Kim, 2012]. This, in turn, will act as the starting point for another user and help spread the adoption of the mobile app.

3.2 Operational Definition and Hypotheses

The research model has a total of 6 first-level research variables. User Experience has a total of 6 independent sub-variables for a total of 11 variables. This section covers the prior researches in relation to these research variables, the formulation of hypotheses used in the research, and the stated hypotheses associated with the model.

3.2.1 Word of Mouth (WOM)

In the era of smart phones where technologies of mobility, connection, and immediacy bring about abundance of social networking sites such as Facebook, Twitter, and Kakao Talk, Word of Mouth plays an irreplaceable role of marketing mobile apps [Parry et al., 2012; Oh et al., 2012; Cho et al., 2013]. It is how most of mobile apps are made known and distribute among potential adopters of mobile apps. The Cambridge International Dictionary of English defines Word of Mouth as “given or done by people talking about something or telling people

about something." Merriam-Webster simply defines Word of Mouth as "oral communication." Regardless of the exact wording of definition, Word of Mouth is regards by many as the most powerful force in the marketplace [Silverman, 2001].

Word of Mouth is defined as the level of exchange of information in relation to the technology adoption among adopters and potential adopters [Maxham et al., 2001; Parry et al., 2012]. Word of Mouth is very closely related to Social Influence. The variable is used here encompassing the "influence" of Social Influence. Word of Mouth, thus, is the starting point for the spread of good (or bad) words about a particular mobile app. It will have a positive effect on a user's intention to try out the mobile app, as well as having a positive (or negative) image about the expected benefits [Vannoy and Prashant, 2010; Oh et al., 2012; Kawakami and Parry, 2013].

Hypothesis (H1-1) : Word of Mouth will have a positive (+) effect on Intention of Usage.

Hypothesis (H1-2) : Word of Mouth will have a positive (+) effect on Expected Benefits.

3.2.2 Expected Benefits (BEN)

Perceived Usefulness, or relative advantage of a new system, is found as a significant variable on almost all technology adoption models and researches [Davis, 1989; Venkatesh et al., 2003]. Except in this research, Perceived Usefulness is expanded in scope to be renamed as Expected Benefits. Many of the IT systems during the mainframe and PC-era were built to improve user productivity and performance (e.g., office software). However, current mobile apps include many more functionalities, including entertainment, personal education, and social networking [Bhattacherjee, 2011]. It light of the evolving nature of IT, with multiple type of benefits, it is more appropriate to use Expected Benefits as a predictor of intention to try, rather than perceived usefulness (which connotes productivity benefits only) [Bhattacherjee, 2011].

Another important variable is Perceived Ease of Use. However, in the era of smart phone where One Touch works like magic, Ease of Use is provided as a given requirement that without such a feature, the mobile app wouldn't be considered as a viable product. Ease of Use, as such, is not included in the model.

In this research, Expected Benefits is defined as a degree to which a potential user of mobile app expects that using a particular mobile app would enhance his life, in line with the purpose of such an app [Bhattacherjee, 2001, 2011; Parry et al., 2012]. Based on the foundation of TRA, TAM, and prior researches, we expect Expected Benefits to have significant impact on Intention of Usage [Ajzen, 1991; Davis, 1989; Parry et al., 2012].

Hypothesis (H2) : Expected Benefits will have a positive (+) effect on Intention of Usage.

3.2.3 Intention of Usage (INT)

Intention of Usage (Behavior Intention) is a

very powerful variable in understanding the mechanism of human behavior in the adoption of new technology. It is defined as a degree of user's intent or willingness to use the new technology [Ajzen, 1975; Davis, 1989]. Based on Ajzen's Theory of Reasoned Action (TRA), Behavior Intention close approximates the eventual behavior, and thus, is a very critical variable in estimating the future behavior. Nevertheless, it is not a final indication of the actual behavior or the continued activity. There is a gap between Intention and continued usage, which this research tries to address. As such, what follows behavior Intention should be the actual behavior, but because such variable is absent in the traditional two-stage model of adoption, User Experience from the initial usage of mobile apps is proposed as a new variable to approximate the resultant behavior after intention. Albeit, there are no prior literature that relates Intention to User Experience, the hypothesis to be tested is proposed in the sense that the potential users of mobile app will intend to try the available technology before being committed to continued usage [Rogers, 2003].

Hypothesis 3 (H3) : Intention of Usage will have a positive (+) effect on User Experience.

