

Quality of Usage as a Neglected Aspect of Information Technology Acceptance

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Abstract:

The importance of user acceptance on the success of information technology (IT) implementations in organizations is widely acknowledged. Many contributions analyzed determinants of usage behavior and concluded in different behavioral models. However, most of these contributions conceptualized the quantity of usage like duration or frequency as the dependent variable.

Chin and Marcolin (2001) called for a greater emphasis in examining the actual phenomena of usage. Beyond simple measures such as amount of use, the manner and form of usage should represent a new area for deeper understanding of technology usage. This paper aims to answer this call by recognizing "quality of usage" as a main aspect of IT usage behavior besides "quantity of usage". It is postulated that both measures have to be taken into account for explaining IT implementation success.

Quality of usage seems to be of particular importance for explaining different outcomes of IT implementations when usage is compulsory in organizations. Hartwick and Barki (1994) stated that a mandatory nature of usage makes it meaningless as an indicator of system success, referring to quantity of usage. This paper postulates that in mandatory situations in organizations, where individuals can't determine their quantity of usage themselves, the consideration of usage quality offers an approach in order to understand different IT implementation outcomes.

Based on former models of IT acceptance, a theoretical framework is build in order to explain (1) the determinants of quality of usage and (2) the impact of perceived usage compulsion on usage behavior. The research on this topic is in progress, no empirical validation of this framework has been done so far.

Introduction

IT offers the potential for substantially improving white collar performance (Davis 1989). A key objective of IT research is to assess the value of IT to an organization, to understand its determinants, to help firms to better deploy and manage their IT resources and thus enhance overall effectiveness (Taylor and Todd 1995a). The often paradox relationship between investment in IT and gains in productivity in the past (Brynjolfsson 1993) has been mainly attributed to a lack of user acceptance of IT innovations (Agarwal and Prasad 1997; Devaraj and Kohli 2003) since information systems (IS) cannot be effective unless they are used (Mathieson 1991; Venkatesh et al. 2003).

Contributions in this field have resulted in several models that explain user acceptance of IT innovations in organizations (for an overview: (Venkatesh et al. 2003)). Most of them conceptualized usage in regard to quantity, i.e. duration, volume and / or frequency of usage. Schwarz et al. (2004) suggested that it is not enough to simply study *how often* an individual engages in a technology, but *how* the device is used. Chin and Marcolin (2001) claimed that greater emphasis should be placed on examining the manner / form of usage. This paper builds up on these considerations and postulates that "**quality of usage**" is the aspect of the manner or form of usage which is important for the success of IT implementations. For an organization, it is not of particular interest how long or how often a technology is used by an employee to improve productivity, but whether it was used to perform the task in an effective and efficient way. For this reason, quality of usage is defined by the time that was required by an individual to perform a certain task with the technology and the accuracy of usage, i.e. the absence of operating errors.

Quality of usage seems to be of particular importance in situations when usage is **mandatory**. Past IS research has largely focused on the study of voluntary usage since it was assumed that usage (quantity) might vary only little in such situations and makes it meaningless as an indicator for implementation success (Hartwick and Barki 1994). Thus, these models can't contribute to explain variations in the success of implementations when usage is mandatory. This paper tries to fill this research gap and postulates that variations of implementation outcomes can be attributed to variations of usage quality in situations where system usage is compulsory.

This leads to the two research questions of this study:

- 1.) *What are the determinants of quality of IT usage in an organizational context?*
- 2.) *How are the relationships between quality of usage and its antecedent influenced by settings of mandatory vs. voluntary usage?*

The paper proceeds as follows: The next chapter gives a review of past research in this field and presents former theoretical models. These serve as a basis for the theoretical framework which is presented in the following chapter. The integrated constructs and postulated propositions in it are explained in detail. Afterwards, the intended methodological validation procedure is explained and the next steps to conduct in the future are pointed out. The paper concludes with a short summary and directions for future research in this field.

