

# Technology-Based Services Adoption: A Comparison of the Major Applications

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A literature review in technology-based services (TBSs) revealed many research projects dealing with the attitudes of consumers towards technology-based service applications and the constructs influencing that relationship. However, there are still no reported research projects examining the differences on attitude and adoption of consumers towards different applications of technology-based services. This study addresses the gap in knowledge in point of the factors influencing consumer attitudes towards, and adoption of, technology-based services, by comparing four different applications of them. A conceptual model for the adoption process of technology-based services is developed and tested across four different applications of the e-service industry. Each survey respondent has to answer the same set of questions for all four categories. The results indicate that attitudes towards different technology-based service applications are separate and distinct from one another, and that attitude towards each technology-based service application differs, while it positively influences the actual future use in all of them.

*Keywords:* Technology-based services; technology readiness and adoption; e-business.

## 1. Introduction

While technology-based service (TBS) applications, carried out in the service encounter, could be beneficial to both businesses and their customers, their adoption rates, from the consumption side, extensively vary, implying that there might be some reasons keeping potential users away from using a specific TBS application. This paper's objective is to examine the factors that influence consumers' attitudes towards the actual future use of TBS applications. It focuses on the impact of pointed antecedent beliefs to the attitude towards TBS applications that leads to the actual future use or rejection of them.

This research tries to fill a research gap of the literature surrounding e-services use and adoption. The paradox lays on the fact that until now, research papers, when

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trying to investigate the intention to use, adoption and attitudes towards any type of e-services, they all rest their proposed models in only one TBS application, such as e-government or e-banking. The only form of comparison tracked down in the existing literature was the research papers that examine different technologies used in the same service industry, for example examination of the three different technologies (ATM, bank by phone and online banking) used in banking industry. It is of great interest to examine whether there are differences in attitudes towards different TBS applications, among the same group of people, and whether these differences are influenced by the same set of beliefs.

A conceptual model of the adoption process for TBSs is developed and tested across four applications, namely e-banking, e-government, e-commerce and the entertainment and communication services.

Findings support the hypothesis that the four TBS applications are receiving different attentions by consumers. Attitudes towards each type of application proved to be separate and distinct from one another. Also, a strong and significant relationship between attitude towards TBS applications and the actual future use of them was evidenced. Finally, it was observed that perceived ease of use, usefulness and technology readiness (TR), which were identified as the antecedents that influence attitude towards a TBS application, were not all of the same importance for all the four examined categories of TBS applications. It resulted that the constructs constituting TR do not influence the attitude towards the use of e-commerce and entertainment and communication services.

This paper explains the varying degrees of acceptance observed among consumers. It explores the factors of importance for the introduction of TBS applications in a global online market and how they vary among different applications. As such, the paper contributes to research on electronic services, by advancing the existing knowledge on applications of TBSs and guiding marketers to ruminate issues of pointed beliefs, when trying to carry out the delivery of an e-service application.

## 2. Literature and Conceptual Model Development

Both potential consumers and firms/organizations are concerned with the usefulness and ease of use of a TBS application, before they decide to avail by it. In the context of studying attitudes and technology, several scholars have made important contributions to the literature.

Davis [1986] studied individuals' attitudes towards using new information systems and computer-based products, through the use of technology acceptance model (TAM). According to TAM, perceived usefulness and perceived ease of use are the two key beliefs that lead to the behavioral attitudes and intentions of users. Moreover, the theory of diffusion of innovations [Rogers (1962)] indicates that the positive or negative attitude towards the innovation would result in the more permanent adoption or rejection of the innovation.

Gatignon and Robertson [1989] conducted an empirical study of the factors accounting for the adoption or rejection of a high-technology innovation. They

concluded that adopters can be separated from non-adopters by their information-processing characteristics. They found that adoption is associated with high vertical integration and high supplier incentives in the supply industry, and high industry concentration and low competitive price intensity in the adopter industry. The decision-maker characteristics (preference for negative information and exposure to personal information sources) actually predict adoption.

Chandrashekar and Sinha [1995] studied how countries are expected to adopt a new technology when their perceived utility from the new technology exceeds their *status quo* utility. They presented the split-population Tobit (SPOT) duration model to incorporate the two conceptually distinct dimensions of innovativeness in a single framework, namely, the timing and volume of adoption, for investigating how they are affected by consumer characteristics and prior purchase behavior that, in turn, could affect post-adoption usage.

Srinivasan *et al.* [2002] studied the adoption of e-business, a radical technology with the potential to alter business models. The authors first established the distinctiveness of technological opportunism from related constructs, such as organizational innovativeness, and showed that it offered a significantly better explanation of technology adoption than existing constructs do.

In the present research, TAM will be employed to investigate the factors influencing attitude towards TBS applications and the relationship between attitude towards and the actual future use of TBS applications. While in the existing literature, TAM explains a significant amount of the variance in usage intentions and future use of technology, many scholars and researchers set the following question: Are perceived usefulness and ease of use alone enough to predict attitude and behavioral intentions? The answer, by most of them, is that attitude and behavioral intentions cannot be predicted solely through these two factors. If so, the research project may lead to inadequate results, as the explanatory power of the model can be improved by adding other factors [Hu *et al.* (1999); King and He (2006); Lin and Lu (2000); Mathieson *et al.* (2001)].

In the current study, it is proposed that TR, is also a critical belief that, jointly to the factors of TAM, form a part of the causal determinants of specific cognitive appraisal of attitude towards a TBS application. Parasuraman [2000] has defined TR as an overall state of mind that refers to “people’s propensity to embrace and use new technologies for accomplishing goals in home life and at work”. In his conceptualization, a combination of positive and negative feelings about technology underlies the domain of TR. That state of mind relates to how ready an individual feels about using a particular technology, that will affect how ready that consumer is to accept and use the specific technology.

Thus, in addition to the two key beliefs of perceived usefulness and perceived ease of use in TAM, the TR element is employed. Trying to figure out the procedure by which consumers determine whether they will use a TBS application or not, our model was developed, see Fig. 1. We propose three antecedent factors as predictors of attitude towards TBS applications. Perceived ease of use and usefulness will be investigated according to the TAM literature and for TR the technology readiness

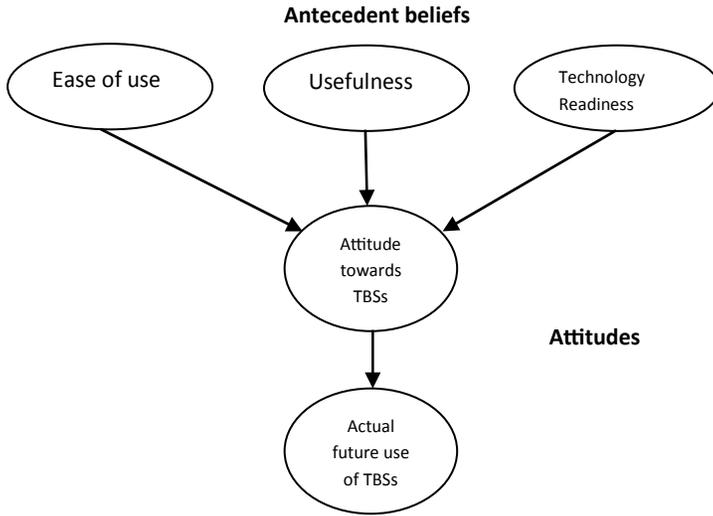


Fig. 1. Conceptual model.

index (TRI) [Parasuraman (2000)] is employed, for improving the explanatory power of our model, as an accessory ascendant factor.

Furthermore, we propose that attitude towards TBS applications impacts the actual future use of them. These relationships are shown in Fig. 1. The model will be tested across four different applications of TBSs to increase the robustness of the testing process and to reveal whether or not the relationships are consistent across the whole e-service encounter. Next, the hypotheses and descriptions of the constructs are analyzed and discussed.

