Association for Information Systems
AIS Electronic Library (AISeL)

DIGIT 2009 Proceedings

Diffusion Interest Group In Information Technology

2009

TOWARDS AN UNDERSTANDING OF AN INDIVIDUAL'S RESISTANCE TO USE AN INFORMATION SYSTEM - EMPIRICAL EXAMINATIONS AND DIRECTIONS FOR FUTURE RESEARCH

Sven Laumer
Otto-Friedrich University of Bamberg, sven.laumer@uni-bamberg.de

Christian Maier
Otto-Friedrich University of Bamberg, christian-engelbert.maier@stud.uni-bamberg.de

Andreas Eckhardt
Goethe-University Frankfurt am Main, eckhardt@wiwi.uni-frankfurt.de

DIGIT 2009

TOWARDS AN UNDERSTANDING OF AN INDIVIDUAL'S RESISTANCE TO USE AN INFORMATION SYSTEM – EMPIRICAL EXAMINATIONS AND DIRECTIONS FOR FUTURE RESEARCH

Sven Laumer
Otto-Friedrich University of Bamberg
Centre of Human Resources Information Systems
sven.laumer@uni-bamberg.de

Christian Maier
Otto-Friedrich University of Bamberg
Centre of Human Resources Information Systems
christian-engelbert.maier@stud.uni-bamberg.de

Andreas Eckhardt
Goethe-University Frankfurt am Main
Centre of Human Resources Information Systems
eckhardt@wiwi.uni-frankfurt.de

ABSTRACT

Building up on current research investigating an individual's resistance regarding the use of new information systems this approach develops a Technology Resistance Model for a better understanding of potential users' resistance intention in the 21st century. The model is evaluated with empirical data of 209 jobseekers who resist using standardized online application forms and the results show that the an individual's intention to resist is predominately explained by a perceived uselessness of the system but not by the perceived difficulty to use it. Based on these results and a comparison with the Technology Acceptance Model the paper concludes that an inverse construct of the Technology Acceptance Model is not appropriate to understand an individual's intention to resist using an information system. Therefore the paper calls for a deeper understanding regarding an individual's intention to resist using a system and identifies possible directions for future research. In general these approaches can be divided into two main areas: methodology and theory. As a consequence the papers discusses directions for future research as the development of a Technology Resistance AND Acceptance Model (e.g. use of semantic differential scales), a Technology Inhibitor Model, the use of different dependant variables as well as a better understanding of an individual's personality trait resistance (e.g. based on psychology research).

Keywords:
Resistance, TAM, TRM, PLS

INTRODUCTION

With the increasing progress of information technologies in daily private and business life researchers, software developers or business consultants are able to develop and implement constantly new information systems which simplify as well as change the work and life of individuals. Research in the field of information systems especially in technology acceptance has investigated the reasons why an individual intends to adopt these kind of new technologies in numerous studies (Williams et al. 2009). Hence, the research stream of technology acceptance and diffusion is considered to be among the most evolved in the IS discipline (Hirschheim 2007; Venkatesh et al. 2007). The basic model for most of the studies is Davis's Technology Acceptance Model (TAM) which predicts that the intention to use an information system is particularly driven by the perceived ease of use and the perceived usefulness of the system (Davis 1989; Davis et al. 1989). However, as the authors of a recent Journal of the Association for Information Systems special issue argue, information systems (IS) acceptance research has reached a point where the explanation power of the TAM might be not enough to explain the effects of technology acceptance and diffusion of information systems in the 21st century. Information systems have dramatically changed since the early 1970s and today most of the people are used to information technologies in both their work and private environment. For example as the German Federal Association for Information Technology, Telecommunications and New Media highlighted around two thirds of all people in Germany are online. However, their usage behavior is different. For example, 38 per cent of the Germans use the internet for online banking, 22 per cent publish pictures on the internet, 11 per cent play online games or buy movies in internet shops and 4 per cent buy flowers in an online flower shop. In general 70 per cent of German households are owner of a private computer[1]. These usage figures indicate that there are people who are more intended to use some kind of systems or services and others who are not. So the still ongoing question is what drives those users who adopt a specific IT based service and those who do not adopt it? Research so far has provided a lot of evidence that the technology acceptance model is a solid model to explain an individual's intention to use an information system (Lee et al. 2003a). However, the phenomenon of user resistance towards the use of information technology is under researched as (Lapointe et al. 2005) only identified four articles which opened the black box of technology resistance by individuals. According to them information systems non-adoption, rejection or resistance was the research objective of researchers in the early beginning of the discipline (Hirschheim et al. 1988; Keen 1981; Markus 1983) with few articles in the 1990s (Joshi 1991; Marakas et al. 1996) and at the beginning of the new century (Bhattacherjee et al. 2007; Cenfetelli 2004b; Ferneley et al. 2006). One of the few outcomes is that the most important drivers of resistance are perceived threats by individuals like perceived loss of power. Furthermore resistance to change has been presented as one of the most frequently encountered reasons for the non-use of innovations. The phenomenon resistance itself has long been recognized, as more than half a century ago researchers already identified in people a natural tendency to prefer keeping to what is well-known and familiar rather than to accept innovation, and thus the unknown. Resistance was regarded here as a resistance to change in a characteristic situation arising from changes in aspects of that situation (Coch et al. 1948; Tichy 1983). (Bhattacherjee et al. 2007) provide a recent example of this kind of conceptualization of resistance in an IT context. Doctors were asked if changes in their working routine conditioned by new computer systems were acceptable. In this context resistance was tested in the IT field and interpreted as loss of control. The model of (Bhattacherjee et al. 2007) contains a construct "resistance to change" as

[1] For a detailed overview of Germans' internet usage behavior see the website of the German Federal Association for Information Technology, Telecommunications and New Media (BITKOM) at http://www.bitkom.org/en/Default.aspx

an antecedent of perceived ease of use, perceived usefulness and the intention to use an information system. The variables of the TAM were measured as suggested by (Davis 1989) and the construct resistance to change by items like "I don't want the system to change the way I do my work". Comparing the scales used for these three antecedents perceived ease of use and perceived usefulness measure the positive decision whether to use the system and resistance to change the negative one.

However, as discussed before it is important to research both acceptance and resistance behavior as the usage figures for example of internet services varies a lot. Therefore, based on the discussion of technology acceptance and resistance the research question of this paper is:

What are potential ways to measure and determine an individual's intention to resist using a system?