Theoretical Background

Overview

Research in the area of IT adoption can be distinguished by the level of analysis. Contributions on the *organizational* level analyze how, why and under which circumstances organizations decide to buy and implement innovative technologies (Cooper and Zmud 1990; Damanpour 1991; Fichman and Kemerer 1997; Fichman 2004; Swanson and Ramiller 2004; Weitzel et al. 2006).

This work focuses on the *individual* level in organizations, i.e. the individual acceptance by employees in organizations after an adoption decision was made by the organization. Research in this area has resulted in several theoretical models (Venkatesh et al. 2003). Many of them are based on the Theory of Reasoned Action (TRA) by Fishbein and Ajzen (1975), which explains human behavior by behavior intentions, attitudes and subjective norm (SN). The Theory of Planned Behavior (TPB) by Ajzen (1985) and Ajzen (1991) extends the TRA by the construct of behavioral control. The Technology Acceptance Model (TAM) by Davis (1986) and Davis et al. (1989) applies the TRA in the context of IT acceptance and postulates that usage behavior is determined by perceived ease of use and perceived usefulness.

Conceptualization of usage behavior in prior research

There exist many models which extend the TAM or adapt the TRA or TPB to the context of IT adoption, e.g. (Goodhue and Thompson 1995; Taylor and Todd 1995a; Taylor and Todd 1995b; Venkatesh

and Davis 1996; Venkatesh 2000; Venkatesh and Davis 2000; Venkatesh and Morris 2000; Wixom and Todd 2005; Karahanna et al. 2006). The dependent variables of these models differ: E.g. Mathieson et al. (1991) chose the *usage intention* as the dependent variable. Others measured *frequency and duration of usage as perceived by the user* (Mathieson et al. 2001; Burton-Jones and Hubona 2005; Karahanna et al. 2006) or *scope of usage as perceived by the user* as percent of system features used regularly and the percent of client interactions managed through the system (Karahanna et al. 2006). Since actual usage data is difficult to gather, only a few studies measured it. E.g. Venkatesh et al. (2003) measured *actual duration of usage* via system logs. Straub (1995) complains about the wide variation of system usage measures, which would hinder comparison of findings. He points out that perceptual, self-reported measures show weaker links to independent variables in acceptance models than objective, computer-recorded measures.

Quality of usage in prior research

A few contributions addressed constructs related to quality of usage. It is implicitly considered in contributions regarding user training in IT implementation processes. For example Compeau and Higgins (1995) state that user training is an essential contributor to the productive use of computer systems in organizations. They conceptualized success of training by the knowledge individuals had after receiving training and their ability to apply that knowledge, but didn't investigate the impact on the resulting usage behavior. Brown (2000) states that the way a technology is being incorporated into the job is not determined by the technology, but rather by an "appropriation" by the users. He reports an example in which employees used a system to make maintenance requests like changing a light bulb. Since they were not always convinced that the repairman really got the request, they made a phone call afterwards to make sure he got it. This meant double work and a bad overall efficiency of system usage. Schwarz et al. (2004) points out that the extent of usage alone is not meaningful for analyzing usage behavior. They give an example of two users spending eight hours using a system; one spending half of the time navigating the "help" screens, while the other using different features of the system to accomplish an objective.

It can be concluded that the conceptualization of IT usage quality has been neglected to a large extent in past research. Furthermore, no contribution so far has measured IT usage quality directly.

Voluntary vs. mandatory usage in prior research

A few models explicitly address the problem of voluntary versus mandatory usage. Two constructs have been conceptualized in this regard: *perceived voluntariness of usage*, defined as "the degree to which use of the innovation is perceived as being voluntary, or of "free will" (Moore and Benbasat 1991) and *SN*, defined as the individual's perception that important others (e.g. superiors) think he or she should use the system (Taylor and Todd 1995a; Venkatesh and Davis 2000).