### 3. Hypothesis Development

#### 3.1. Attitude

Attitude towards a product or a service is perceived as a concept of high value, as it is a determinant for the consumer's actual behavior [Mosavi and Ghaedi (2011)]. Attitude towards an innovation is a critical intervening variable in the innovation adoption decision [Rogers (1995)]. Thus, attitude towards a specific information technology is conceptualized as a potential user's assessment of the desirability of using that technology [Davis *et al.* (1989)] and, according to TAM, predicts an individual's use of technology.

Many studies have applied TAM to test users' adoption in different settings. In electronic commerce, Gefen *et al.* [2003] found that electronic consumer trust was as important to online commerce as the widely-accepted TAM use-antecedents, perceived usefulness and perceived ease of use. Together these variable sets explained a considerable proportion of variance in intended behavior. Their study also provided evidence that online trust is built through: (a) a belief that the vendor has nothing to gain by cheating, (b) a belief that there are safety mechanisms built into the web site, (c) having a typical interface, and (d) ease of use.

In Internet banking, Wang *et al.* [2003] used TAM as a theoretical framework and introduced “perceived credibility” as a new factor, which reflects the user’s security and privacy concerns in the acceptance of Internet banking. They examined the effect of computer self-efficacy on the intention to use Internet banking. Their results strongly supported the extended TAM in predicting the intention of users to adopt Internet banking. Their research also demonstrated the significant effect of computer self-efficacy on behavioral intention, through perceived ease of use, perceived usefulness and perceived credibility.

In e-government, Alhujran and Chatfield [2009] evidenced a wide digital divide that exists between the Arab countries and the leading developed countries. Importantly, however, the results of their research also showed a wide digital divide even among the Arab countries studied, particularly in the development of advanced e-government service delivery capabilities. Also, Carter and Bélanger [2005] integrated constructs from TAM, diffusions of innovation theory and web trust models to form a parsimonious, yet comprehensive, model of factors that influence citizen adoption of e-government initiatives. Their findings indicate that perceived ease of use, compatibility and trustworthiness are significant predictors of citizens’ intention to use an e-government service.

According to the literature, consumers may have distinguishable attitudes toward self-service technologies (SSTs). Curran *et al.* [2003] found that intentions to use SST options are driven by multiple, hierarchical attitudes. In addition to the direct effects of attitudes towards specific SSTs, their findings confirmed that higher-order global attitudes towards service technologies influence individual intentions to use SSTs. Also, they proved that heavy SST users rely more on attitudes towards specific SSTs than the light SST users, who rely more heavily on global attitudes towards SSTs, when determining intention to use an SST.

Supposing that TBS applications used for the delivery of different advantages may vary between industries, it would be useful to examine consumers’ potential predispositions towards different TBS applications and discover whether attitudes towards them will be separate and distinct from one another.

**H1.** TBS applications receive different levels of attention since attitudes towards them will be separate and distinct from one another.

According to Fishbein and Ajzen [1975], attitude towards behavior is defined as an individual’s positive or negative feelings (evaluative affect) toward performing the target behavior. Literature reveals that attitude towards behavior positively affects the intention and actual use of a specific technology [see, for example, Chang and Zhu (2011); Dominik and Michel (2008)]. So, in our research the influence of consumers’ attitudes towards the actual future use of a TBS application is studied.

Bagozzi [2007] deals with whether the relationship between behavioral intention and actual use is theoretically strong enough and he discusses the fact that there may be other factors that actually affect the final use of a TBS application, even after initial intention is formed. Still, TAM is relevant to the present research, because it

will focus on the acceptance of technology which does not require any explicit inputs from the user.

According to TAM, attitude towards the actual use is the evaluative judgment of adopting a part of technology [Rahimi *et al.* (2003)]. A meta-analysis of attitudinal research related to the theory of reasoned action found strong support for using attitude to predict intentions [Sheppard *et al.* (1988)].

After reviewing the relevant literature, particularly as it pertains to the consumer context, attitude towards adoption is retained for use in the model and is hypothesized to be influenced by perceived usefulness, ease of use and TR. Also, since attitude predicts behavior, concerning the intention and actual use of a specific technology [Chang and Zhu (2011); Dominik and Michel (2008)], it is hypothesized that:

**H2.** Attitude towards a TBS application will positively influence a consumer's actual future use of it.

### 3.2. *Antecedents*

The model of our research, as stated above, includes three antecedents. These are perceived usefulness, perceived ease of use and TR. TAM directly relates perceived ease of use and perceived usefulness to an individual's attitude towards using a particular technology [Davis (1986, 1989)]. TR, defined as a state of mind that relates to how ready an individual feels about using a particular technology — and in our study a TBS application — [Parasuraman (2000)], will affect the level of consumer readiness to accept and use the specific technology.

If potential consumers believe that a given application is too hard to use or that the performance benefits of usage are outweighed by the effort, then they may not choose to use it. In Davis's [1989] words, perceived ease of use refers to “the degree to which a person believes that using a particular system would be free of effort”. In TAM, perceived ease of use is defined as the extent to which a person believes that using a technology will be simple [Davis *et al.* (1989)]. Perceived ease of use is substantial for initial acceptance of a new TBS application and is fundamental for further adoption and continued use [Davis *et al.* (1989)]. Ease of use was found to have a direct and positive effect on attitude towards use of technological innovations concerning consumers [Childers *et al.* (2002); Dabholkar and Bagozzi (2002); Gentry and Calantone (2002)]. Therefore, it is hypothesized:

**H3a.** Perceived ease of use of technology will be positively related to attitude towards TBS applications.

Perceived usefulness is defined as the degree to which a user believes that using a particular technology system would enhance his or her job performance [Davis (1989)]. From a consumer's perspective, it is considered to be the possibility that technology will help when performing a task. According to many TAM research projects, perceived usefulness is a strong determinant of user acceptance, adoption and usage behavior [Davis (1989); Mathieson (1991); Taylor and Todd (1995)]. Also,

literature shows that there are positive relationships between perceived usefulness and attitudes towards new Internet services [Childers *et al.* (2002); Gentry and Calantone (2002)], as well as that there is positive impact between perceived usefulness and attitude towards using mobile Internet products [Bruner and Kumar (2005); Lee *et al.* (2002)]. Therefore, it is hypothesized:

**H3b.** Perceived usefulness of technology will be positively related to the attitude towards TBS applications.

Many scholars have examined the differences in the adoption of new technologies between individual customers [Tsikriktsis (2004); Agarwal and Prasad (1999); Harrison and Rainer (1992); Gutek and Bikson (1985)]. Thus, TR shows the level of consumers' readiness to embrace a new technology and their technical and personal abilities to actually use it [Caison *et al.* (2008)].

Cunningham *et al.* [2002] state that an individual's perception of the benefits of change is an initiator of readiness for change. Agarwal and Prasad [1999] as well as Dabholkar and Bagozzi [2002] have suggested that TAM model fails to consider some individual differences of customers. On that grounds, TR for change is included in the current research.

The value of measuring TR, in addition to TAM, is related to the novelty of TBS applications. Potential or actual users of TBS applications are usually asked to present their beliefs, attitudes and usage intentions about their virtual experiences. TR has been integrated to other models also, such as theory of planned behavior (TPB) [Chen and Li (2010)]. Chen and Li [2010], in their integrated model of TR and TPB, where TR was theorized to be one of the four causal antecedents of attitude, explained a total variance in continuous intention increase to 70%, revealing that integrating the theoretical constructs of TPB with TR can definitely increase the accuracy of an integrated model to predict and explain customers' behavioral intentions.

Pires *et al.* [2011] studied the models developed for assessing critical aspects of consumer use and acceptance of technology-based products and services. They used TAM and TRI as theoretical references for their field research on Internet banking users. They tested whether TRI could be an antecedent to the main construct of TAM, which is the intention to use online services, and proposed that their model should be tested in other interactive interfaces, such as e-commerce and services, to find whether there are differences in the various web environments.

In other studies TR is proposed to be a key moderator in the relationship between a model's variables and behavioral intention. For example, Borrero *et al.* [2014] proposed that TR moderates the relationship between unified theory of acceptance and use of technology (UTAUT) model variables and behavioral intention. They showed that respondents with either high or low TR differ in their beliefs-intention relationships.

