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UNDERSTANDING THE ADOPTION AND USE OF IT ARTEFACTS: A STRUCTURATIONAL MODEL

Daniel Grgecic
Goethe University Frankfurt

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Grgecic, Daniel, Goethe-University, Grüneburgplatz 1, RuW Building, 60323 Frankfurt, Germany, grgecic@wiwi.uni-frankfurt.de

Abstract

Within the Information Systems literature, there has been a call for new theories to investigate IT adoption and IT use. Based on Adaptive Structuration Theory a new model was developed to capture different functionalities, values and meanings provided by IT systems. Using a sample of 183 users of a student IT system, the research model and the hypothesized relationships were tested for the first time. Findings from the study show that the proposed constructs explain a large amount of IT use and might contribute to the understanding of the relevant factors of IT adoption and use in IS research.

Keywords: IT adoption, Adaptive Structuration Theory, IS acceptance.

1 Introduction

IT (Information Technology) pervades important aspects of human life at different levels, such as individuals, teams or organisations. An important and long-standing research question in the field of Information Systems (IS) research deals with the acceptance of IT and its success factors. The interplay between IT and individuals has been investigated, especially within two major research streams – the technology adoption and the user satisfaction literature – and both research streams have converged on a shared understanding of the salient predictors of individuals' acceptance and intentions to use IT (Venkatesh et al. 2003). While both research streams have made important contributions to the field of IS the narrow definition of utilitarian-based beliefs and attitudes to assess IT artefacts has been criticized and a call for a broader assessment of IT systems was made (Al-Natour and Benbasat 2009). At the same time, research on IT adoption calls for a more feature-centric view of technology to account for the very different feature adoption decisions, feature use behaviours, or feature extension behaviours made by an individual user (Jasperson et al. 2005). Many studies on IT success or IT adoption treat IT systems as a black box and therefore neglect the many effects that may result from different functions that are offered by an IT system. Until now, only a few studies have investigated the use of different features and tried to uncover the effects of different functionalities (see e.g. Cenfetelli et al. 2008, Sun and Fricke 2009). Therefore, different functions provided by an IT system might not only be useful to support tasks in an efficient way but might also enable the execution of processes and tasks in new and innovative ways.

In sum, concentrating on behavioural intentions, attitudes, and beliefs and treating IT systems as a "black box" might neglect important aspects of IT acceptance and IT use. We therefore suggest to use an alternative way of studying IT interactions and propose to use Adaptive Structuration Theory (AST, DeSanctis and Poole 1994) as a meta-framework for reasoning and theorizing (Bostrom et al. 2009). In doing so, we present a fresh approach to research on IT adoption in contrast to already established theories, such as the technology acceptance model. Especially in the post-adoptive context, where people have already developed their attitudes toward a system and have established intentions, we propose that applying AST can provide additional insights into human-system interaction because AST-based concepts like structural features and spirit are essential for research on IT effects (Markus and Silver 2008). In this paper, we aim to answer the following research questions:

- How can we conceptualize AST to be applicable in quantitative studies of IT adoption?
- What kind of structural features provided by an IT system have an effect on IT use?

In the remainder of this paper, we first discuss the theoretical groundings and assumptions we build on to study the effects of IT systems on IT use. We then develop our research model. This is followed by an empirical study of a student information system. Lastly, we discuss this study's contributions and limitations, and give an outlook on future research.

2 Theoretical Background and Hypothesis Development

2.1 Adaptive Structuration Theory

To answer our research questions, we build on AST to develop a theoretical framework for the structurational features of an IT system and their impacts on individual IT use and propose seven hypotheses (Figure 1). AST, developed by DeSanctis and Poole (1994), is one of the most influential structurational approaches in IS research (Jones and Karsten 2008). It is a social theory that describes the interplay between technology, social structures, and human action, and is a holistic attempt to examine the use and the impacts of advanced technologies in organizations (DeSanctis and Poole