Hartwick and Barki (1994) showed in their analysis that SN had a strong influence on usage intention in the case of mandatory IT usage, while voluntary users focused on their own attitudes. Agarwal and Prasad (1997) state that the perception of voluntariness may be important for initial IT acceptance behavior because of the required modification of behavior; because an external mandate to change might provide the required motivation. Venkatesh and Davis (2000) found that SN had a direct effect on IT usage intentions for mandatory, but not voluntary contexts. Venkatesh et al. (2003) showed that SN is more likely to be salient for older workers, particularly women, during early stages of experience and in mandatory settings.

Two things can be concluded: (1) It seems to be obvious that SN and perceived voluntariness are related to each other. Moore and Benbasat (1991) found that perceived voluntariness is not an "either-or" perception, but there tend to be degrees of voluntariness with respect to behavior in organizations. Hartwick and Barki (1994) state that mandatory use is under the individual's control, but is likely to be based on normative considerations. If one thinks that his superior wants him to use a system and the superior's opinion is important to him, this will lead to a reduced perceived voluntariness of usage. Based on these considerations, perceived usage mandate is equated with SN regarding superiors and is defined as the extent of the individual's perception that superiors want him to use the system and his motivation to comply. Consistent with Moore and Benbasat (1991) it is assumed that it is not a binary construct, that means the extent of SN can vary.

(2) Some of the models found that SN or usage mandate increased the extent of IT usage, which seems to be a comprehensible reaction of the employees. This makes clear that quantity of usage shouldn't be used as an indicator of user acceptance or system success in mandatory usage settings. So far no contribution has dealt with mandatory usage situations sufficiently, as it is also recognized by Chin and

Marcolin (2001) who called for complex, mandatory diffusion models. This paper tries to fill this gap by conceptualizing quality of usage as the main indicator of IT implementation success in mandatory usage situations.

Theoretical Model

Deduction of Propositions

Figure 1 shows the postulated relationships between usage behavior, conceptualized as both quantity and quality of usage, and its antecedents. Table 1 explicates the constructs.