Attitude and intention are presented as mirrors of beliefs, and not as standing predictors of TBS applications adoption [Lanseng and Andreassen (2007)]. While TRI measures customers' propensity to adopt a new technology, results that show

high scores imply that the population under investigation is comfortable with technology through usage in other areas. So, combining TAM with TRI as a unidimensional scale is a way to provide more valid predictions of actual adoption and use of TBS applications.

TR is positively associated with attitudes toward using TBS applications, in that optimism and innovativeness are positively related to customer attitudes towards using TBS applications, while discomfort and insecurity are negatively related towards using TBS applications [Liljander *et al.* (2006)]. TR also may encourage positive attitudes towards technology and vice versa [Lin and Hsieh (2006)].

In the current study, TR will be treated as an antecedent of attitude towards TBS applications, similar to Pires *et al.* [2011] and Chen and Li [2010], and it will be unidimensionally modeled. Therefore, we propose that TR will be positively related to attitude towards TBS applications.

**H3c.** TR will be positively related to attitude towards TBS applications.

#### 4. Research Method

Trying to investigate attitudes towards TBS applications and the final actual future use of them, users of different types of TBS applications were targeted. TBS applications are applied in various applications, such as e-ticketing, e-government, e-commerce, e-health, e-banking, e-booking and e-education [Taherdoost *et al.* (2013)]. Taherdoost *et al.* [2013] introduced 31 services under 11 e-service applications and categorized these applications under the  $2 \times 2$  matrix to evaluate them. The 11 e-service applications were e-health, e-ticketing, e-booking, e-banking, e-government, e-education, e-commerce, social networking service, entertainment, communication services and information access.

In the present research, only four of the aforementioned categories will be used, based on their familiarity in Greece. Three of them are identically taken from the classification of Taherdoost *et al.* [2013], namely e-banking, e-government and e-commerce. The last one is a combination of two, namely entertainment and communication services. They were chosen through the implementation of a preliminary survey made to identify the ones that are mostly recognized by Greek citizens. This context allows the TBS application model to be tested across four different technologies.

E-banking refers to activities such as electronic bill payment, transfer of money, applying for loan, checking exchange rates and so on. E-government refers to activities of electronic financial services, legal services, license renewals, filing and payment of income taxes and so on. E-commerce refers to activities of e-marketing, e-sales, online business trading with other businesses, internal processes that businesses use to support their buying, selling, hiring and planning and so on. Entertainment and communication services refer to activities of TV stations, radio stations, newspapers, online games, online music, online movies, email and chat sites, other communication services (forums, etc.) and so on.

A survey was conducted to study the three antecedent constructs — perceived ease of use, usefulness and TR — as well as attitude towards using TBS applications and actual future use of each technology application. Four different versions of the survey were developed. Every one of them had questions related to the customer's attitude antecedents, attitude towards and the actual future use of each one of the four TBS applications (e-banking, e-government, e-commerce and entertainment and communication services). The goal to achieve a minimum of 400 respondents, that would agree to answer questions for each one of the four technologies, was set and achieved. The difficulty of this goal was the large number of questions included in the questionnaire due to the effort made to investigate four different technologies.

#### 4.1. *Construct measurement*

The integrated instrument, created for the purpose of this research, was modeled in a way appropriate for people who have both high and little experience in using the TBS applications under research. The questions from the adapted scales were modified for each one of the four versions to indicate every TBS application.

To start with, the scale used for measuring the ease of use that was adapted from Dabholkar [1994] and Davis *et al.* [1989] included the following: “Learning to use the technology-based service applications ... was easy for me”, “I find the technology-based service applications ... difficult to use”, and “It was easy for me to become skillful at using the technology-based service applications ...”. Next, the scale used for measuring the usefulness that was adapted from Adams *et al.* [1992], Davis *et al.* [1989], Igbaria *et al.* [1996] and Jackson *et al.* [1997] included: “the technology-based e-service ... is useful for doing my job”, “using the technology-based service application ... improves the way in which I do my job”, and “using the technology-based service application ... makes doing my job easier”. In every question the blank area ... was adjusted according to the respective TBS application, e.g. of e-banking, e-government, e-commerce and entertainment and communication services.

Concerning the third in row scale for studying TR, TRI was initially undergoing to be used. Then, it was observed that in many research projects, an abbreviated scale of TRI, proposed by Parasuraman [2000], was used. The four TR dimensions have been successfully replicated using a 10-scale [see, for example, Lam *et al.* (2008); Lin and Hsieh (2006); Tsikriktsis (2004); Van der Rhee *et al.* (2007)] and Liljander *et al.* [2006] used a 12-scale. When using an abbreviated version of TRI questionnaire, the goal is to create a TR scale, consisting of a group of items to investigate the consumer's readiness construct to accept technology [see, for example, Rose and Fogarty (2010)].

The reason for using a short version is related to the large number of items in the original questionnaire. The length of the questionnaire might present challenges to scale administration and result in a decreased response rate, or increased inaccuracy due to response fatigue and agreement bias [Barnhart and Ratchford (2007)]. So, to reduce respondent weariness, a set of 12 items, adapted by Liljander *et al.* [2006], out of the 36 TR items proposed by Parasuraman [2000], were included in the questionnaire.

Three items for each of the four dimensions of TRI — optimism, innovativeness, discomfort and insecurity — were chosen. The items were based on the reported factor loadings [Parasuraman (2000)] and relevance for the market. As suggested by Parasuraman [2000], the TR items were presented to respondents in a randomly mixed order and they formed this research's TR scale. These were: use of technology for banking/government/commerce/entertainment and communication purposes gives people more control over their daily lives; technology for banking/government/commerce/entertainment and communication purposes gives you more freedom of mobility; products and services that use the newest technologies are much more convenient to use in the banking/government/commerce/entertainment and communication industry; other people come to you for advice on new technologies concerning banking/government/commerce/entertainment and communication industry; in general, you are among the first in your circle of friends to acquire new technology in the banking/government/commerce/entertainment and communication industry, when it appears; you can usually figure out new high-tech products and services in the banking/government/commerce/entertainment and communication industry, without help from others; technical support lines in banking/government/commerce/entertainment and communication industry are not helpful because they do not explain things in terms that you understand; when you get technical support from a provider of a high-tech product or service in the banking/government/commerce/entertainment and communication industry, you sometimes feel as if you are being taken advantage of by someone who knows more than you do; it is embarrassing when you have trouble with a high-tech gadget of the banking/government/commerce/entertainment and communication industry while people are watching; you do not feel confident doing business with a place that can only be reached online in the banking/government/commerce/entertainment and communication industry; you do not consider it safe giving out a credit card number over a computer to implement your banking/government/commerce/entertainment and communication activities; and any banking/government/commerce/entertainment and communication transaction you do electronically should be confirmed later with something in writing.

Continuing, attitude was measured using the three-item measure, adapted from Barki and Hartwick [1994], Dabholkar [1994], Harrison *et al.* [1997], Nysveen *et al.* [2005] and Curran and Meuter [2005], including: "How good or bad do you feel about using a technology-based service application . . .?", "How pleasant or unpleasant is it to use a technology-based service application . . .?" and "How much would you say that you like or dislike using a technology-based service application . . .?" Closing, the item used for measuring the actual future use of TBS applications, adapted from Curran and Meuter [2005] and adjusted for purposes of our research, was "When you have routine job that could be completed through the use of a technology-based service application . . . , how likely are you to actually use technological means and not take the traditional route?" In these two measures, as also seen above, the blank area . . . was adjusted according to the respective TBS application, e.g. of e-banking, e-government, e-commerce and entertainment and communication services.

Ease of use and usefulness belief constructs were measured using seven-point Likert scale with end points of 1 (strongly agree) and 7 (strongly disagree). A five-point Likert scale was employed for all the structured questions of the abbreviated TRI with end point anchors of strongly disagree (1) and strongly agree (5). The single item behavior intention measure used a seven-point Likert scale with end points of 1 (extremely likely) and 7 (extremely unlikely). All respondents were asked a total of 12 ease of use, 12 usefulness, 48 TR, 12 attitude and four actual future use questions (the same three questions of the first two antecedent beliefs, 12 questions for the third antecedent belief, three questions for attitude and one for actual future use for each of the four TBS applications), see Table 1.