The question seems to have an important impact on technology acceptance and resistance research in the 21st century as user today might have a general positive attitude and aptitude towards information technology however the usage behavior varies regarding the particular information system in question. One user might use for example the internet for online banking but not for buying flowers. Therefore the purpose of this paper is to investigate whether the technology acceptance model in its current form and with its current measurement as suggested by (Davis 1989; Davis et al. 1989) and used by many other researchers is appropriate for researching user behavior in the 21st century in the case of user resistance towards an information system or whether a new approach and model for investigating user resistance towards an information system is needed.

Therefore the paper will proceed as follows. Based on a theoretical discussion of technology acceptance and user resistance research we will develop two research models based on TAM modeling and depicting technology acceptance (original TAM model) and technology resistance (the newly developed Technology Resistance Model (TRM)) based on TAM using inverse items. We will validate both models using empirical data from user and non-user of a particular technology and finally discuss the results by comparing the explanation power of each model. A discussion of future research regarding an individual's resistance towards using information systems concludes the paper.

THEORETICAL BACKGROUND

Within this section we present and discuss prior research of technology acceptance as well as technology resistance to develop our research models of technology acceptance and resistance.

History of Technology Acceptance Research

An analysis of (Williams et al. 2009) in their editorial to a current special issue of the Journal of Information Technology on information systems acceptance and diffusion reveals that 345 articles focusing on technology acceptance have been published in the top 19 peer-reviewed journals of the IS community in the last 20 years. Predominately researchers have focused on the Technology Acceptance Model and quantitative research methods. In 2007 a special issue of the Journal of the Association for Information Systems asked "Quo vadis TAM?" where leading technology acceptance researchers discussed their opinions of past and future technology acceptance research.

In their contribution to this special issue (Lucas et al. 2007) summarize the development of technology acceptance and diffusion research since the early 1970s. They argue that firms innovated with information technology today as they did in the early 1970s. The responsible managers implement innovations with less understanding of their value proposition and their fit with individuals' tasks and organizational processes. (Lucas et al. 2007) continue their argument that many of these projects run

into difficulties and some of them failed as they do today however with less frequency and less contra-productive results. Research grounded in management science at this time called these phenomena implementation problems and addressed the nature and sources of problems regarding the implementation of information systems (Churchman et al. 1965). (Lucas 1975), for example, provides some first examinations of "why information systems fail". This kind of research continued into the 1980s and ended up in the introduction of the TAM (Davis 1989; Davis et al. 1989).

The TAM caused a tremendous research stream leading in various extensions, modifications, replications, competing (Venkatesh et al. 2007) and unifying models (Venkatesh et al. 2003). Several meta-analytical or scientometric approaches observed and reviewed this development (King et al. 2006; Lee et al. 2003b; Williams et al. 2009). However, as the articles of the JAIS special issue in 2007 highlighted TAM "has fulfilled its original purpose" (Benbasat et al. 2007). The special issue contributors emphasized that the nature of information technology has changed since the beginning of the discipline. IT applications transformed from single-user systems to a multiple-user communication system in inter-organizational contexts. Mainframe applications turned to client-server ones and are no considered as services in a global setting. (Benbasat et al. 2007) pointed out that TAM based research has paid less attention to the antecedents of its belief constructs and treated, for example, perceived ease of use and usefulness as "black boxes". Furthermore the conceptualized behavior related to system usage was modeled in a narrow manner. The internal strength of TAM's logic – simplicity and robustness – discouraged researchers to investigate how the constructs of TAM (and the related research) might differentially influence other behaviors than acceptance (Benbasat et al. 2007). However, the definition of acceptance can vary as (Schwarz et al. 2007) discussed. They used an etymology approach to discover the five dimension of acceptance: receive, grasp, asses, be given and submit. They expect that these dimensions may extend the understanding of technology acceptance and that researchers consider the lifecycle of usage beyond the original acceptance. (Bagozzi 2007) suggested a paradigm shift by linking the technology acceptance research to the decision making core concept of usage.

One aspect of what user do in and around system usage was outlined by (Ferneley et al. 2006) who asked the question "Resist, comply or workaround?" to investigate one possible reaction to the implementation of information systems by user: their resistance or non-adoption of the system. Therefore the following section discusses what researchers have discussed about this kind of behavior to provide a broader focus of user behaviors related to information systems so far.

Technology Non-Adoption and User Resistance

Already in the early beginning of the discipline some researchers have asked for the other side of the coin of information systems acceptance: non-adoption, rejection or resistance (Hirschheim et al. 1988; Keen 1981; Markus 1983). However, as (Lapointe et al. 2005) argue, until 2005 there are only four articles which opened the black box of why and how resistance take place. In general their review of 20 IT related journals over the past 25 years found 43 articles recognizing and outlining resistance as a critical variable. "Better theories of resistance will lead to better implementation strategies and hopefully to better outcomes" was the outlined objective of researchers trying to explain why people resist to technology (Markus 1983). Resistance in general is defined as "opposition, challenge or disruption to process or initiatives" (Ferneley et al. 2006; Jermier et al. 1994) and can be divided into a negative resistance as the rationale to oppose or deceive (Marakas et al. 1996) and a positive one as the rationale to support or improve (Joshi 1991). The different resistance behavior that can occur varies from lack of cooperation as one extreme to deliberate sabotage as the other (Lapointe et al. 2005; Prasad et al. 2000; Waddell et al. 1998). (Ferneley et al. 2006) come up with a categorization of three different resistance

behaviors related to the rejection of information systems individuals can perform: Compliance, resistance and workaround. Based on their analyses and case study research (Ferneley et al. 2006) developed a compliance resistance workaround model which identifies workaround as "a related but separate and distinct phenomena from that of resistance". Therefore (Ferneley et al. 2006) distinguished between two resistance phases. The first one is the individual cognitive or emotional process that results in a non-adoption or resistance decision and the second one is the actual resulting behavior of the individual which can be compliance, negative or positive resistance or workaround.

All the discussed models of user resistance have in common that they consider resistance to be neither good nor bad and they assume that resistance results from the mutual adjustment of several antecedents. They posit that perceived threats result from the interaction between a given set of initial conditions and an object. Furthermore they pointed out that the presence of perceived threats is a necessary condition for resistance behaviors to occur (Lapointe et al. 2005).

(Lapointe et al. 2005) identified five basic components of resistance: behaviors, object, subject, threats, initial conditions. They argue that when a system is introduced, users will first assess the system in terms of its interplay between its features and the user's initial conditions and tasks. Thereby users make projections about the consequences of the use. If these expected consequences threaten, resistance behavior will occur. Resistance behavior will follow if threats are perceived from the interaction between the object of resistance and initial conditions.