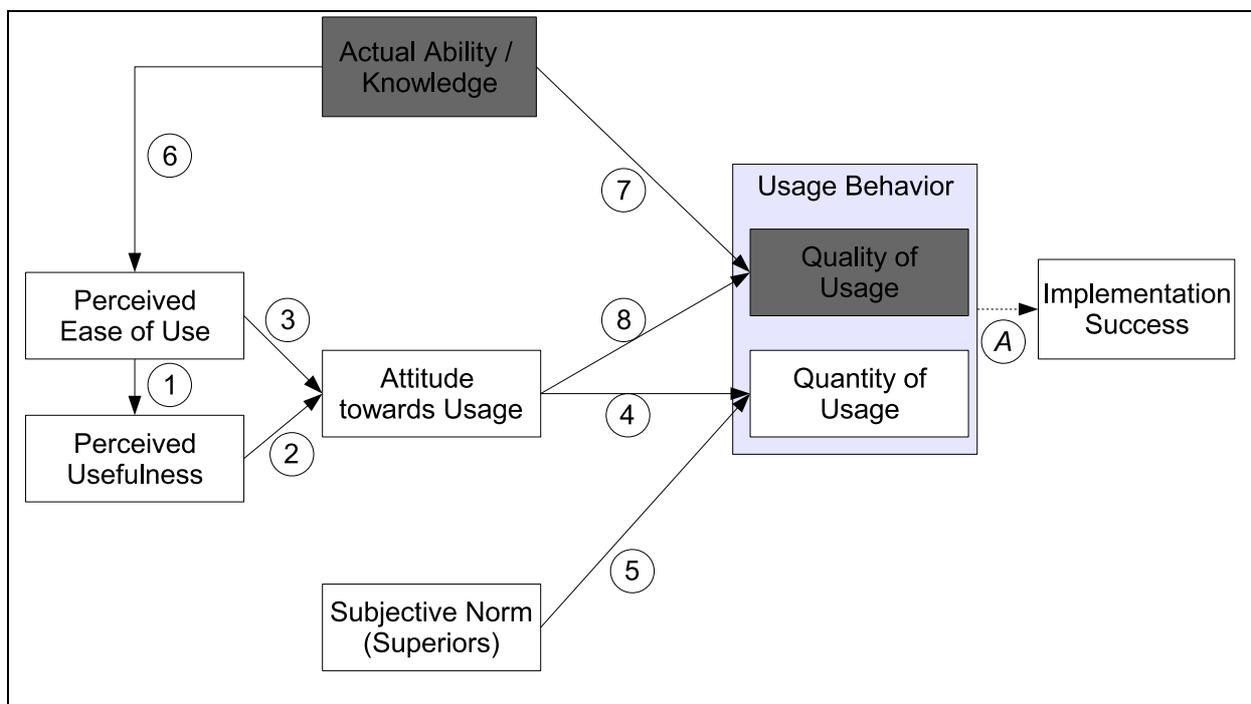


Figure 1 Research Model

The theoretical model is based on the model of Taylor and Todd (1995a) who extended the TPB to the context of IT usage. The main differences to this model are the substitution of perceived behavioral control by *actual* behavioral control, the conceptualizing of SN only by the influence of superiors (not colleagues) and the exclusion of usage intention.

Two aspects seem to have an impact on the *quality* of system usage: the *attitude* towards system usage and the *actual ability / knowledge regarding system usage*. On the other hand, *quantity* of usage is determined by *attitude* and by perceived usage mandate, conceptualized as exemplified above as *SN*

regarding superiors. Actual ability / knowledge regarding system usage only has an indirect impact on usage quantity via the perceived ease of use.

It is assumed that both quality and quantity of usage have to be sufficient to make an IT implementation successful. Thus, in situations where usage quantity doesn't vary, which can be assumed in especially in mandatory settings, different implementation outcomes can be explained by different levels of usage quality.

Furthermore, in situations where SN is high, the attitude of usage can become meaningless as a determinant of usage quantity. In voluntary settings, a negative attitude towards an IT system will lead to no or little usage. In mandatory settings, attitude can become meaningless for the determination of the usage quantity. Even users with a negative attitude towards usage can be forced to use the system. But their attitude will impact their usage quality and thereby implementation success.

In the following the propositions are explained in detail.

Proposition one to three are consistent with the TAM by Davis (1986).

Proposition 4: Attitude towards usage has a positive impact on quantity of usage. This is consistent with the TAM, except that the TAM explains the connection of the two constructs using usage intention. Since there is a timeline between behavioral intention and resulting behavior, it is difficult to measure both at the same point of time. Thus a direct influence of attitude on usage behavior is conceptualized.

Proposition 5: SN (superiors) has a positive impact on quantity of usage. This is consistent with findings from Moore and Benbasat (1991), Hartwick and Barki (1994) as well as Venkatesh and Davis (2000), who found an impact of SN and / or perceived voluntariness on usage intention. Thus an impact of SN on usage behavior can be concluded. Consistent with TRA, the resulting behavior is dependent on the motivation to comply.

Proposition 6: Actual knowledge / ability has a positive impact on perceived ease of use. Mathieson et al. (2001) found a positive relationship between perceived resources, which were partly measured by the individual's perception of his own knowledge, and perceived ease of use. One can assume that an individual's perception of his own ability / knowledge is correlated to the actual ability / knowledge. Thus it is concluded that actual knowledge / ability impacts perceived ease of use.

Proposition 7: Actual ability / knowledge has a positive impact on quality of usage. Ajzen (1985) differentiates between perceived behavioral control and actual behavioral control. Perceived behavioral control influences the attempted behavior, while actual behavioral control determines - in conjunction with the attempted behavior - the actual behavior (Ajzen 1985). This proposition follows this idea and postulates that quality of usage is determined by the actual ability / knowledge to use the system in an effective and efficient manner.