The reason for asking respondents to answer the TR questions separately for every TBS application is that one person may exhibit different levels of TR on different e-service industries, thus the quality of the scale is enhanced. Consumer TR levels in certain SST service industries, e.g. government, may differ from other ones [Lin and Hsieh (2006)]. For example, based on the identified TR traits, a technologically optimistic person is more likely to assume a more positive outlook about his or her chances of success. Therefore, he or she tends to perceive a self-service technology as being functional and useful and perceives a specific web innovation to be more trustworthy, since he or she worries less, by nature, about possible negative outcomes in an unknown situation [Walczuch *et al.* (2007); Lu *et al.* (2012)].

The questionnaire was translated into Greek and then back-translated into English by a different person in order to prevent any possible distortion in the translation process, which would be revealed by comparing the original and originated questionnaire. The comparison showed no mistakes regarding either the content or the meaning of the questions. A pilot study was then conducted in a university's marketing class in Greece for identification of obvious errors in content and expression.

Table 1. Items of integrated instrument.

Name of the construct	Category of TBS application				Number of items	
	<i>E-banking</i>	<i>E-government</i>	<i>E-commerce</i>	<i>Ent. and comm. service</i>		
Technology readiness					48	
Drivers of TR	<i>Optimism</i>	3	3	3	3	12
	<i>Innovativeness</i>	3	3	3	3	12
Inhibitors of TR	<i>Discomfort</i>	3	3	3	3	12
	<i>Insecurity</i>	3	3	3	3	12
Attitude towards TBS applications	3	3	3	3	12	
Perceived ease of use	3	3	3	3	12	
Perceived usefulness	3	3	3	3	12	
Actual future use	1	1	1	1	4	
Total	22	22	22	22	88	

## 4.2. Data collection

At first, in order to decide which technologies to include in our research, 900 phone calls were made from which we obtained 574 answers — response rate 64%. Trained interviewers calling a random sample of homes in Greece completed the data collection. The telephone numbers were purchased from a firm specializing in developing random samples from designated populations.

Respondents were asked to answer whether they are users of each one of the 11 forenamed TBS applications according to Taherdoost *et al.* [2013]. The answers of the respondents indicated the use of four technologies (e-banking, e-government, e-commerce and entertainment and communication services) for the purposes of our study. The remaining ones were mentioned by respondents in too low percentages and they were excluded from the research. Nevertheless, none of the technologies scored a use of less than 10%, proving that they are all used by a measurable percentage of potential consumers. Still, including all technologies in our research would make it almost impossible to achieve the goal of a minimum of 400 respondents who would agree to answer questions for all of them. Therefore, e-banking, e-government, e-commerce and entertainment and communication services, by gathering the higher number of responses, were finally included in our research.

After having decided the TBS applications used for the research, an intercept method was followed by 15 research assistants in public locations in the capital (Athens) and subcapital (Thessaloniki) of Greece, that are considered to be busy (shopping malls, subway–bus–train stations, public parks, etc.), in order to collect the data. The research assistants were choosing the respondents based on a sampling schedule. Multiple timescales were created to secure random selection, and sampling hours were adjusted differently for working days and weekends. Timescales, places and citizens were randomly selected. Respondents, who completed the questionnaires, were firstly introduced to e-banking, e-government, e-commerce and entertainment and communication services, by explaining what each one represents, and then they were asked about their antecedents towards these four TBS applications, as well as about their attitude and the actual future use of them. All of them had experience in using each one of the four types of TBS applications. Upon the completion of the questionnaire, each of the participants received a gift.

## 5. Results

*Descriptive statistics:* Initially, from the 1000 people asked to start the survey 596 of them agreed to complete the questionnaire, but only 463 of them completed the whole process. There were no missing data from the completed questionnaires and the final sample consisted of 463 usable responses. There were more males than females, see Table 2. Ages ranged from 18 years to 70 years old, with an average age of 39. Income and education distributions seemed to be normal among all categories.

*Analysis:* The two-step procedure proposed by Anderson and Gerbing [1988] was applied during the structural equation modeling (SEM). The first step involves the development of an effective measurement model with confirmatory factor analysis

Table 2. Study demographics.

	Number	Percentage
<u>Gender</u>		
Male	259	56
Female	204	44
<u>Age (years)</u>		
Under 30	135	29
31–40	116	25
41–50	131	28
Over 51	81	18
<u>Income (in €)</u>		
Under 20 000	157	34
21 000–40 000	134	29
41 000–60 000	79	17
Over 61 000	42	9
Refused	51	11
<u>Education</u>		
High school or less	111	24
Some college or institution	162	35
Bachelor's degree	190	41

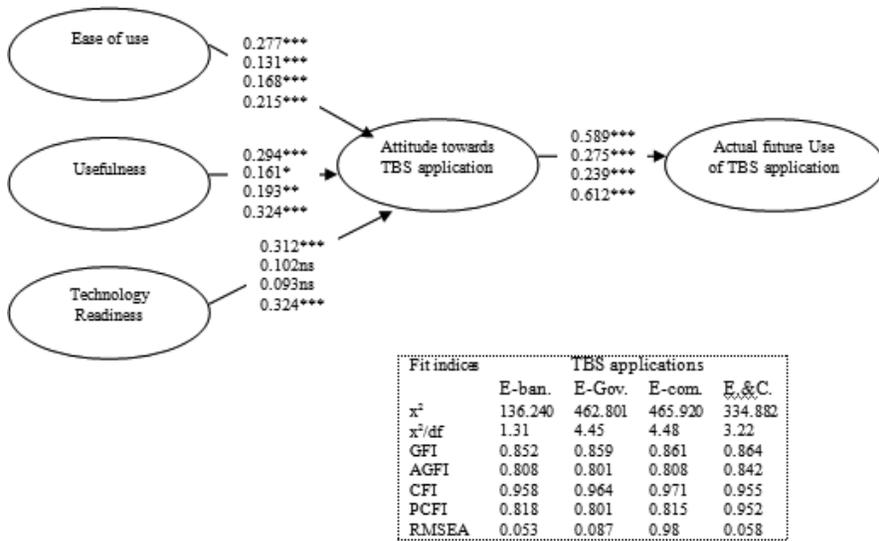
(CFA) and the second step analyzes the structural model. SPSS 22.0 and AMOS 22.0 were used for the implementation of the research.

*Reliability analysis:* Initially we performed reliability analysis in SPSS by checking the value of Cronbach's  $\alpha$  in order to check whether individual items in the scale were related. Cronbach's  $\alpha$  measures internal consistency of the scale. For a scale to be reliable, Cronbach's  $\alpha$  must be greater than 0.6 [Hair *et al.* (2005)]. As noticed in Table 3, this criterion is satisfied.

*Confirmatory factor analysis:* Thereafter, CFA was conducted for the structural model. CFA was chosen to run over exploratory factor analysis (EFA), because the existing items of the questionnaire had been validated before, in TAM. The software packages used for this analysis are SPSS 22.0 and SEM AMOS 22.0, a specialized software for structural equation modeling. The sample size is 463 responses and the observed variables included in the model are 22. We checked for the model fit indices, to see how well our data fit the predicted model.

Table 3. Reliability analysis results.

	Cronbach's $\alpha$			
	Perceived ease of use	Perceived usefulness	Technology readiness	Attitude towards TBS applications
E-banking	0.729	0.736	0.678	0.726
E-government	0.686	0.617	0.675	0.682
E-commerce	0.615	0.622	0.678	0.619
Entertainment and communication services	0.791	0.790	0.764	0.742



Note: The first row shows the standardized estimates of e-banking, the second of e-government, the third of e-commerce and the fourth of entertainment and communication services. \*\*\*  $p < 0.001$ , \*\*  $p < 0.01$ , \*  $p < 0.05$ , ns  $p > 0.05$ .

Fig. 2. Structural model.