3.2.4 User Experience (UX)

User Experience is not just another name for User Interface (UI). It is the total experience (or feeling) a person gets. Likewise, it is defined as the level of total experience or feeling a user gets from an interaction (before, during, and after) with a product (or technology) [Hassenzahl and Tractinsky, 2006; Bhattacherjee, 2001]. In this research, User Experience has 6 sub-parts : Attractiveness, Efficiency, Perspicuity, Dependability, Stimulation, and Novelty [Laugwitz, 2008]. User Experience Questionnaire is a 26 item questionnaire used to measure the user experience of software products. Studies conducted for the original German, and the follow-on English version, have indicated a satisfactory level of reliability and construct validity [Laugwitz, 2008]. We expect User Experience to have a significant positive effect on the satisfaction of expected benefits of mobile app that the user originally had in mind, since satisfaction is the consolidated feeling a user gets from the result of usage [DeLone and McLean, 1992; Bhattacherjee and Barfar, 2011]

Hypothesis 4 (H4) : User Experience will have a positive (+) effect on Satisfaction.

3.2.5 Satisfaction (SAT from Experience)

Satisfaction is the missing link for the gap between intention and actual usage. Because of the characteristics afforded by smart phones, users can easily and readily test a mobile app and immediately feel the satisfaction level. As defined by Parasuraman et al., service quality is the difference between the expected service quality and the actually perceived service quality [Parasuraman et al., 1985]. Similarly, in this research, Satisfaction is defined as the level of overall difference in quality a user feels between expected quality and actual perceived

quality of mobile app [Suh et al., 2010; Bhattacherjee, 2001]. Satisfaction from user trial is the cornerstone of multi-stage adoption framework. Based on many researches about User Satisfaction and its impact of continued usage, we hypothesize that Satisfaction (from User Experience) will too have a positive effect on Continued Usage [Suh et al., 2010; Bhattacherjee, 2001; Wang et al., 2012].

Hypothesis 5 (H5) : Satisfaction will have a positive (+) effect on Continued Usage.

3.2.6 Continued Usage (CON)

Continued Usage is defined as the users' intention to continue using the mobile app until an alternative is presented, either with the introduction of a replacement or an improved version [Mathieson, 1991; Bhattacherjee 2001]. Measurement instruments are extended from behavior intention scale [Mathieson, 1991]. Although not included as part of this research, there is a re-confirmation loop that continuously checks for the validity of continued usage of mobile app.

4. Data Collection and Analysis

4.1 Survey Questionnaire and Analysis Tool

Survey questionnaire was developed for the 6 variables (11 total including sub variables of User Experience) utilizing the references from previous researches on related variables. The questionnaire was first developed in English, and tested for any grammatical or errors in meaning with a few native English speakers in the US. Then, it was translated into Korean and was also tested for similar errors. After a series of revision, a final version in Korean was settled and was distributed for collection. To be true to the name of research title (related to the application of mobile apps), survey questionnaire was distributed and collected using mobile phones. An online survey application of SurveyMonkey had been used for the creation of questionnaires as well as pilot testing and full survey. For the full suryey, a total of 282 samples were collected, and 53 (18.8%) were filtered out for various reasons (i.e., incomplete, unacceptable, etc). The remaining 229 samples were used for this analysis.

For the purpose of controlling the factor of uncertainty and variability, the target of mobile apps had been limited to Social Networking and Communication Services (SNS) apps, such as KakaoTalk, Naver Band, and Facebook. Participants without prior experience of using such an app had been asked not to participate in the survey.

For analysis software, IBM SPSS Statistics (Version 19) and Amos (Version 22) had been used to analyze data.IBM SPSS had been used for General statistics analysis, Linear Regression Analysis, Reliability Analysis, and Exploratory Factor Analysis (EFA), while IBM SPSS Amos had been used for Confirmatory Factor Analysis (CFA) and Structural Equation Modeling (SEM). This chapter is composed of Descriptive Analysis, Measurement Model Analysis, and Structural Model Analysis.