1994, Poole and DeSanctis 2003, Grgecic 2011). Initially, DeSanctis and Poole (1994) considered social structures (rules and resources as basis for human behaviour) embedded in technology in the form of "structural features" and "spirit" (Markus and Silver 2008). Structural features are said to bring meaning and control to group interaction. For a group support system, for example, these might include voting algorithms and anonymous recording of ideas. The spirit of a structural feature set is described as its underlying general intent with regard to values and goals. Both concepts serve as a source for social structure and influence the way people actually use IT. However, these definitions are highly controversial, as the concepts of structural feature and spirit are conceptualized as properties of an IT system, although such values are fundamentally attributed to human agents (Jones and Karsten 2008, Poole 2009). To resolve this controversy, Markus and Silver (2008) propose two different concepts that are not defined as properties of a technology but as *relations* between technical objects and human agents: "functional affordance" and "symbolic expression". These structures provided by an IT system partly influence human behaviour and serve as a basis to study the effects of IT systems on different user groups. Thus, researchers can make hypotheses about the properties of IT artefacts that may be associated with particular effects, i.e. use behaviours or performance gains. However, since the properties of IT systems are not directly attributed to the technical object itself but to the relation between technical objects and users, this conceptualization emphasizes the importance of technology-human interactions. In other words, every user or user group perceives, understands, and grasps the structures that are provided by technical objects differently, thus the technology in use and the user (the relation between them) are inextricably connected and cannot be studied separately.

2.2 Functional Affordance of IT Systems

The term "affordance" was introduced by Gibson (1977) and refers to actionable properties between any real-world object and an actor. Affordances are relations between objects and actors in special situations and can be described as cues and instructions that are offered by an object to the user in order to provide opportunities for particular types of individual behaviour (Chemero 2003). *Functional affordances* comprise "the possibility for goal-oriented action afforded by technical objects from designers to a specified user group (potential use of an IT object)" (Markus and Silver 2008). They are purposefully designed to assist and help users to accomplish tasks (Hartson 2003). Therefore, the functional affordance of an IT system refers to the potential uses one can make of a technical object in order to achieve a certain goal. The concept of *functional affordance* provides a perspective that recognizes how features of certain technical objects favour, shape, invite, or at the same time constrain a set of specific uses (Markus and Silver 2008). In contrast to already well-understood constructs like perceived usefulness (Davis 1989), functional affordance allows and requires focusing on distinct functionalities provided by an IT system. Thus, it enables researchers to investigate the impact of functionalities more precisely. Cenfetelli et al. (2008) for example introduce a "Supporting Services Functionality" construct and demonstrate how perceived service functionality influences service quality, perceived usefulness and overall satisfaction of a website.

Although every object has specific affordances, what researchers are dealing with are not the affordances themselves, but rather the combination of the perceived affordances and the behavioural constraints that are placed upon them, such as physical, logical, and cultural constraints (Norman 1999). Physical constraints refer to technical possibilities of an IT system. For example, it is not possible to move the mouse cursor outside the screen. Logical constraints mean logical reasoning to determine alternatives, such as when a user is asked to click on five locations but only four are actually visible. Thus, the user knows that there must be another location. Cultural constraints can be understood as shared conventions by a cultural group. For example, the colour "red" can have different meanings in different cultures and can therefore afford different types of behaviours. Depending on the aforementioned constraints, the possibilities that technical objects afford for action may or may not be perceived by several individuals in differing ways and therefore elicit different kinds of behavioural outcomes. Therefore, only if there is a congruence between the functional

affordance of an IT system and the users' intentions and goals there will be a positive effect on the frequency and extent of IT use (Goodhue 1995, Goodhue and Thompson 1995).

Hypothesis 1: The functional affordance of an IT system will positively affect IT use.

2.3 Symbolic Expression

Similar to the concept of functional affordance, a *symbolic expression* is not a property of a technical object but a relational concept that connects technical objects and users. They can be understood as "the communicative possibilities of technical objects for a specified user group" (Markus and Silver 2008) and enable the interpretation of technical objects and the consequences resulting from those interpretations. For example, symbolic expressions include "messages" that help users interact with technical objects or functionalities, or messages pertaining to designers' or users' goals and values. Symbolic expressions are not to be confused with designer's intentions or user's perceptions. It is true that IT systems express "messages" and provide information intended by designers. However, they may also provide information that is not intended by designers and users may or may not perceive certain signs, symbols, or messages differently due to the fact that every user has a different background, expertise, or knowledge base. Referring to de Souza and Preece (2004), Markus and Silver (2008) focus their definition of symbolic expression on the conveyance of values, even though the concept is not inherently limited to the domain of values. An expression can be understood as the manner or form in which a thing is expressed in words, or in the special case of a symbolic expression, in which a thing is expressed in any kind of symbols. We therefore argue that the conveyance of meaning or from the perspective of an user, the understanding of a symbol is as important as the value-laden intent of an IT system. While meaning of a symbol does also promote some kind of values because the concept is inherently connected to values of a symbol, meaning is mostly considered as the interpretation by a user of an underlying real-world phenomenon (or abstract concept) that a symbol refers to (Margolis and Laurence 2006). Symbols serve as a means of communication; successful communication requires the know-how to produce the relevant signs/symbols with the intended meaning (Bühler 1990, Hesse et al. 2008). In general, IT systems can promote values such as control or reliability on an aggregate level; however, the understanding of certain perceptual cues needs to be considered in more detail as well. If a symbol is to convey meaning it must be identified by a user group and the symbol must communicate a similar meaning to all users within a group. For instance, concerning the example of Wikipedia, do the users understand what the meaning of the "edit button" is and how it has to be used? What this discussion amounts to is that we propose to subdivide the concept of symbolic expression into two distinct sub-concepts: *communication of values* and *communication of meaning*. Communication of values deals with values that should be conveyed by an IT system to support certain functionalities or tasks. Communication of meaning comprises the understanding of functionalities that are provided by an IT system. Defining the concept this way has the advantage of supporting potential analyses of the relationships between functional affordances, symbolic expressions and IT use in more detail. Ultimately, this conception also allows directly answering the question whether users understand the functionalities of IT systems. Thus, we are not asking users if an IT system is user-friendly, rather we focus on the understanding of the IT system (its functionalities) and the values conveyed by the system. Still we assume that communication of meaning and communication of values will be a sub-construct of symbolic expression and will therefore be positively correlated.