(Cenfetelli 2004b) offers a conceptualization of the perceived threats which will lead to resistance behavior and which are important in the first emotional or cognitive resistance phase. He argues that technology acceptance research in the past fostered positive user attitudes and encouraged system use. This kind of information systems research has typically seen the presence of certain factors as leading to adoption, while a lack of those factors is seen as the cause of rejection. These kinds of antecedents are defined as enablers. Enablers are "those external beliefs regarding the design and functionality of a system that either encourage or discourage usage, dependent on valence" (Cenfetelli 2004b) . (Cenfetelli 2004b) argues that there are perceptions that solely discourage usage and these are different from the opposite of these ones encouraging usage. He defines these perceptions as inhibitors. Inhibitors are "the perceptions held by user about a system's attributes with consequent effect on a decision to use a system. The important aspect of use inhibitors – in contrast to enablers – is that they solely discourage use" (Cenfetelli 2004b). These beliefs act to solely discourage use, but their absence does not encourage use. He continues his argumentation that these inhibiting and enabling perceptions are independent of one another and can coexist as well. Additionally they have different antecedents and consequent effects. Enablers are typically created through the application of purposeful design, whereas inhibitors are not. Inhibitors will be produced through the lack of attention to risk management factors. However, both can have an effect on the intention to use or the intention to resist towards an information system (Cenfetelli 2004b).

In the last four years the ideas and concepts of technology resistance where extended and used to explain mainly physicians' resistance toward healthcare information technologies (Bhattacherjee et al. 2007; Ilie et al. 2007; Lapointe et al. 2007) or to investigate social influence as a key driver of non-adoption by individuals (Brown et al. 2005; Eckhardt et al. 2009).

Table 1 provides an overview over empirical technology resistance research. Regarding the research question of this paper the most interesting column is the last one. Resistance was according to this literature review conceptualized as a part of the influence behaviors and outcomes (Enns et al. 2003), different perceived threats (Jiang et al. 2000) or the intention not to comply with the change introduced

(Kim et al. 2009). However, no approach could be found modeling resistance as an individual's intention to resist using an information system. As a consequence our approach based on the Technology Acceptance Model is to provide a Technology Resistance Model explaining an individual's intention to resist using an information system. Therefore we used the constructs perceived ease of use and perceived usefulness however with inverse items to model perceived difficulty to use and perceived uselessness. Our two research models are described in the following section.

Authors	Research type	Influence of … on resistance	Effect	Effect confirmed?	Influence of resistance on …	Effect	Effect confirmed?	Examined System	Perceive resistance as ...
Enns et al (2003)	Empirical	Rational Persuasion	positive	Significant				Strategic information systems	Part of 'influence Behaviors and Outcomes'
		Consultation	positive	Not significant					
		Personal Appeal	positive	Significant					
		Ingratiation	negative	Not tested					
		Exchange	negative	Significant					
		Coalition	negative	Not significant					
		Pressure	negative	Significant					
Jiang et al. (2000)	Empirical	Change job content	k.a.	Significant (TPS & DSS)				Decision support system (DSS); Transaction processing systems (TPS)	Different Perceived Threats
		Loss of Status		Significant (DSS)					
		Relationship altered		Not significant					
		Loss of Power		Significant (DSS)					
		Change in decision making		Significant (DSS)					
		Uncertainty		Significant (TPS & DSS)					
		Job security		Significant (DSS)					
Kim & Kankanhalli (2009)	Empirical	Perceived Value	negative	Significant				Enterprise system	Intention not to comply with change
		Switching Costs	positive	Significant					
		Self-efficacy	negative	Not significant					
		Organizational Support	negative	Significant					
		Favorable Collegue Opinion	negative	Not significant					
Bhattacherjee & Hikmet (2007)	Empirical	Perceived Threat	positive	Significant	Perceived Usefulness	negative	Significant	Healthcare information technology (HIT)	Loss of Control
					Perceived Ease of Use	negative	Significant		
					Intention to Use	negative	Significant		
Bhattacherjee & Hikmet (2007)	Empirical	Perceived Threat	positive	Significant	IT Usage	negative	Significant	HIT	Loss of Control
					Behavioral Intention	negative	Significant		
Nov, Ye (2008)	Empirical				Perceived Ease of Use	negative	Significant	Digital Library	Personality trait

Table 1: Overview resistance studies

RESEARCH MODELS

In this section we develop based on the presented literature review two research models for examining an individual's resistance. The first one is the Technology Acceptance Model (Davis 1989; Davis et al. 1989) and the second is the newly developed Technology Resistance Model.

Technology Acceptance Model (TAM)

The basic model of our research model is the Technology Acceptance Model introduced by Fred D. Davis in 1989. The model is based on the Theory of Reasoned Action by Fishbein and Ajzen (1975) and was transferred to the IT context by (Davis 1989). The propositions of TAM are the key hypotheses for our model. We assume that

H1: Perceived Usefulness (PU) has a direct, positive impact on the Intention to use (ITU).

H2: Perceived Ease of Use (PEOU) has a direct, positive impact on the Intention to use (ITU).

H2: Perceived Ease of Use (PEOU) has a direct, positive impact on the Perceived Usefulness (PU).

The research model and the items used are summarized in Figure 1.

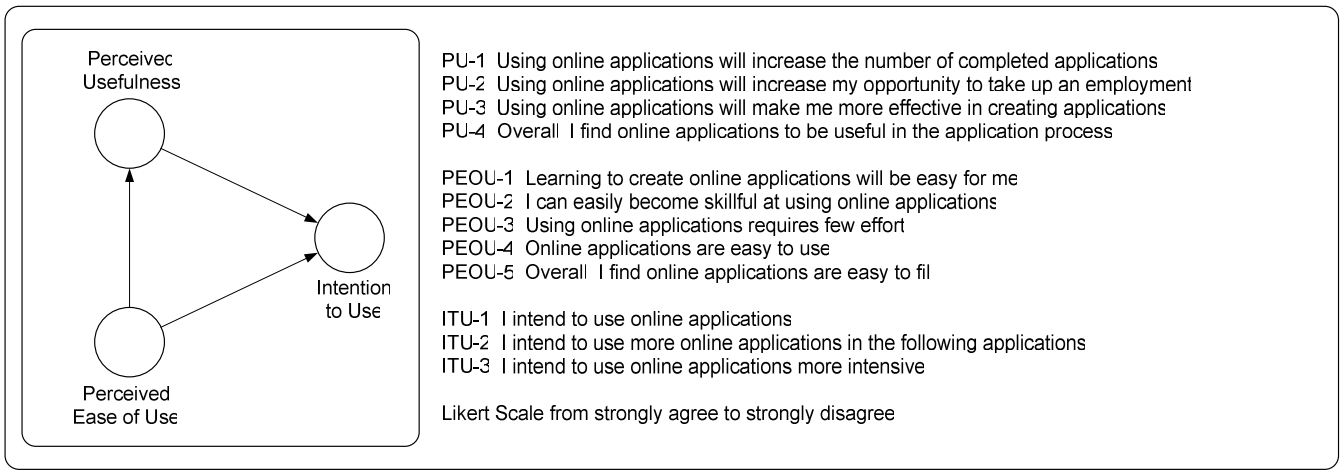

Figure 1: Technology Acceptance Model

Technology Resistance Model (TRM)