4.2 Descriptive Statistics of Samples

A review of the frequencies of respondent samples is indicated as described in <Table 7>. The frequency distribution of sex reflects 120 (52.4%) for male, and 109 (47.6%) for female. The distribution for age reflects 35 (15.3%) for Under 20, 63 (27.5%) for 20~29 years of age, 50 (21.8%) for 30~39 years of age, 67 (29.48%) for 40~49 years of age, and 14 (6.1%) for 50 and over. Smartphone manufacturer and brand used by the survey respondents indicate 27 (12.5%) for Apple iPhone, 157 (68.6%) for Samsung Galaxy, 2 (0.9%) for Nokia, 43 (18.8%) for others. There is no response for Blackberry used in the survey. For usage duration, 20 (8.7%) was under 6 months, 29 (12.7%) was 6~12 months, 41 (17.9%) was 1~2 years, 55 (24.0%) was 2~3 years, and 84 (36.7%) was over 3 years. Finally, the frequency of occurrence for the SNS app type indicated 161 (70.3%) for KakaoTalk, 25 (10.9%) for Band, 12 (5.2%) for Line, 8 (3.5%) for KakaoStory, 2 (0.9%) for NateOn, and 21 (9.2%) for others.

〈Table 7〉 Descriptive Statistics of Samples

Category		Frequency (Person)	Percentage (&)
Sex	Male	120	52.4%
	Female	109	47.6%
Age	Under 20	35	15.3%
	20~29	63	27.5%
	30~39	50	21.8%
	40~49	67	29.48%
	50 and Over	14	6.1%
Smartphone Manufacturer and Brand	Apple iPhone	27	12.5%
	Samsung Galaxy	157	68.6%
	Blackberry	0	0.0%
	Nokia	2	0.9%
	Others	43	18.8%
Usage Duration	Under 6 Months	20	8.7%
	6~12 Months	29	12.7%
	1~2 Years	41	17.9%
	2~3 Years	55	24.0%
	Over 3 Years	84	36.7%
SNS Mobile App Type	KakaoTalk	161	70.3%
	Band	25	10.9%
	Line	12	5.2%
	KakaoStory	8	3.5%
	NateOn	2	0.9%
	Others	21	9.2%

4.3 Analysis of Measurement Model

4.4.1 Confirmatory Factory Analysis (CFA)

Prior to verification of relationship among different constructs, an analysis of unidimentionality was performed. One of the objects of Confirmatory Factor Analysis (CFA) is the removal of any items that may prevent the unidimentionality of constructs. In general, Confirmation Factor Analysis is considered better than Exploratory Factor Analysis in achieving unidimentionality, and thus, is used in this analysis.

<Table 8> shows the results of CFA. Based on <Table 8>, a loading value less than 0.6 and the Squared Multiple Correlation (SMC) value that is less than 0.4 needs to be removed from the list [Bae, 2011; Song, 2014]. This situation, known as Heywood Case, renders SMC value and Goodness of Fit test meaningless, and must be resolved by either by 1) removing the item or 2) arbitrarily limiting the value of variance to 0.005 and selecting the best option from the analysis results. In this analysis, with the ex-

ception of UX6, however, none of the observed values fell in this category, and thus, all the variables had been kept for subsequent analysis.

〈Table 8〉 Results of Confirmatory Factor Analysis (CFA)

Latent Variable	Observed Variable	Observed Value	
		SMC (R^2)	Loading
Word of Mouth (WOM)	WOM1	.709	.842
	WOM2	.900	.949
	WOM3	.744	.863
Expected Benefits (BEN)	BEN1	.829	.911
	BEN2	.848	.921
	BEN3	.783	.885
Intention of Usage (INT)	INT1	.726	.852
	INT2	.805	.897
	INT3	.656	.810
User Experience (UX)	UX1	.610	.781
	UX2	.737	.859
	UX3	.581	.762
	UX4	.468	.684
	UX5	.506	.712
	UX6	.361	.601
Satisfaction (SAT)	SAT1	.523	.723
	SAT2	.839	.916
	SAT3	.891	.944
	SAT4	.761	.872
Continued Usage (CON)	CON1	.665	.815
	CON2	.953	.976
	CON3	.499	.707

Note) 1. The loading value of 0.6 is minimum; over 0.7 is excellent [Bae, 2011]
2. SMC value less than 0.4 and negative variance value need to be removed [Song, 2014]

4.3.2 Analysis of Internal Consistency

After Confirmatory Factor Analysis (CFA) had been performed and analyzed to achieve unidimentionality of constructs, an analysis for internal consistency was performed by evaluating convergent validity and reliability of constructs. There are two ways to evaluate convergent validity : Construct Reliability (C.R.) value and Variance Extracted (VE) value. The calculated values are listed in <Table 9>. The results show that all constructs have C.R. value greater than 0.7 and VE value greater than 0.5, and thus, is said to have achieved convergent validity [Hair et al., 1998; Fornell and Larcker, 1981; Song, 2014]. The results also show that all constructs have Cronbach α greater than 0.7, and thus, have achieved reliability [Fornell and Larcker, 1981; Song, 2014].