Proposition 8: Attitude towards usage has a positive impact on the usage quality. The argument for postulating a direct impact of attitude towards usage on usage behavior is equivalent to that of proposition four. It is assumed that an individual with a positive attitude towards usage has a higher motivation to use the system more thoroughly than an individual with a negative attitude.

The impact of usage behavior on implementation success (proposition A) is not measured. But it is assumed that a sufficient usage behavior regarding quantity and quality of usage will lead to productivity gains.

Operationalization of Constructs

The construct *actual ability / knowledge* is based on the concept of actual behavioral control by Ajzen (1985) who postulates that the actual behavior of an individual is not only determined by his behavioral intention, but also by his actual behavioral control. The construct will be measured by two formative indicators: First, by *experience*, conceptualized as the time period the individual has used the system (Venkatesh and Davis 2000). This is based on Schwarz et al. (2004) who state that engagement with a technology results in skill development. The second formative indicator for the actual ability is the amount of *training* the individual has received (Compeau and Higgins 1995).

Usage behavior will be measured by observations rather than user perceptions, as it is claimed by Straub (1995). It is assumed that quantity and quality of usage are independent, since one can use a system with high frequency and volume, but in a bad manner. *Quality of usage* will be measured by two aspects based on Card et al. (1980): *efficiency*, i.e. the time spent to accomplish a task, and *accuracy*, i.e. the amount of operating errors, both measured by computer logs. The results will be compared to the performance of other group members and experts based on Venkatesh and Davis (1996) and the keystroke model by Card et al. (1980). *Quantity of usage* will be measured by the percentage

of incidents in which the system is used for accomplishing a certain task. This is consistent with Karahanna et al. (2006), who measured the scope of usage as the percentage of client interactions managed through the system. The necessary time to accomplish a task can be very different dependent on the task, thus the absolute amount of time doesn't seem to be appropriate (Karahanna et al. 2006). The total amount of usage time seems to be even contradictory to efficiency thoughts.

Construct	Definition / Measurements or examples of questions in the case study
Quality of usage	Definition see above; measurement by computer logs
Quantity of usage	Definition see above; measurement by computer logs
Actual ability / knowledge	Definition see above <i>How long have you used the system (days, months)?</i> <i>How much training did you receive (hours)?</i>
Perceived Ease of Use:	The degree to which a person believes that using a particular system would be free of effort (Davis 1986). Related to the <i>perceived</i> behavioral control by (Ajzen 1985) as well as to the construct of self-efficacy by (Bandura 1977). <i>How do you evaluate the ease of system usage? (Davis 1989)</i> <i>Do you think your interaction with the system is clear and understandable? (Davis 1989)</i>
Perceived Usefulness	The degree to which a person believes that using a particular system would enhance his or her job performance (Davis 1986). <i>Do you think that system usage enhances your effectiveness or your productivity on the job? (Davis 1989)</i> <i>Do you think that system usage improves your job performance? (Davis 1989)</i>
Attitude towards Usage	The individual's positive or negative evaluation of performing the behavior (Ajzen 1985), that means in this case of using the system. <i>Do you like the idea of using the system? (Taylor and Todd 1995a)</i> <i>Do you think it's pleasant to use the system? (Taylor and Todd 1995a)</i> <i>Do you think it's a good idea to use the system? (Taylor and Todd 1995a)</i>
SN (Superiors)	Extent of the individual's perception that superiors want him to use the system (Moore and Benbasat 1991; Taylor and Todd 1995a) and his motivation to comply. <i>Do you think that your superiors think that you should use the system? (Taylor and Todd 1995a)</i> <i>Does your superior require you to use the system? (Venkatesh and Davis 2000)</i> <i>To what extent do you want to comply to that? (Taylor and Todd 1995a)</i> <i>Would you say that your use of the system is voluntary? (Venkatesh and Davis 2000)</i> <i>Is the use of the system compulsory in your job? (Venkatesh and Davis 2000)</i>