Hypothesis 2: Communication of meaning and communication of values will be positively correlated.

The objective of an utilitarian information system is to increase the user's task performance while encouraging efficiency and productivity. Therefore, an important tactic that developers employ is to align an IT system with task requirements (Goodhue 1995, Goodhue and Thompson 1995). However, a prerequisite for a task-technology alignment is that users of an IT system understand the IT system and perceive the values that are conveyed by that system in order to use it as developers intended (Grange and Benbasat 2010). Only if there is a congruence between the users' values and goals and

those underlying the IT system, users will be able to perceive the functionalities afforded by the IT system and ultimately make use of them (Soliman and Beaudry 2010). The same reasoning applies to the relation between communication of meaning and functional affordance. Users will be more prone to perceive the functionalities as intended by the designers if they basically understand the underlying IT system and its functionalities.

Hypothesis 3A: The communication of meaning will have a positive effect on the functional affordance of an IT system.

Hypothesis 3B: The communication of values will have a positive effect on the functional affordance of an IT system.

In general, symbolic expressions may be erroneous; or functional and value-oriented symbolic expressions may be in conflict with each other. Moreover, a technical object may have many different symbolic expressions for a specified user group. Therefore, every study that seeks to assess the effects of IT systems needs to take possible misconceptions of symbolic expressions as well as different possible user groups into account. In their seminal paper on AST, DeSanctis and Poole (1994) propose that the use of IT systems can only lead to desired and intended outcomes if social structures are appropriated by users in an "ideal" way. Only if users of an IT system know the IT system and the underlying functionalities well and know how to use them in order to accomplish a certain task at hand, the IT systems will lead to performance gains. Traditionally, AST was developed and applied to investigate technologies such as electronic messaging systems, collaborative systems, and group decision support systems that enable improved team collaboration and team performance (Salisbury et al. 2002, Poole and DeSanctis 2003). While consensus on how to adopt and use a technology may be an important prerequisite for group and collaboration systems, there is no clear evidence supporting that same assumption when it comes to individuals using the same IT artefact without collaborating with each other. Therefore, we suggest that the structures provided by an IT system through the channels of communication of meaning and communication of values will also affect the use of IT systems on an individual level.

Hypothesis 4A: The communication of meaning will positively affect IT use.

Hypothesis 4B: The communication of values will positively affect IT use.

Individual productivity consists of behaviours that are carried out in order to complete a certain task or to serve a certain purpose. It can be understood as the extent to which the usage of an IT system improves the user's output (Torkzadeh and Doll 1999). IT use is one of the key variables in most theoretical frameworks on IT success and an important antecedent of individual productivity (DeLone and McLean 2003, Petter and McLean 2009). Therefore, we argue that:

Hypothesis 5: IT use will have a direct effect on individual productivity.

Figure 1 shows our research framework and the proposed hypotheses. Summing up, we investigate the effects of the structurational features of an IT system on IT use and individual productivity.