The second research model of our study is the newly developed Technology Resistance Model. The key propositions of the model are the same as in the Technology Acceptance Model; however, the constructs are different ones. For the Technology Resistance Model the constructs used are similar to those in the TAM, however, the items are inverse. Therefore the research model contains a construct modeling perceived uselessness, perceived difficulty to use and the intention to resist using a particular technology in question. Hence, we assume for the hypotheses in the TRM following the propositions of the TAM, that

H1: Perceived Uselessness (PUL) has a direct, positive impact on the Intention to Resist (ITR).

H2: Perceived Difficulty of Use (PDOU) has a direct, positive impact on the Intention to Resist (ITR).

H3: Perceived Difficulty of Use (PDOU) has a direct, positive impact on the Perceived Uselessness (PUL).

The research model and the items used are summarized in Figure 2.

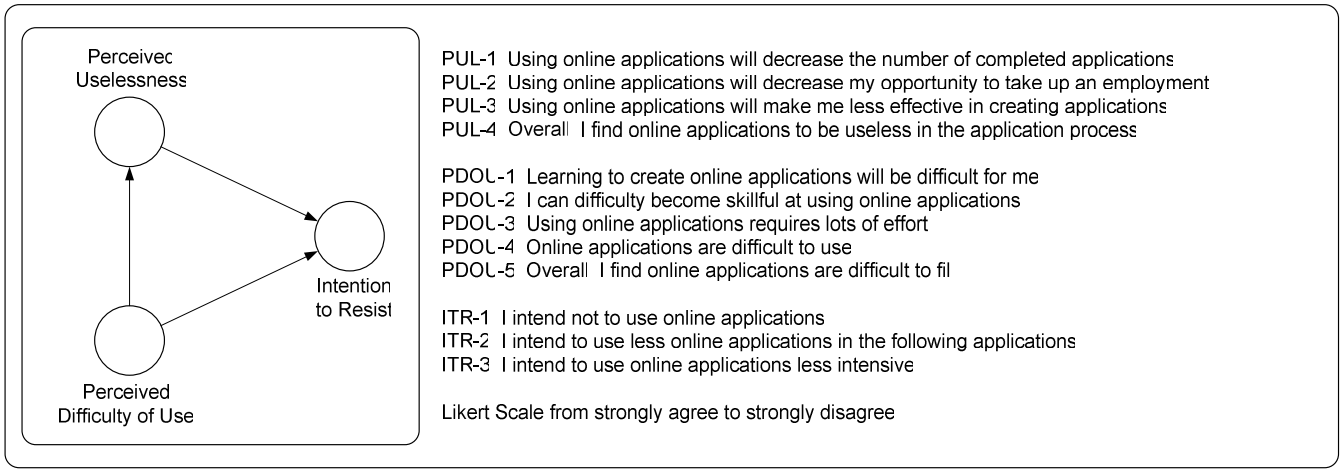

Figure 2: Technology Resistance Model (TRM)

These two models will be validated in the next section using empirical data of non-users and users of a particular technology to discuss the differences in the two models tested.

RESEARCH RESULTS

To evaluate the two research model we conducted an empirical survey investigating an individual's intention to use an online application form or not. Online applications were chosen as the technology in question as there is also a non IT based solution available (the paper based application portfolio) to apply for a job and therefore one could expect that the participants of the study are both users and non-users of online applications. The following section will explain how we conducted our survey and will present the results of our statistical analysis.

Research Design

The necessary data sample for these two research models was collected by an online survey. In order to reach the observed group and to provide a valid amount of data for evaluation, an electronic survey has been chosen to be the most appropriate form for our data collection (Boyer et al. 2002; TAN et al. 2007). (Stanton et al. 2001) outlined some distinctive advantages of online questionnaires over physical surveys such as failure prevention in the data collection and data archiving process. Therefore our questionnaire was developed and designed for online use and tested with different hardware and software settings. In May and June 2009 the questionnaire was published on the IS department's website and available online for about six weeks. The survey was introduced to registered people of an online job board using an e-mail invitation. Only these groups had access to the survey and were able to answer questions about their usage behavior and attitude regarding online applications. This sample would enable a distinctive

data analysis for both groups and comparison of both the technology Acceptance and the Technology Resistance Model.

The resulting data samples were consequently divided in two groups: 209 people who know online application forms but never used them for application and the other group, consisting of 926 research participants, who have already used online application forms for their application process. To have two approximately equal data sets, we perform the following analyses with a group of randomly selected 209 users from the group of 926 users. The demographic data of both data samples used is provided in Table 2.

Table 2: Research Participants[2]

Validation of both research models

This section presents the results of our model validation using the two data sets of non-users and users to compare their reaction to information technology. Therefore the measurement and structural model of our research approach is evaluated for both groups. The quality of the used reflective measurement model is determined by (1) content validity (2) indicator reliability, (3) construct reliability and (4) discriminant validity (Bagozzi 1979).

[2] If the numbers do not sum up to 209 the resulting difference indicates missing values in the demographic information about the survey participants

Content validity

The required constructs were all measured using a 5-point Likert scale and in setting up the questionnaire the aim was to refer to methods of measurement which had already been used in other empirical research. Thus intention to use, perceived usefulness and perceived ease of use were adopted to the context online applications and derive originally from (Bhattacherjee et al. 2007). For the Technology Resistance Model, we took the same questions but inversed the item.

	ITEMS	Loading	Mean	AVE	CR	Latent Variable Correlations		
Intention to Use	INT-1	0,919	3,145	0,845	0,942	0,9190		
	INT-2	0,919						
	INT-3	0,919						
Perceived Usefulness	PU-1	0,792	3,016	0,713	0,925	0,533	0,8443	
	PU-2	0,735						
	PU-3	0,839						
	PU-4	0,893						
Perceived Ease of Use	PEOU-1	0,735	3,471	0,668	0,723	0,240	0,501	0,8170
	PEOU-2	0,841						
	PEOU-3	0,811						
	PEOU-4	0,924						
	PEOU-5	0,897						
All loadings are significant at p≤0.001; Square Root of AVE is listed on diagonal by Latent Variables Correlation								

Table 3: Measurement model of the Technology Acceptance Model

Indicator reliability

Indicator reliability shows the proportion of the variance of an indicator which derives from the relevant latent variables. Since those loadings that are less than 0.7 must be removed for reflective indicators, so that at least 50% of the variance should be greater than 0.7 (Carmines et al. 1979). Altogether one item must be eliminated because of this threshold but apart from that the other items fulfilled this criteria in both cases as well as the significance level of all loadings, which are, according to the bootstrap method with 5000 samples (Henseler et al. 2009) highly significant at $p \leq 0.001$.