4.3.3 Discriminant Validity

After satisfying the internal consistency of measurement model through analysis of convergent validity and reliability, the Discriminate Validity of measurement model was verified. To have Discriminant Validity, the square roof of Average Variance Extracted (AVE) must be greater than any correlation of constructs among different constructs. The results, as shown in <Table 10>, reveal that the square root of AVE of a construct is greater than any correlation of constructs, and thus, have achieved discriminant validity [Fornell and Larcker, 1981; Song, 2014].

4.4 Analysis of Structural Model

4.4.1 Goodness of Fit of Research Model

After the analysis of measurement model, the analysis of structural model was perform first with the Goodness of Fit of Research Model. The <Table 11> displays the results of ob-

〈Table 9〉 Results of Internal Consistency Analysis

Construct	Measurement Variable	Construct Reliability (C.R.)	Variance Extracted (VE)	Reliability (Cronbach α)
WOM	WOM1	0.898	0.738	α = 0.938
	WOM2			
	WOM3			
BEN	BEN1	0.903	0.765	α = 0.940
	BEN2			
	BEN3			
INT	INT1	0.876	0.691	α = 0.927
	INT2			
	INT3			
UX	UX1	0.904	0.513	α = 0.921
	UX2			
	UX3			
	UX4			
	UX5			
SAT	SAT1	0.921	0.688	α = 0.946
	SAT2			
	SAT3			
	SAT4			
CON	CON1	0.883	0.643	α = 0.938
	CON2			
	CON3			

Note) C.R. > 0.7 and V.E. > 0.5 is considered to have achieved Convergent Validity, and Cronbach α> 0.6 is said to have achieved Reliability [Hair et al., 1998; Fornell and Larcker, 1981; Song, 2014].

〈Table 10〉 AVE-Square Root and Correlation of Constructs

Construct Name	Correlation of Constructs					
	1	2	3	4	5	6
WOM	1					
BEN	0.578	1				
INT	0.698	0.630	1			
UX	0.671	0.642	0.751	1		
SAT	0.543	0.439	0.594	0.709	1	
CON	0.459	0.330	0.548	0.501	0.586	1
SQRT AVE	**0.864**	**0.870**	**0.838**	**0.811**	**0.865**	**0.850**
AVE	0.746	0.757	0.703	0.657	0.748	0.722

Note) Square Root of AVE > any correlation of constructs is said have achieved discriminant validity [Fornell and Larcker, 1981; Song 2014].

served values in comparison against the recommended values, and show that the data samples and research model is generally a good fit. Although there are some items that are below the recommend value, most values are close to or above the recommended values, especially the Chi-square/df with a value of 1.551, Goodness of Fit Index (GFI) of 0.874, Adjusted Goodness of Fit Index (AGFI) of 0.844, and Root Mean Square Error of Approximation (RMSEA) of 0.049, and are considered to have met the goodness of fit test.

4.4.2 Verification of Research Hypotheses

<Table 12> shows the results of Path Analysis. All hypotheses are found to be significant. In addition, <Figure 2> shows the results of path analysis in graphical form.

To regurgitate the results of research analysis as indicated in <Figure 2>, Word of Mouth is found to have a positive effect on Intention with a coefficient value (C.V.) of 0.430 and a p-value of 0.000 (H1-1). Word of Mouth is also found to have a positive effect on Expected Benefits with a coefficient value of 0.445 and a