Table 1 Conceptualization of constructs

Next steps and research methodology

A theoretical framework has been set up which tries to answer the research questions. The subsequent research procedure is planned as follows:

So called positivistic case studies (Dubé and Paré 2003) will be conducted for a first validation of the framework. Eisenhardt (1989) claims there can be a priori constructs, but there shouldn't be hypotheses in advance. The procedure of this study is not accordant with this claim. It was chosen because not all of the assumed relationships are new; especially the integrated TAM is a well-proven theory. Only one construct, quality of usage, and only a part of the relationships are new and make for the explor-

ative character of the study. Thus, it seems to be appropriate to build up a theoretical framework in advance. But the new constructs and relationships will be investigated especially thoroughly and in an open-minded way during the conduction of the cases.

Regarding case selection, a few aspects have to be pointed out: First, usage quality can only be observed if there is any quantity of usage. Thus, it doesn't make sense to analyze cases where employees completely refuse system usage. Second, variance regarding quality of usage must be possible to occur. In other words, if the whole usage consists of pressing two buttons on the keyboard, it doesn't make sense to measure usage quality. Third, for being able to observe and evaluate usage behavior, the technology shouldn't be too complex and the tasks to accomplish with the system should be self-contained entities.

It is intended to conduct three pairs of cases. In each pair *one* group of employees will be analyzed regarding the usage of *two* different systems; one which is used on a voluntary basis and one which is used under compulsion. Thus, altogether the usage of six systems by three different groups of employees will be investigated. In each case interviews will be conducted with one superior, one member of IT staff and four to six users.

The analysis of the cases will be accordant to Miles and Huberman (1994), Eisenhardt (1989) and Yin (2003). Basing on the results, the framework will be adapted, that means it is possible that new constructs or relationships appear to be important and have to be integrated into the original framework, or, on the other hand, that assumed relationships appear to have no or minor significance for answering the research questions and have to be excluded from the framework.

Afterwards, the (adapted) framework will be validated in a quantitative way, that means by written questionnaires and their statistical analysis. Thus, the overall research methodology will be mixed, qualitative and quantitative.

Discussion and conclusions

This paper aims to contribute to IT adoption research by conceptualizing *quality of usage* as a main, so far neglected aspect of IT usage behavior besides quantity of usage. It is postulated that both aspects have to be taken into account for explaining IT implementation outcomes.

Especially in situations where the usage quantity doesn't vary, which can be expected mainly in mandatory usage situations, quality of usage can explain different implementation outcomes. For this reason this paper includes the aspect of *mandatory usage*, conceptualized as SN regarding superiors. In voluntary settings, a negative attitude towards an IT system impacts usage quantity. But in mandatory settings, even users with a negative attitude towards usage can be forced to use the system. It can be expected that their usage behavior differs from the one of users with a positive attitude. Quality of usage seems to be the right starting point for the investigation of these differences.

The third contribution of this paper is the conceptualization of *actual ability / experience* regarding a system as a main determinant of usage quality. This aspect hasn't been conceptualized in former IT acceptance models, but seems to be of major importance. Even a user with a positive attitude, who wants to use the system in an appropriate way, can't do that without the necessary knowledge.

It is expected that there are more than the postulated relationships between the constructs. For example (Venkatesh and Davis 2000) found a positive relationship between SN and perceived usefulness. Furthermore, the differentiation between intrinsic and extrinsic motivation towards usage, the relationship between the two of them and the impact of SN on both of them (Davis et al. 1992) promise further exciting aspects for future research.

It was tried to keep the model as simple as possible to investigate the main basic assumptions. If these are proven to be right, extensions and combinations with former models seems to be widely possible.

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