Construct reliability

Quality assessment at the construct level was carried out using Composite Reliability (CR) and Average Variance Extracted (AVE), since all the indicators which refer to the same construct should show a high level of mutual correlation (Fornell et al. 1981). For this purpose CR should have a value higher than 0.7 and AVE should be over 0.5 ((Bagozzi et al. 1988). As Table 3 and Table 4 show these criteria are fulfilled by the data collected.

Discriminant validity

Discriminant validity describes the extent to which measurements differ from others which theoretically should not be equal (Campell et al. 1959). This involves examining the cross-loadings, which must be smaller than the root of the corresponding AVE (Fornell et al. 1981; Hulland 1999). Since this is also the case as illustrated by Table 3 and Table 4, validity of the used measurement models is completely confirmed.

	Items	Loading	Mean	AVE	CR	Latent Variable Correlations		
Intention to Resist	RES-1	0,961	2,968	0,916	0,970	0,9569		
	RES-2	0,969						
	RES-3	0,941						
Perceived Uselessness	PUL-1	deleted	2,904	0,734	0,892	0,760	0,8568	
	PUL-2	0,789						
	PUL-3	0,877						
	PUL-4	0,900						
Perceived Difficulty of Use	PDOU-1	0,817	2,273	0,760	0,941	0,240	0,302	0,8721
	PDOU-2	0,866						
	PDOU-3	0,927						
	PDOU-4	0,850						
	PDOU-5	0,896						
All loadings are significant at p≤0.001; Square Root of AVE is listed on diagonal by Latent Variables Correlation								

Table 4: Measurement model of the technology resistance model

Structural model

After verifying the validity of the measurement model successfully, the structural model with its coefficient of determination (R2) and the significance level of the path coefficients should be tested (Chin 1998a; CHIN 1998b). Thereby both cases offer a R2 for intention to use (56.1%) or intention to resist (57.8%), which stand for an absolute explanatory power of the model, if you compare it with other studies using a comparable questionnaire. Furthermore a much higher R2 for perceived usefulness (25.1%) explained by perceived ease of use was discovered compared to the opposite construct perceived uselessness (9.1%), explained by perceived difficulty of use. Apart from this one can recognize that only one path, between Perceived Difficulty of Use and Intention to Resist is not significant at leastwise $p<0.05$, however the other five path coefficients are highly significant at a level of $p< 0.001$

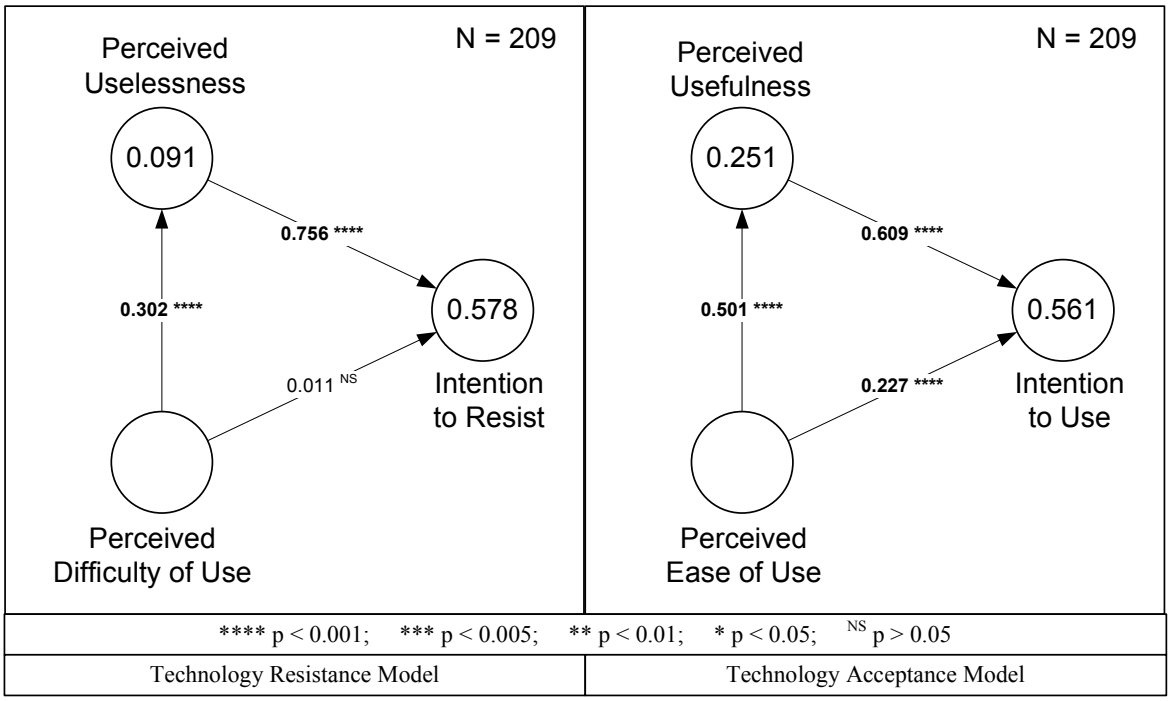

Figure 3: Structural Model Results

Comparing TAM and TRM

We based our multi-group comparison on the suggested procedure model by (Qureshi et al. 2009). They analyzed with a simulation model which of the both techniques parametric and covariance SEM approaches should by conducted based on different decision criterions. Due to our research model analyzed with PLS (Ringle et al. 2005) in general, our small sample size, our number of loadings, our non-normal data-set and our moderate to large path differences we used the parametric approach to test for group differences between users and non-users. This approach uses a component-based SEM first and then performs a between-group t-test with pooled standard errors as introduced by (Chin 2000) and adopted by (Hsieh et al. 2008; Morris et al. 2000).