The displayed fit indices, shown in Fig. 2, signify that data for e-banking and entertainment and communication services fit the suggested model better than e-government and e-commerce. Relative/normed chi-square ( $\chi^2/\text{degree of freedom}$ ) must score values as high as 5.0 (less than 5) [Wheaton *et al.* (1977); Schumacker and Lomax (2004)], GFI greater than 0.85 [Anderson and Gerbing (1984); Cole (1987)], AGFI greater than 0.8 [Anderson and Gerbing (1984); Cole (1987)], CFI greater than 0.95 [Hu and Bentler (1999)], PCFI greater than 0.8 [Johnson and Wichern (2003); Browne and Cudeck (1993)] and RMSEA less than 0.1 [MacCallum *et al.* (1996)].

### 5.1. Attitude results

In order to test Hypothesis 1, 12 items were used to measure attitudes towards different TBS applications (three for each one of the four applications). Factor analysis of the items showed that four separate and distinct from one another factors exist. All factor loadings for every TBS application showed strong loadings. Through varimax rotation the four factors were revealed, see Table 4.

To investigate factor correlations SEM was employed which revealed a good model fit having 104 degrees of freedom,  $\chi^2$  is 338, a chi-square to df ratio ( $\chi^2/df$ ) of 3.25, a GFI of 0.892, and AGFI of 0.823, a CFI of 0.986, a PCFI of 0.825 and an RMSEA of 0.095. Correlation coefficients above from 0.1 to 0.3 are considered to be weak, from 0.4 to 0.6 as moderate, from 0.7 to 0.9 as strong and 1 as perfect, based on the work of Dancy and Reidy [2004]. Our correlations were strong between e-commerce and entertainment and communication services (0.71); moderate between attitude towards e-banking and e-commerce (0.46), between e-banking and

Table 4. Paired sample *t*-test.

	Mean	Paired difference	Correlation	<i>t</i>	Sig.
Average e-banking scale	3.18	-0.46	0.46	-10.02	0.000
Average e-commerce scale	3.64				
Average e-government scale	2.96	-0.22	0.51	-7.26	0.000
Average e-banking scale	3.18				
Average e-banking scale	3.18	-1.69	0.49	-10.13	0.000
Average entertainment and communication services scale	4.87				
Average e-government scale	2.96	-0.68	0.28	-15.28	0.000
Average e-commerce scale	3.64				
Average e-commerce scale	3.64	-1.23	0.71	-4.12	0.000
Average entertainment and communication services scale	4.87				
Average e-government scale	2.96	-1.91	0.26	-15.02	0.000
Average entertainment and communication services scale	4.87				

e-government (0.51) and between entertainment and communication services and e-banking (0.49); and weak between e-commerce and e-government (0.28) and between e-government and entertainment and communication services (0.26).

Discriminant analysis on the attitude factors of each construct was performed (Table 5). The results showed that for all four constructs, the average variance extracted was above the critical value of 0.5 [Netemeyer *et al.* (1997)]. After comparing the squared correlations between each of the attitude constructs to the average variance extracted, the results show that for all four constructs, the average variance extracted is greater than the squared multiple correlations index, with the minimum average variance extracted being 0.654 and the highest-squared correlation value being 0.380. This proved the existence of discriminant validity between the four attitudes towards the use of a service, which in turn signifies that all four TBS applications are receiving different attentions.

The mean value for e-banking was 3.18, for e-commerce it was 3.64, for e-government it was 2.96 and for entertainment and communication services it was 4.87 indicating that entertainment and communication services and e-commerce receive the highest attitude scores. Average sum scores for all four TBS application attitudes were compared to reveal the differences between them. The *t*-values of paired *t*-tests proved the existence of differences and revealed that the largest attitude differences ( $\geq 10$ ) were between e-banking and e-commerce, e-banking and entertainment and

Table 5. Attitude discriminant analysis.

	Average variance extracted	Squared correlation
E-banking	0.838	0.362
E-government	0.654	0.208
E-commerce	0.782	0.201
Entertainment and communication services	0.877	0.380

communication services, e-commerce and e-government and e-government and entertainment and communication services, see Table 4. All the above results demonstrate that consumers exhibit different attitudes towards each TBS application and that TBS applications receive different levels of attention since attitudes toward them are separate and distinct from one another.

## 5.2. Structural equation modeling

For testing the remaining hypotheses, multi-group SEM was used combining the models of the four TBS applications, see Fig. 2. The results showed a statistically significant relationship between attitude towards a specific service and the actual future use of that service. This is done in particular because of the probability that the null hypothesis of no statistical relationship existing between the two variables is rejected, considering that the probability of this phenomenon to occur is less than the upper threshold of 0.5. The “\*\*\*” sign indicates that the probability of a significant relationship between the actual future use of TBS application and attitude towards it is greater than 99.99%. As predicted, H2 is accepted for all four TBS applications, since attitude towards each TBS application (H2:  $\gamma_{e\text{-banking}} = 0.589$ ,  $\gamma_{e\text{-government}} = 0.275$ ,  $\gamma_{e\text{-commerce}} = 0.239$  and  $\gamma_{\text{entertainment and communication services}} = 0.612$ ) has significantly a positive relationship with the actual future use of it.

Similarly, H3a is supported for all four TBS applications since the ease of use (H3a:  $\gamma_{e\text{-banking}} = 0.277$ ,  $\gamma_{e\text{-government}} = 0.131$ ,  $\gamma_{e\text{-commerce}} = 0.168$  and  $\gamma_{\text{entertainment and communication services}} = 0.215$ ) has significantly a positive relationship with attitude towards a TBS application, signifying they are positively related with each other.

Perceived usefulness has a significant positive relationship with the attitude towards the use of TBS application (H3b:  $\gamma_{e\text{-banking}} = 0.294$ ,  $\gamma_{e\text{-government}} = 0.161$ ,  $\gamma_{e\text{-commerce}} = 0.193$  and  $\gamma_{\text{entertainment and communication services}} = 0.324$ ), but exhibits differences in the significance levels. Subsequently, H3b is also supported for all four TBS applications, pointing up that in e-banking and entertainment and communication services, perceived usefulness has a greater influence to the attitude towards them than in e-government and e-commerce applications.

Finally, H3c is only supported for e-banking and entertainment and communication services applications, since TR was unrelated to the consumers' attitude towards the use of the applications of e-government and e-commerce (H3c:  $\gamma_{e\text{-banking}} = 0.312$ ,  $\gamma_{e\text{-government}} = 0.102$ ,  $\gamma_{e\text{-commerce}} = 0.093$  and  $\gamma_{\text{entertainment and communication services}} = 0.324$ ).

## 6. Discussion

From the data collected by consumers of TBS applications for the purposes of this research it was found that attitudes along with their influential factors have neither the same degree nor the same way of influencing the actual future use of TBS applications. So, it is suggested that generalizing the results of a research

implemented in the context of one TBS application, e.g. e-banking, to all applications of TBS applications is inexplicit.

As proposed, the existence of discriminant validity between the four attitudes towards the use of a TBS application, proved the existence of difference in their received degrees of attention. Results from the comparison of attitudes' average sum scores towards each one of the four TBS applications indicate that consumers exhibit the more favorable attitude towards e-government application, then to e-banking, next to e-commerce and the least towards entertainment and communication services.

One possible explanation for favoring more e-government and e-banking applications could be due to their context differences. They are applications that include mandatory consumer tasks. While prior technology adoption research has been conducted primarily in environments of voluntary adoption, the applicability of previous findings to the mandatory use context is unclear. Some research has suggested that the underlying relationships in traditional technology adoption models could be different in the context of mandatory technologies [see, for example, [Brown et al. \(2002\)](#)]. A major distinction between e-government and other online technologies, such as e-commerce, is that the use of certain e-government technologies is mandatory, rather than voluntary [[Warkentin et al. \(2002\)](#)]. By mandating the use of such technologies that, in fact, limit the need for citizens to personally interact with government agencies or representatives, typically viewed as unpleasant interactions [[Gilbert et al. \(2004\)](#)], there may be a favorable view of them [[Chan et al. \(2010\)](#)]. This suggests that consumers' attitudes may vary between the merely voluntary and mandatory contexts.