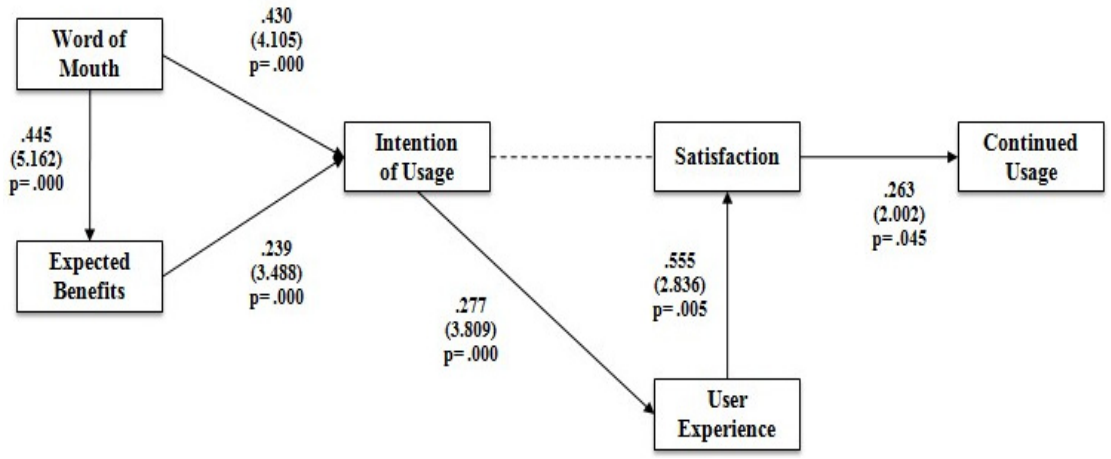
〈Table 11〉 Results of Goodness of Fit Test

Category	Index	Observed Value	Recommended Values
Absolute Fit Measure	Chi-Square/df (x^2/df)	1.551	<2.0
	Goodness of Fit Index (**GFI**)	.874	> 0.8 to 0.9
	Adjusted Goodness of Fit Index (**AGFI**)	.844	> 0.8
	Root Mean Square Residual (**RMR**)	.626	< 0.05
	Root Mean Square Error of Approximation (**RMSEA**)	.049	< 0.05 to 0.08
Incremental Fit Measure	Normed Fit Index (**NFI**)	.549	> 0.9
	Tucker-Lewis Index (**TLI**)	.727	Higher is Better
	Comparative Fit Index (**CFI**)	.761	> 0.9
	Incremental Fit Index (**IFI**)	.774	> 0.9
	Relative Fit Index (**RFI**)	.487	> 0.9
Parsimonious Fit Measure	Parsimonious Goodness of Fit Index (**PGFI**)	.702	> 0.5
	Parsimonious Normed Fit Index (**PNFI**)	.482	Higher is Better
	Parsimonious Comparative Fit Index (PCFI)	.668	Higher is Better

Source : Hair et al. [1998], Fornell and Larcker [1981] Huh [2013], Song [2014].

〈Table 12〉 Results of Path Analysis

Hypothesis : Path	Coefficient Value	C. R.	R^2	p Value
[H1-1] WOM → INT	.430	5.934	0.485	.000
[H1-2] WOM → BEN	.445	5.162	0.395	.000
[H2] BEN → INT	.239	3.488	0.331	.000
[H3] INT → UX	.277	3.809	0.563	.000
[H4] UX → SAT	.555	2.836	0.500	.005
[H5] SAT → CON	.263	2.002	0.341	.045



〈Figure 2〉 Results of Research Analysis

p-value of 0.000 (H1-2). As a starting point in the process of adoption, Word of Mouth seems to be played its role very effectively. Expected Benefits is found to have a positive effect on Intention with a coefficient value of 0.239 and a p-value of 0.000 (H2). There is no connection between Intention and Satisfaction, because what follows Intention is Behavior [Ajzen and Fishbein, 1973; Ajzen, 1991].

Thus, User Experience plays the role of mediator between Intention of Usage and Satisfaction from Usage. Intention has a positive effect on User Experience with a coefficient value of 0.277 and a p-value of 0.000 (H3). User Experience, in turn, has a positive effect on Satisfaction with a coefficient value of 0.555 and a p-value of 0.005; and Satisfaction on Continued Usage with a C.V. of 0.263 and a p-value of 0.045. The multi-stage adoption model is supported, at least, for the SNS mobile apps technologies in Korea, and User Experience is found to play an important role of bridging the two distant stages of pre and post-adoption.

5. Conclusion

5.1 Research Results and Implications

This research was set out to investigate the validity of multi-stage adoption model for the Smart Age that we currently live in. By 'smart,' we mean the introduction of smart phones and other smart devices, and the mobile apps that live in these devices, that permeate and change the fiber of our lives. In the days of adoption prior to the 'Smart Age', the adoption was rooted in the Technology Acceptance Model (TAM) [Davis, 1989] and its derivatives, such as the Technology Task Fit (TTF) model [Goodhue, 1995] or the United Theory of Acceptance and Use Technology (UTAUT) [Venkatesh, 2003]. These technology adoption models are all based on the "two-stage" adoptions, meaning they deal with either the pre-adoption or the post-adoption. One of the key short-comings of these two-stage adoption models is that they fail to adequately explain the Intention-Behavior dis-

crepancies, that is, there is Intention, but no follow-on Behavior. Another is the Acceptance -Discontinuance discrepancies, which is, there is Acceptance but for an unknown reason there is Discontinuance of usage.