As Figure 3 and Table 5 show, there are several differences between the Technology Acceptance and the Technology Resistance Model. First, Perceived Ease of Use explains Perceived Usefulness better than the corresponding Perceived Difficulty of Use as Table 5 indicates containing the results of a comparison of means of the beta-coefficients resulted from the bootstrapping analysis using a t-test for the mean. Second, the path between PEOU/PDOU and INT/RES is only significant for PEOU and third, the significance of the path between PU/PUL and INT/RES is evaluated differently regarding its significance and its impact on INT/RES. As it is shown in Table 5 the statistical results provide evidence, that also these two paths are significant different for the both groups tested.

		N	MEAN	T	df	Sig (2-sides)
PEOU / PDOU --> ITU / ITR	TAM	500	0.226	55.301	675.410	0.00
	TRM	500	0.040			
PEOU / PDOU --> PUF / PUL	TAM	500	0.507	-43.734	957.134	0.00
	TRM	500	0.311			
PUF / PUL --> ITU / ITR	TAM	500	0.607	-55,613	882,953	0.00
	TRM	500	0.755			

Table 5: Group comparison results

The group comparison results show that the Technology Resistance Model built as an opposite model of the Technology Acceptance Model is not able to explain non-user behavior in the same way as the Technology Acceptance Model does it for users. Especially the influence of perceived difficulty of use does not affect the intention to resist in the Technology Resistance Model. Only in the Technology Acceptance Model this influence can be supported by our statistical analysis. Also the influence of PEOU/PDOU on PU/PUL is more significant for the Technology Acceptance Model than for the Technology Resistance Model. Although both paths are highly significant for both models the group comparison showed for the path of PU/PUL on INT/RES that it is higher significant for the Technology Resistance Model. These results and the resulting opportunities for future research are discussed in the following chapter.

DISCUSSION AND FUTURE RESEARCH

The general objective of this paper was to test whether the Technology Acceptance Model can model individual's resistance behavior and in a second step if a Technology Resistance Model explains resistance in a different way. Therefore we developed a Technology Resistance Model based on the propositions of the Technology Acceptance Model using inverse items. As one can see perceived difficulty of use and perceived uselessness are antecedents of the intention to resist using online applications, however, the influence is different compared to the Technology Acceptance Model. The results of the TRM showed that there is no direct positive influence of PDOU on INT but the influence is mediated by PUL. For TAM all proposed influences can be statistically support in this study. As a result only using the inverse construct of the Technology Acceptance Model to explain an individual's intention to resist using an information system might not be appropriate. From the tested TRM one can conclude that the intention to resist using an information system is predominately explained by the perceived uselessness of the system, however not by the perceived difficulty to use. As explained in the introduction, 70 per cent of German household have a private computer and almost two thirds are online. Therefore using an online service is not difficult to them as they are used to online services in a general way. This can be shown by the results of the TAM as PEOU is a driver of the intention to use; however, as most of the research participants do not feel using online applications as difficult, perceived difficulty to use is not a significant driver for the intention to resist. For individuals who resist using a technology a more important driver is perceived uselessness. If potential users perceive that a particular technology is useless they are intended to resist using it, especially if there are alternatives available. The intention to resist is therefore mainly explained by the perceived uselessness of a system when only using the inverse Technology Acceptance Model constructs. As a consequence to understand resistance behavior in more detail diverse research approaches are required. Research which investigated resistance so far has identified different perceived threats and resistance to change in situative behavior as the main driver of resistance. However, as (Lapointe et al. 2005) pointed out research lacks to explain resistance

behavior in detail. According to them only four papers opened the black box of resistance in a appropriate way. Based on (Lapointe et al. 2005) and actual research investigating resistance towards an information system like (Bhattacherjee et al. 2008; Bhattacherjee et al. 2007; Eckhardt et al. 2009; Kim et al. 2009) we propose possible directions for future research dealing with different aspects of an individual's resistance to use an information system. We will distinguish these approaches between those with impact on the method used and those with impact on theory.

First regarding the method used to understand technology adoption, following the discussion of (Chin et al. 2008) it might be useful to use semantic differential scales instead of Likert one to combine the Technology Acceptance Model and the Technology Resistance Model in a combined Technology Resistance and Acceptance model (TRAM). This model might enable researchers using constructs modeling both side of the coin (e.g. usefulness and uselessness) to explain both behaviors of interests regarding the implementation of a new information system. Future research might follow the ideas of (Chin et al. 2008) to propose a TRAM and to discuss its implications for technology acceptance and resistance research in the 21st century. While discussing the implications of a TRAM future research might consider whether it is useful or not to combine both acceptance and resistance in one model or to treat both aspects differentiated to explain acceptance and resistance phenomena. In addition while discussing a TRAM future research might explain how other antecedents of the intention to use can be converted into those explaining resistance as well.

In addition a second beneficial area especially connected to theoretical improvements might be to develop a Technology Inhibitor Model (TIM) to identify and discuss those antecedents explaining an intention to resist. As (Cenfetelli 2004a; Cenfetelli 2004b) highlighted inhibitors are those antecedents which have only an effect on the intention to not to use and not if an inhibitor is not present on the intention to use. He continued his argumentation that inhibitors are mediated by enablers such as perceived ease of use or usefulness. Identifying and discussing inhibitors beside those already identified by resistance research (mainly as perceived threats) could help to better understand potential users' intention not to use an information system. With this understanding helpful design science oriented advices can be provided to enable a better developing of those information systems which are rejected by users.

While discussing resistance behavior by users it is important to distinguish between voluntary and mandatory use of information systems. The resulting resistance behavior might be different for voluntary and mandatory settings. In voluntary ones individuals can perform a non-usage behavior in a more easy way than in a mandatory one. As (Ferneley et al. 2006) pointed out there are different behaviors a user can perform: resist, comply or workaround. As a consequence future research might discuss and evaluate the most appropriate dependant variable for mandatory and voluntary scenarios. Possible variables include an intention to resist, intention not to comply, intention to workaround, etc. Based on this evaluation the resulting question is whether different intentions are driven by different antecedents. Future research might first discuss the use of different dependant variables regarding the resistance of individuals and in a second step which factors are driving which intention. In this research an individual's intention to resist using an information system was tested regarding the attitude towards a particular online service. Future research might discover if resistance and usage behavior and the related antecedents are different for online applications for private use, for business use or for application systems like word processing or ERP systems.

Another beneficial area for future research might be to discuss whether resistance is a personality trait or only important for a given situation. (Devaraj et al. 2008) introduced the concept of personality and its importance for technology acceptance research in general. Based on this approach future research might

evaluate of the personality trait resistance is in charge for resistance behavior of particular individuals. Are those who are more resistant than others driven by other influencing factors than those who are more open to change? In addition future research might evaluate of the personality trait resistance is different for men and women, individuals of different age, tenure etc. Following the introduction of personality in general by (Devaraj et al. 2008) future research might consider if those who are more resistance towards new information systems have different personality traits than those who are more intended to use an information system in general.