Also, the differences in the attitudes towards each TBS application were evidenced to the paired-samples *t*-test. There were significant differences in the scores for e-banking ( $M = 3.18$ ) and e-commerce ( $M = 3.64$ ) applications,  $t = -10.02$ ,  $p = 0.000$ ; e-banking ( $M = 3.18$ ) and entertainment and communication services ( $M = 4.87$ ) applications,  $t = -10.13$ ,  $p = 0.000$ ; and e-commerce ( $M = 3.64$ ) and e-government ( $M = 2.96$ ),  $t = -15.28$ ,  $p = 0.000$ ; and e-government ( $M = 2.96$ ) and entertainment and communication services ( $M = 4.87$ ),  $t = -15.02$ ,  $p = 0.000$ .

Three antecedent constructs for attitude towards four TBS applications, ease of use, usefulness and TR, were tested and all of them were found to have significant impact onto at least one application. The level of impact varied upon each application. Structural model showed that ease of use was a significant predictor, at the level of 0.001, of attitude towards all four TBS applications. Usefulness was also a significant predictor for all four TBS applications, but differed in the levels since e-banking and entertainment and communications services were significant at the level of 0.001, e-government at the level of 0.05 and e-commerce at the level of 0.01. TR was an important determinant only for e-banking and entertainment and communication services, at the level of 0.001, and no evidence was provided to support its significance for e-government and e-commerce. All the above obviously make clear that the various antecedent constructs that may be considered to be related to the attitudes towards a TBS application are not constant across applications and have different significance levels.

Interestingly, if TR was treated as a respondent characteristic or an individual difference variable it would be providing only one readiness level for each respondent and it would be assumed that this TR level is the same for all four TBS applications. In the current study, by treating TR as an antecedent of attitude towards TBS applications and by unidimensionally modeling it [Pires *et al.* (2011); Chen and Li (2010)], it is demonstrated that TR either differs or, in two of our cases, does not even affect the attitudes towards an application. Although TR is supposed to be a relevant construct in other contexts, it must be assumed that it does not solely influence all the TBS applications. Obviously, one consumer may be technologically ready for one TBS application and not for another.

As predicted, attitude towards a TBS application was a significant predictor in all four applications at the level of 0.01 for the actual future use of it. The results showed that consumer attitude towards a TBS application has positive effect on the consumer's actual future use and adoption. According to Fishbein and Ajzen [1975], behavioral intention is the result of attitude. So, the more positive the consumer attitude towards a TBS application, the more likely he/she will intend to adopt and actually use it. This result advocates businesses offering TBS applications to pay more attention into consumer attitude towards them before guiding consumer intention. The business must show and possibly highlight the delivered benefit of the TBS application, in order to establish consumer positive attitude. Therefore, consumer will intend to adopt the TBS application and perhaps he/she will go through behavioral intention to use it.

### **6.1. Theoretical and managerial implications**

Hassenzahl [2003] distinguishes between the utilitarian (extrinsic) and hedonic (intrinsic) aspects of user experience in human-computer interaction. Utilitarian experience is goal-oriented and highlights the functional performance of technology for goal/task-fulfillment. The utilitarian values derived from an economic concept in the information-processing paradigm come from the useful, economically efficient and productive experiences [Carpenter *et al.* (2005)]. In contrast, hedonic experience is not motivated by just what a technology can do, but rather by the experiential and emotional value the technology may bring about, such as fun, entertainment and enjoyment [Hassenzahl (2003); Carpenter *et al.* (2005)].

E-banking and e-government applications offer utilitarian user experience in human-computer interaction, while e-commerce and entertainment and communication services are hedonic. Since in our research it was shown that consumers exhibit more favorable attitudes towards e-government and e-banking TBS applications and less towards e-commerce and entertainment and communication services ones, we can conclude that consumers tend to favor more TBS applications with a utilitarian experience and less with hedonic experience.

Concerning the context differences between mandatory and voluntary environments, the relative importance of determinants of user acceptance, such as perceived usefulness and perceived ease of use in TAM, may differ in a mandatory use setting [Brown *et al.* (2002)]. Other researches show that the effects of these determinants on

behavioral intention are moderated by voluntariness of use. Further, some researchers have noted that user satisfaction, rather than behavioral intention, is a more appropriate dependent variable in mandated use environments [Brown *et al.* (2002, 2008)].

In the present research consumers exhibited more favorable attitudes towards e-banking and e-government applications, a result supported by Arora and Stoner [1996], who found that specific e-government applications have become a mandatory procedure for consumers for the execution of obligatory tasks such as income statement. So, they became familiar to working with such platforms and familiarity is believed to create favorable attitude towards a service and is an important determinant in consumer decision-making [Lin *et al.* (2009)].

Thus, we suggest that managers should increase familiarity for e-commerce and entertainment and communication services through various activities, such as promoting quality reviews, increasing public relations efforts surrounding quality or investing in TBS applications quality associations. Lin *et al.* [2009] build on the notion that familiarity reduces concerns for safety [Richardson *et al.* (1996)], and safety is considered a crucial factor in the formulated attitude towards and accruals for future use in both e-commerce and entertainment and communication services. So, investing on familiarity creation may prompt consumer decision-making.

Finally, we suggest that TR must be examined differently for every TBS application, since it was found that the same consumers exhibit different degrees of TR towards all four applications. Moreover the role of consumers' TR must be examined separately for every TBS application, possibly along with other drivers of the industry that the application belongs to, such as the number of years that the TBS application is widely available. Managers should consider that since TR shows how ready an individual feels about using a particular technology, which will affect how ready that consumer is to accept and use the specific technology, his/her TR level may change from one TBS application to another or even between applications offered by the same service industry, such as phone banking, ATMs and Internet banking.

## **6.2. Limitations and future research**

An abbreviated version of TRI was used, because the length of the questionnaire might present challenges to scale administration and result in a decreased response rate or increased inaccuracy due to response fatigue and agreement. The number of questions was already too many, considering the fact that each respondent had to answer every question included in the questionnaire for all four TBS applications.

For the same reason, we decided to use four TBS applications. In a further research, it could be worthwhile to replicate this study among all categories of TBS applications in order to see the differences between them and try to reach a larger number of respondents.

Another important limitation of our study is related to the origin country of respondents. All of them were Greek citizens and they may have been influenced by their national cultural values, individual characteristics and perception of the people

of one country. Through model testing, the suspected impact of culture can be scrutinized to further our understanding of TBS applications users in a further research.