With the changes of environment and technologies, these two-stage adoption models don't seem to fit well with the changing flow of time and to adequately explain the intricacies involved with the adoption of technologies, at least for the SNS mobile apps, in the Smart Age. A new model of Multi-Stage Adoption of Technologies was proposed to resolve these discrepancies, at least for the Social Networking Service (SNS) mobile apps that were selected to be tested against the hypotheses. As the data and the resultant analysis have indicated, all hypotheses were found to be significant, or proven to be valid.

In light of these findings, this research can be summarized to provide benefits in 3 ways. First, with a better understanding of the characteristics of mobile apps in the Smart age, we could develop a better adoption framework which will help not only the developers, but ultimately the consumers of mobile apps. Second, by understanding the multi-stage adoption of technologies and the determinants that transition a user from Pre-Adoption, through Interim-Adoption, and onto Post-Adoption, the developers of mobile apps will have a better understanding of targets in terms of functions, features, and values. They will achieve a higher rate of consumption which will ultimately lower the cost of technology while increase the rate of adoption. And finally, by bringing out the role of User Experience, in relation to various stages of adoption of technologies, and subsequently better ensued user experience design and implementation into products and services, not only the future researchers and developers, but the end users will ultimately benefit from better user experience and enhanced value.

Although not included in the research scope, there is a re-confirmation loop which postulates that based on continuous changing environment and the needs of users, the user experience (the encapsulation of total value) needs to be continuously re-confirmed for continuance of usage.

What might this all mean to suppliers or developers of mobile apps? It means that they need to be aware of the changing situation, that the field the game is played on has adopted a whole new set of rules. It is no-longer a simple two-stage adoption, but a multi-stage adoption, where the total benefits from the perspective of users (in the name of user experience) must be continually upgraded and advanced. It also means that there is a new player-User Experience-in the game that they need to pay great attention to.

The multi-stage adoption model signals the arrival of a new model for the new era. It needs to be further studied and applied whenever necessary to better understand the human nature behind the adoption of technologies. As Vargo and Lusch [2004, 2008] have stated in their famous foundational premise of service-dominant logic, without adoption there is no use, and without use, there is no value.

5.2 Research Limitations and Recommendation

However important a new model of multi-

stage adoption model may be, it is ridden with many identified limitations, along with many uncovered or un-ventured areas for further study. Whether the multi-stage model holds true for other types of mobile apps (other than SNS mobile apps), or for other cultures of the world, is yet to be seen. As such, a comparison of results from different culture will shed additional light on the changing requirements of adoption of technologies, and would be very interesting to observe.

The element of time was also an important limiting factor. The model needs to be advanced with a longitudinal aspect of time, especially the observation of re-confirmation of user experience after the acceptance and continued usage. Whether the multi-stage adoption model will withstand the test of time through longitudinal studies is a challenge for a follow-on study. Lastly, whether there is constructs other than User Experience (UX) that can better bridge the Pre- and Post-adoptions is also a subject of further investigation. User Experience was chosen as the critical variable, but it is, by no means, the only variable to better explain the adoption in the smart age.

Despite its limitations, nonetheless, the multi-stage adoption model as proposed and validated in this research adequately explains the phenomena of technology adoption in the smart age, as opposed to the two-stage adoption models of the bygone PC-era. A mobile app, a technology which utterly changes the fiber of our lives, goes through many stages of adoption. A positive word of mouth is akin to the conception of an embryo-It plants a seed of possibility in the mind of user. From the seed of such "social influence," an expectation of composite benefits is established and influences the user's intention of trying out the app. This intention leads to the actual downloading and trial and a comprehensive experience from the trial sets where the user is satisfied or not. And depending on this satisfaction, he or she will proceed to continue using the app or delete the app from the smart phone.

In layman's term, this is the gist of adoption process as spelled out by the multi-stage adoption. Just as a new wineskin is needed for the new wine, the multi-stage adoption model is needed to explain the adoption of mobile apps in the smart age.

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