As a last implication for future research we identified the opportunity to investigate if there are differences regarding resistance towards the use of information systems during the diffusion process of a new technology. Are there differences for first and late adopters? This can be discussed while analyzing the personality traits of the Big Five (Norman 1963) for first and late adopters.

A clearer examination of resistance in future will have several implications for practice as well. With knowing what drives an individual to resist a change introduced regarding the implementation of a new information system managers are able to better conduct change management in general. As shown by our research an intention to resist is particularly driven by perceived uselessness and not by perceived difficulty of use. As a consequence manager might focus their change management activities on the perception of the usefulness of the systems to improve this perception. As those individuals who perceives systems as useful are more intended to use it and those who perceive it as useless are more intended to resist using it. In addition perceived difficulty of use does not have an effect as potential user are used to online services in general. With a deeper knowledge of other inhibitors and the personality of users and non-users change management could be conducted more effectively.

CONCLUSION

In our study we discussed the importance to investigate an individuals' resistance behavior as a major challenge for technology acceptance and resistance research in the 21st century. Therefore we developed a Technology Resistance Model based on the Technology Acceptance Model and showed that an intention to resist using an information system can only be explained by perceived uselessness (an inverse form of the TAM antecedent perceived usefulness). Based on these results we called for a deeper understanding of an individual's resistance intention. Possible opportunities for future research such as a Technology Resistance and Acceptance model (TRAM), Technology Inhibitor model (TIM), different dependant variables and to understand an individual's personality trait resistance have been discussed with in the paper.

REFERENCES

1. Bagozzi, R.P. "The Role of Measurement in Theory Construction and Hypothesis Testing: Toward a Holistic Model," in: *Conceptual and Theoretical Developments in Marketing,* O.C. Ferell, S.W. Brown and C.W. Lamb (eds.), American Marketing Association, Chicago, IL, 1979, pp. 15-32.
2. Bagozzi, R.P. "The Legacy of the Technology Acceptance Model and a Proposal for a Paradigm Shift," *Journal of the Association for Information Systems* (8:4) 2007, pp 244-254.
3. Bagozzi, R.P., and Yi, Y. "On the Evaluation of Structural Equation Models," *Journal of the Academy of Marketing Science* (16:1) 1988, pp 74-94.
4. Benbasat, I., and Barki, H. "Quo vadis, TAM?," *Journal of the Association for Information Systems* (8:4) 2007, pp 211-218.
5. Bhattacherjee, A., Davis, C.J., Hikmet, N., and Kayhan, V. "User Reactions to Information Technology: Evidence from the Healthcare Sector," in: *International Conference of Information Systems*, Paris, France, 2008.
6. Bhattacherjee, A., and Hikmet, N. "Physicians' resistance toward healthcare information technology: a theoretical model and empirical test," *European Journal of Information Systems* (16:6) 2007, pp 725-737.

7. Boyer, K.K., Olson, J.R., Calantone, R.J., and Jackson, E.C. "Print versus electronic surveys: a comparison of two data collection methodologies," *Journal of Operations Management* (20:4) 2002, pp 357-373.
8. Brown, S.A., and Venkatesh, V. "Model of Adoption of Technology in Households: A Baseline Model Test and Extension Incorporating Household Life Cycle," *MIS Quarterly* (29:3), Sep2005 2005, pp 399-426.
9. Campell, D.T., and Fiske, D.W. "Convergent and discriminant validation by the multitrait-multimethod matrix," *Psychological Bulletin* (56) 1959, pp 81-105.
10. Carmines, E.G., and Richard, A.Z. *Reliability and Validity Assessment* Sage Publications, Beverly Hills, CA., 1979.
11. Cenfetelli, R.T. "An Empirical Study of the Inhibitors of Technology Usage," in: *Twenty-Fifth International Conference on Information Systems*, 2004a.
12. Cenfetelli, R.T. "Inhibitors and Enablers as Dual Factor Concepts in Technology Usage," *Journal of the Association for Information Systems* (5:11-12) 2004b, pp 472-492.
13. Chin, W.W. "Issues and Opinion on Structural Equation Modeling," *MIS Quarterly* (22:1) 1998a.
14. CHIN, W.W. "The Partial Least Squares Approach to Structural Equation Modeling," in: *Modern Methods for Business Research,* G.A. Marcoulides (ed.), Mahwah, NJ, Lawrence Erlbaum, 1998b, pp. 295-336.
15. Chin, W.W. "Frequently Asked Questions -- Partial Least Squares and PLS-Graph," 2000.
16. Chin, W.W., Johnson, N., and Schwarz, A. "A Fast Form Approach to Measuring Technology Acceptance and Other Constructs," *MIS Quarterly* (32:4), Dec2008 2008, pp 687-703.
17. Churchman, C.W., and Schainblatt, A.H. "THE RESEARCHER AND THE MANAGER: A DIALECTIC OF IMPLEMENTATION," *Management Science* (11:4) 1965, pp B-69-B-87.
18. Coch, L., and French, J.R.P.J. "Overcoming resistance to change," *Human Relations* (1:4) 1948, pp 512-532.
19. Davis, F.D. "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology," *MIS Quarterly* (13:3), Sep89 1989, pp 319-340.
20. Davis, F.D., Bagozzi, R.P., and Warshaw, P.R. "User Acceptance of Computer Technology: A Comparison of Two Theoretical Models," *Management Science* (35:8), Aug89 1989, pp 982-1003.
21. Devaraj, S., Easley, R.F., and Crant, J.M. "How Does Personality Matter? Relating the Five-Factor Model to Technology Acceptance and Use," *Information Systems Research* (19:1) 2008, pp 93-105.
22. Eckhardt, A., Laumer, S., and Weitzel, T. "Who influences whom? Analyzing workplace referents' social influence on IT adoption and non-adoption," *Journal of Information Technology* (24:1) 2009, pp 11-24.
23. Enns, H.G., Huff, S.L., and Higgins, C.A. "CIO LATERAL INFLUENCE BEHAVIORS: GAINING PEERS' COMMITMENT TO STRATEGIC INFORMATION SYSTEMS," *MIS Quarterly* (27:1) 2003, pp 155-176.
24. Ferneley, E.H., and Sobreperez, P. "Resist, comply or workaround? An examination of different facets of user engagement with information systems," *Eur J Inf Syst* (15:4) 2006, pp 345-356.
25. Fornell, C.R., and Larcker, D.F. "Structural equation models with unobservable variables and measurement error," in: *Journal of Marketing Research*, 1981, pp. 39-50.
26. Henseler, J., Ringle, C.M., and Sinkovics, R.R. "The use of partial least squares path modeling in international marketing," *Advances in International Marketing* (20) 2009, pp 277-319.
27. Hirschheim, R. "Introduction to the Special Issue on "Quo Vadis TAM - Issues and Reflections on Technology Acceptance Research"," *Journal of the Association for Information Systems* (8:4) 2007, pp 203-205.
28. Hirschheim, R., and Newman, M. "Information Systems and User Resistance: Theory and Practice," *The Computer Journal* (31:5), May 1, 1988 1988, pp 398-408.
29. Hsieh, J.J.P.-A., Rai, A., and Keil, M. "UNDERSTANDING DIGITAL INEQUALITY: COMPARING CONTINUED USE BEHAVIORAL MODELS OF THE SOCIO-ECONOMICALLY ADVANTAGED AND DISADVANTAGED," *MIS Quarterly* (32:1) 2008, pp 97-126.
30. Hulland, J. "Use of partial least squares (PLS) in strategic management research: a review of four recent studies," in: *Strategic Management Journal*, 1999, pp. 195-204.
31. Ilie, V., Courtney, J.F., and Slyke, C.V. "Paper versus Electronic: Challenges Associated with Physicians' Usage of Electronic Medical Records," in: *40th Hawaii International Conference on System Science*, Waikoloa, Hawaii, USA, 2007.
32. Jermier, J.M., Knights, D., and Nord, W. (eds.) *Resistance and Power in Organisation*. Routledge, London, 1994.
33. Jiang, J.J., Muhanna, W.A., and Klein, G. "User resistance and strategies for promoting acceptance across system types," *Information & Management* (37:1) 2000, pp 25-36.
34. Joshi, K. "A Model of Users' Perspective on Change: The Case of Information Systems Technology Implementation," *MIS Quarterly* (15:2) 1991, pp 229-242.
35. Keen, P.G.W. "Information systems and organizational change," *Commun. ACM* (24:1) 1981, pp 24-33.
36. Kim, H.-W., and Kankanhalli, A. "INVESTIGATING USER RESISTANCE TO INFORMATION SYSTEMS IMPLEMENTATION: A STATUS QUO BIAS PERSPECTIVE," *MIS Quarterly* (33:3) 2009, pp 567-582.