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## References

- Adams, D. A., Nelson, R. R. and Todd, P. A. (1992). Perceived usefulness, ease of use, and usage of information technology: A replication. *MIS Quarterly*, **16**, 2: 227–247.
- Agarwal, R. and Prasad, J. (1999). Are individual differences germane to the acceptance of new information technologies? *Decision Sciences*, **30**, 2: 361–391.
- Alhujran, O. and Chatfield, A. T. (2009). A cross-country comparative analysis of e-government service delivery among Arab countries. *Information Technology for Development*, **15**, 3: 151–170.
- Anderson, J. C. and Gerbing, D. W. (1984). The effect of sampling error on convergence, improper solutions, and goodness-of-fit indices for maximum likelihood confirmatory factor analysis. *Psychometrika*, **49**: 155–173.
- Anderson, J. C. and Gerbing, D. W. (1988). Structural equation modeling in practice: A review and recommended two-step approach. *Psychological Bulletin*, **103**, 3: 411.
- Arora, R. and Stoner, C. (1996). The effect of perceived service quality and name familiarity on the service selection decision. *Journal of Services Marketing*, **10**, 1: 22–34.
- Bagozzi, R. P. (2007). The legacy of the technology acceptance model and a proposal for a paradigm shift. *Journal of the Association for Information Systems*, **8**, 4: 244–254.
- Barki, H. and Hartwick, J. (1994). Measuring user participation, user involvement, and user attitude. *MIS Quarterly*, **18**, 1: 59–82.
- Barnhart, M. and Ratchford, M. (2007). Rethinking readiness: Development and validation of a reduced form of the technology readiness index (TRI). In *Proceedings of the 2007 AMA Winter Educator's Conference: Marketing Theory and Applications*.
- Borrero, J. D., Yousafzai, S. Y., Javed, U. and Page, K. L. (2014). Expressive participation in Internet social movements: Testing the moderating effect of technology readiness and sex on student SNS use. *Computers in Human Behavior*, **30**: 39–49.
- Brown, S. A., Massey, A. P., Montoya-Weiss, M. M. and Burkman, J. R. (2002). Do I really have to? User acceptance of mandated technology. *European Journal of Information Systems*, **11**, 4: 283–295.
- Browne, M. W. and Cudeck, R. (1993). Alternative ways of assessing model fit. In *Testing Structural Equation Models*, eds. K. Bollen and J. Long. Sage, Newbury Park, pp. 136–162.
- Bruner II, G. C. and Kumar, A. (2005). Explaining consumer acceptance of handheld Internet devices. *Journal of Business Research*, **58**, 5: 553–558.
- Caison, A. L., Bulman, D., Pai, S. and Neville, D. (2008). Exploring the technology readiness of nursing and medical students at a Canadian University. *Journal of Interprofessional Care*, **22**, 3: 283–294.
- Carpenter, J. M., Moore, M. and Fairhurst, A. E. (2005). Consumer shopping value for retail brands. *Journal of Fashion Marketing and Management*, **9**, 1: 43–53.
- Carter, L. and Bélanger, F. (2005). The utilization of e-government services: Citizen trust, innovation and acceptance factors. *Information Systems Journal*, **15**, 1: 5–25.

- Chan, F. K., Thong, J. Y., Venkatesh, V., Brown, S. A., Hu, P. J. and Tam, K. Y. (2010). Modeling citizen satisfaction with mandatory adoption of an e-government technology. *Journal of the Association for Information Systems*, **11**, 10: 519–549.
- Chandrashekar, M. and Sinha, R. K. (1995). Isolating the determinants of innovativeness: A split-population tobit (SPOT) duration model of timing and volume of first and repeat purchase. *Journal of Marketing Research*, **32**: 444–456.
- Chang, Y. P. and Zhu, D. H. (2011). Understanding social networking sites adoption in China: A comparison of pre-adoption and post-adoption. *Computers in Human Behavior*, **27**, 5: 1840–1848.
- Chen, S. C. and Li, S. H. (2010). Consumer adoption of e-service: Integrating technology readiness with the theory of planned behavior. *African Journal of Business Management*, **4**, 16: 3556–3563.
- Childers, T. L., Carr, C. L., Peck, J. and Carson, S. (2002). Hedonic and utilitarian motivations for online retail shopping behavior. *Journal of Retailing*, **77**, 4: 511–535.
- Cole, D. A. (1987). Utility of confirmatory factor analysis in test validation research. *Journal of Consulting and Clinical Psychology*, **55**: 584–594.
- Cunningham, C. E., Woodward, C. A., Shannon, H. S., MacIntosh, J., Lendrum, B., Rosenbloom, D. and Brown, J. (2002). Readiness for organizational change: A longitudinal study of workplace, psychological and behavioural correlates. *Journal of Occupational and Organizational Psychology*, **75**, 4: 377–392.
- Curran, J. M., Meuter, M. L. and Surprenant, C. F. (2003). Intentions to use self-service technologies: A confluence of multiple attitudes. *Journal of Service Research*, **5**, 3: 209–224.
- Curran, J. M. and Meuter, M. L. (2005). Self-service technology adoption: Comparing three technologies. *Journal of Services Marketing*, **19**, 2: 103–113.
- Dabholkar, P. A. (1994). Incorporating choice into an attitudinal framework: Analyzing models of mental comparison processes. *Journal of Consumer Research*, **10**: 100–118.
- Dabholkar, P. A. (1996). Consumer evaluations of new technology-based self-service options: An investigation of alternative models of service quality. *International Journal of Research in Marketing*, **13**, 1: 29–51.
- Dabholkar, P. A. and Bagozzi, R. P. (2002). An attitudinal model of technology-based self-service: Moderating effects of consumer traits and situational factors. *Journal of the Academy of Marketing Science*, **30**, 3: 184–201.
- Dancey, C. and Reidy, J. (2004). Analysis of differences between three or more conditions: One-factor ANOVA. *Statistics without Maths for Psychology: Using SPSS for Windows*. Prentice Hall, Essex, pp. 290–320.
- Davis, F. D. (1986). A technology acceptance model for empirically testing new end-user information systems: Theory and results. Ph.D. thesis, Sloan School of Management, MIT, Boston, MA.
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, **13**, 3: 319–339.
- Davis, F. D., Bagozzi, R. P. and Warshaw, P. R. (1989). User acceptance of computer technology: A comparison of two theoretical models. *Management Science*, **35**, 8: 982–1003.
- Dominik, P. and Michel, C. (2008). Adoption of new movie distribution services on the Internet. *Journal of Media Economics*, **21**, 3: 131–157.
- Feldman, J. M. and Lynch, J. G. (1988). Self-generated validity and other effects of measurement on belief, attitude, intention, and behavior. *Journal of Applied Psychology*, **73**, 3: 421.
- Fishbein, M. and Ajzen, I. (1975). *Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research*. Addison-Wesley, Reading, MA.
- Gatignou, H. and Robertson, T. S. (1989). Technology diffusion: An empirical test of competitive effects. *The Journal of Marketing*, **53**, 1: 35–49.

- Gefen, D., Karahanna, E. and Straub, D. W. (2003). Trust and TAM in online shopping: An integrated model. *MIS Quarterly*, **27**, 1: 51–90.
- Gentry, L. and Calantone, R. (2002). A comparison of three models to explain shop-bot use on the web. *Psychology and Marketing*, **19**, 11: 945–956.
- Gilbert, D., Balestrini, P. and Littleboy, D. (2004). Barriers and benefits in the adoption of e-government. *International Journal of Public Sector Management*, **17**, 4: 286–301.
- Grönroos, C. (2007). *Service Management and Marketing: Customer Management in Service Competition*, 3rd edn. Wiley, Chichester.
- Grönroos, C. (2008). Service logic revisited: Who creates value? And who co-creates? *European Business Review*, **20**, 4: 298–314.
- Gutek, B. A. and Bikson, T. K. (1985). Differential experiences of men and women in computerized offices. *Sex Roles*, **13**, 3/4: 123–136.
- Hair, J. F., Black, B., Babin, B., Anderson, R. E. and Tatham, R. L. (2005). *Multivariate Data Analysis*. Prentice-Hall, New Jersey.
- Harrison, A. W. and Rainer, Jr. R. K. (1992). The influence of individual differences on skill in end-user computing. *Journal of Management Information Systems*, **9**, 1: 93–112.
- Harrison, D. A., Mykytyn, Jr. P. P. and Riemenschneider, C. K. (1997). Executive decisions about adoption of information technology in small business: Theory and empirical tests. *Information Systems Research*, **8**, 6: 171–195.
- Hassenzahl, M. (2003). The thing and I: Understanding the relationship between user and product. *Funology: From Usability to Enjoyment*, eds. M. A. Blythe, A. F. Monk, K. Overbeeke and P. C. Wright. Kluwer Academic, The Netherlands, pp. 31–42.
- Hu, L. T. and Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, **6**, 1: 1–55.
- Hu, P. J., Chau, P. Y., Sheng, O. R. L. and Tam, K. Y. (1999). Examining the technology acceptance model using physician acceptance of telemedicine technology. *Journal of Management Information Systems*, **16**, 2: 91–112.
- Igarria, M., Parasuraman, S. and Baroudi, J. J. (1996). A motivational model of microcomputer usage. *Journal of Management Information Systems*, **13**: 127–143.
- Jackson, C. M., Chow, S. and Leitch, R. A. (1997). Toward an understanding of the behavioral intention to use an information system. *Decision Sciences*, **28**, 2: 357–389.
- Johnson, R. A. and Wichern, D. W. (2003). *Applied Multivariate Statistical Analysis*, 5th edn. Prentice Hall, Upper Saddle River, New Jersey.
- King, W. R. and He, J. (2006). A meta-analysis of the technology acceptance model. *Information and Management*, **43**, 6: 740–755.
- Lam, S. Y., Chiang, J. and Parasuraman, A. (2008). The effects of the dimensions of technology readiness on technology acceptance: An empirical analysis. *Journal of Interactive Marketing*, **22**, 4: 19–39.
- Lanseng, E. J. and Andreassen, T. W. (2007). Electronic healthcare: A study of people's readiness and attitude toward performing self-diagnosis. *International Journal of Service Industry Management*, **18**, 4: 394–417.
- Lee, W. J., Kim, T. U. and Chung, J. Y. (2002). User acceptance of the mobile Internet. In *Proceedings of the First International Conference on Mobile Business (Mobiform)*, Athens, Greece.
- Liljander, V., Gillberg, F., Gummerus, J. and van Riel, A. (2006). Technology readiness and the evaluation and adoption of self-service technologies. *Journal of Retailing and Consumer Services*, **13**, 3: 177–191.
- Lin, C.-C. J. and Lu, H. (2000). Towards an understanding of the behavioural intention to use a web site. *International Journal of Information Management*, **20**, 3: 197–208.
- Lin, C. Y., Marshall, D. and Dawson, J. (2009). Consumer attitudes towards a European retailer's private brand food products: An integrated model of Taiwanese consumers. *Journal of Marketing Management*, **25**, 9/10: 875–891.