37. King, W.R., and He, J. " A meta-analysis of the technology acceptance model," *Information & Management* (43:6) 2006, pp 740-755.
38. Lapointe, L., and Rivard, S. "A MULTILEVEL MODEL OF RESISTANCE TO INFORMATION TECHNOLOGY IMPLEMENTATION," *MIS Quarterly* (29:3) 2005, pp 461-491.
39. Lapointe, L., and Rivard, S. "A Triple Take on Information System Implementation," *Organization Science* (18:1) 2007, pp 89-107.
40. Lee, Y., Kozar, K.A., and Larsen, K.R.T. "The Technology Acceptance Model: Past, Present and the Future," *Communications of the AIS* (12) 2003a, pp 752-780.
41. Lee, Y., Kozar, K.A., and Larsen, K.R.T. "The Technology Acceptance Model: Past, Present, and the Future," *Communications of AIS* (12) 2003b, pp 752-780.
42. Lucas, H.C. *Why Information Systems Fail* Columbia University Press, New York, USA, 1975.
43. Lucas, H.C., Swanson, E.B., and Zmud, R.W. "Implementation, Innovation and Related Themes over the Years in Information Systems Research," *Journal of the Association for Information Systems* (8:4) 2007, pp 206-210.
44. Marakas, G.M., and Hornik, S. "Passive resistance misuse: overt support and covert recalcitrance in IS implementation," *Eur J Inf Syst* (5:3) 1996, pp 208-219.
45. Markus, M.L. "Power, politics, and MIS implementation," *Commun. ACM* (26:6) 1983, pp 430-444.
46. Morris, M.G., and Venkatesh, V. "Age Differences in Technology Adoption Decisions: Implications for a Changing Work Force," *Personnel Psychology* (53:2), Summer2000 2000, pp 375-403.
47. Norman, W.X. "Toward an adequate taxonomy of personality attributes: Replicated factor structure in peer nomination personality ratings," *Joumal of Abnormal & Social Psychology* (66:4) 1963, pp 574-583.
48. Prasad, P., and Prasad, A. "Stretching the Iron Cage: The Constitution and Implications of Routine Workplace Resistance," *Organization Science* (11:4) 2000, pp 387-403.
49. Qureshi, I., and Compeau, D. "ASSESSING BETWEEN-GROUP DIFFERENCES IN INFORMATION SYSTEMS RESEARCH: A COMPARISON OF COVARIANCE- AND COMPONENT-BASED SEM," *MIS Quarterly* (33:1) 2009, pp 197-214.
50. Ringle, C.M., Wende, S., and Will, A. "SmartPLS 2.0.M3, www.smartpls.de. ," 2005.
51. Schwarz, A., and Chin, W.W. "Looking Forward: Toward an understanding of the nature and definition of IT acceptance," *Journal of the Association for Information Systems* (8:4) 2007, pp 230-243.
52. Stanton, J.M., and Rogelberg, S.G. "Using Internet/Intranet Web Pages to Collect Organizational Research Data," *Organizational Research Methods* (4:3) 2001, p 200.
53. TAN, C.W., BENBASAT, I., and CENFETELLI, R.T. "Understanding the Antecedents and Consequences of E-Government Service Quality: An Empirical Investigation," in: *Twenty Eighth International Conference on Information Systems (ICIS 2007)*, Montreal, Quebec, Canada, 2007.
54. Tichy, N.M. *Managing strategic change. Technical, political and cultural dynamics* Wiley, New York, 1983.
55. Venkatesh, V., Davis, F.D., and Morris, M.G. "Dead Or Alive? The Development, Trajectory And Future Of Technology Adoption Research," *Journal of the Association for Information Systems* (8:4), Apr2007 2007, pp 268-286.
56. Venkatesh, V., Morris, M.G., Davis, G.B., and Davis, F.D. "User Acceptance of Information Technology: Toward a Unified View," *MIS Quarterly* (27:3), Sep2003 2003, pp 425-478.
57. Waddell, D., and Sohal, A.S. "Resistance: a constructive tool for change management," *Management Decision* (36:8) 1998, pp 543-548.
58. Williams, M.D., Dwivedi, Y.K., Lal, B., and Schwarz, A. "Contemporary trends and issues in IT adoption and diffusion research," *Journal of Information Technology* (24:1) 2009, pp 1-10.