- Lin, J. S. C. and Hsieh, P. L. (2006). The role of technology readiness in customers' perception and adoption of self-service technologies. *International Journal of Service Industry Management*, **17**, 5: 497–517.
- Lu, J., Wang, L. and Hayes, L. A. (2012). How do technology readiness, platform functionality and trust influence C2C user satisfaction? *Journal of Electronic Commerce Research*, **13**, 1: 50–69.
- MacCallum, R. C., Browne, M. W. and Sugawara, H. M. (1996). Power analysis and determination of sample size for covariance structure modeling. *Psychological Methods*, **1**, 2: 130–149.
- Mathieson, K. (1991). Predicting user intentions: Comparing the technology acceptance model with the theory of planned behavior. *Information Systems Research*, **2**, 3: 173–191.
- Mathieson, K., Peacock, E. and Chin, W. (2001). Extending the technology acceptance model: The influence of perceived user resources. *ACM SigMIS Database*, **32**, 3: 86–112.
- Mosavi, S. A. and Ghaedi, M. (2011). An examination of the effects of perceived value and attitude on customers behavioral intentions in shopping. *African Journal of Business Management*, **6**, 5: 1950–1959.
- Netemeyer, R. G., Boles, J. S., McKee, D. O. and McMurrian, R. (1997). An investigation into the antecedents of organizational citizenship behaviors in a personal selling context. *Journal of Marketing*, **61**: 85–98.
- Nysveen, H., Pedersen, P. E. and Thorbjørnsen, H. (2005). Intentions to use mobile services: Antecedents and cross-service comparisons. *Journal of the Academy of Marketing Science*, **33**, 3: 330–346.
- Parasuraman, A. (2000). Technology readiness index (TRI): A multiple-item scale to measure readiness to embrace new technologies. *Journal of Service Research*, **2**, 5: 307–320.
- Parasuraman, A. and Colby, C. L. (2001). *Techno-Ready Marketing: How and Why Your Customers Adopt Technology*. The Free Press, New York.
- Pires, P. J., da Costa Filho, B. A. and da Cunha, J. C. (2011). Technology readiness index (TRI) factors as differentiating elements between users and non-users of Internet banking, and as antecedents of the technology acceptance model (TAM). *Enterprise Information Systems*. Springer, Berlin, pp. 215–229.
- Prahalad, C. K. and Ramaswamy, V. (2004). *The Future of Competition: Co-Creating Unique Value with Customers*. Harvard Business School Press, Boston.
- Rahimi, F., Nadaf, M. and Ghanbari, E. (2003). The effect of cognitive and affective factors on the attitude and intention to purchase a new high-tech product. *World of Sciences Journal*, **1**, 14: 186–201.
- Richardson, P., Jain, A. and Dick, A. (1996). Household store brand proneness: A framework. *Journal of Retailing*, **72**, 2: 159–185.
- Robertson, T. S. and Gatignon, H. (1986). Competitive effects on technology diffusion. *Journal of Marketing*, **50**, 3: 1–12.
- Rogers, E. M. (1962). *Diffusion of Innovations*. Free Press of Glencoe, New York.
- Rogers, E. M. (1976). New product adoption and diffusion. *Journal of Consumer Research*, **2**, 4: 290–301.
- Rogers, E. M. (1995). *Diffusion of Innovations*, 4th edn. The Free Press, New York.
- Rogers, E. M. (2003). Elements of diffusion. *Diffusion of Innovations*, **5**: 1–38.
- Rose, J. and Fogarty, G. J. (2010). Technology readiness and segmentation profile of mature consumers. In *Proceedings of the 4th Biennial Conference of the Academy of World Business, Marketing and Management Development*, Vol. 4, pp. 57–65. Academy of World Business, Marketing and Management Development, Australia.
- Schumacker, R. E. and Lomax, R. G. (2004). *A Beginner's Guide to Structural Equation Modeling*, 2nd edn. Lawrence Erlbaum Associates, Mahwah, New Jersey.
- Sheppard, B. H., Hartwick, J. and Warshaw, P. R. (1988). The theory of reasoned action: A meta-analysis of past research with recommendations for modifications and future research. *Journal of Consumer Research*, **15**, 3: 325–343.

- Srinivasan, R., Lilien, G. L. and Rangaswamy, A. (2002). Technological opportunism and radical technology adoption: An application to e-business. *Journal of Marketing*, **66**, 3: 47–60.
- Suki, N. M. (2010). An empirical study of factors affecting the Internet banking adoption among Malaysian consumers. *Journal of Internet Banking and Commerce*, **15**, 2: 1–11.
- Sukkar, A. A. and Hasan, H. (2005). Toward a model for the acceptance of Internet banking in developing countries. *Information Technology for Development*, **11**, 4: 381–398.
- Taherdoost, H., Sahibuddin, S. and Jalaliyoon, N. (2013). E-services usage evaluation; applications' level of co-creation and digitalization. *International Journal of Academic Research in Management*, **2**, 1: 10–18.
- Taylor, S. and Todd, P. A. (1995). Understanding information technology usage: A test of competing models. *Information Systems Research*, **6**, 2: 144–176.
- Tsikriktis, N. (2004). A technology readiness-based taxonomy of customers: A replication and extension. *Journal of Service Research*, **7**, 1: 42–52.
- Van der Rhee, B., Verma, R., Plaschka, G. R. and Kickul, J. R. (2007). Technology readiness, learning goals, and e-learning: Searching for synergy. *Decision Sciences Journal of Innovative Education*, **5**, 1: 127–149.
- Walczuch, R., Lemmink, J. and Streukens, S. (2007). The effect of service employees' technology readiness on technology acceptance. *Information and Management*, **44**, 2: 206–215.
- Wang, Y. S., Wang, Y. M., Lin, H. H. and Tang, T. I. (2003). Determinants of user acceptance of Internet banking: An empirical study. *International Journal of Service Industry Management*, **14**, 5: 501–519.
- Warkentin, M., Gefen, D., Pavlou, P. A. and Rose, G. M. (2002). Encouraging citizen adoption of e-government by building trust. *Electronic Markets*, **12**, 3: 157–162.
- Wheaton, B., Muthen, B., Alwin, D. F. and Summers, G. (1977). Assessing reliability and stability in panel models. *Sociological Methodology*, **8**, 1: 84–136.
- Zhu, D. H. and Chang, Y. P. (2014). Investigating consumer attitude and intention toward free trials of technology-based services. *Computers in Human Behavior*, **30**: 328–334.

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