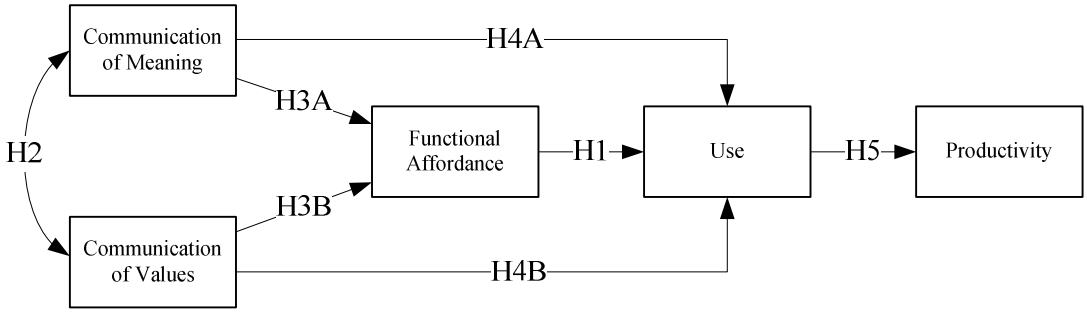

Figure 1. Research Framework

3 Methodology

3.1 Research Site and Data Collection

Data for this study was collected by surveying users of a computerized student IT system (SIS) in place at a Western university. The IT system provides students with information about lectures, seminars, and courses. Moreover, it offers the possibility to plan and manage the entire semester. The use of the IT system is mandatory, since all course materials are only provided via the IT system. Above this, the SIS is ideally suited to test the research model, since its functionalities as well as its scope are limited and the purpose of the system is precisely determined. The students attended a basic Information Systems course during the winter term 2011. Out of approximately 380 students a total of 200 students participated in the online questionnaire. After removing all questionnaires that were incomplete or not reliable a total of 183 usable questionnaires were received. The questionnaire included measures for all latent constructs. Respondents ranged from 18 to 42 years of age, with a mean age of 21.8 (sd = 2.8). On average, students (106 male students and 77 female students) were in their second semester (mean 2.2, sd = 0.88).

3.2 Measures

To ensure content validity, we followed the two-staged approach proposed by Burton-Jones and Straub (2006). We first interviewed four students in order to find out about the most common functionalities and in order to understand the IT system from the point of view of a student. Thus, we were able to make sure that all important functionalities and values that are provided by the SIS are being considered. Based on a previous study (see Grgecic and Rosenkranz 2011), the theoretical deliberations, and the interviews, we then created measures that tie together the constructs in our research model and that seemed suitable to reflect our underlying causal relationships.

Most constructs were operationalised as reflective indicators (Jarvis et al. 2003). All variables were measured using multiple items on 7-point Likert-type scales, ranging from “strongly agree” to “strongly disagree” (Table 1). Communication of meaning (COM) was measured using six reflective items. Students were asked if they knew and understood how different functionalities provided by the SIS work. IT use (USE) and Individual Productivity (PROD) were modelled as reflective constructs since we were interested to find out if students thought their perceived personal performance would rise by using the SIS. Communication of values (COV) was operationalised using five reflective items. The set of relevant values were determined with the help of the interviews. Since the SIS serves as a tool to support students during their studies we focused on values that are associated with productivity. The construct of functional affordance (FA) was operationalised as a formative construct (Petter et al. 2007). The decision to model a formative construct was based on different criteria (Jarvis et al. 2003, Petter et al. 2007). We were especially interested to find out what kind of different functionalities were offered by the IT system and to what extent these functions were important for the users. While one could easily define general items that ask to what extent the IT system as a whole is being used, we wanted to focus on the most important features that build and therefore define the construct functional affordance. Therefore, changes in the variables influence the meaning of the formative construct. In other words, if different functionalities were added to the system the functional affordance of the SIS (thus what the IT system offers to do) would change significantly. In addition, the formative measures may not be interchangeable since every measure accounts for a unique dimension of the formative construct. Again, the set of items was developed with the help of the interviews in order to be sure that the most important functionalities were considered in our survey. We added control variables as IT use may vary across users with different demographic characteristics such as age, gender, degree and semester.

Items		COM	COV	FA	USE	PROD
I know how to download the offered course materials.	COM1	**0.76**	0.34	0.46	0.42	0.41
I know how to use the forums.	COM2	**0.78**	0.28	0.37	0.37	0.41
I know how to apply for a course.	COM3	**0.72**	0.37	0.41	0.36	0.34
Generally, I understand the basic functionality of the system.	COM4	**0.84**	0.47	0.47	0.38	0.50
In general, I understand how the system works.	COM5	**0.87**	0.43	0.41	0.41	0.48
I know how to use the system and its functionalities.	COM6	**0.81**	0.37	0.33	0.32	0.44
Reliability	COV1	0.35	**0.76**	0.42	0.41	0.43
Effectiveness	COV2	0.39	**0.84**	0.25	0.27	0.44
Efficiency	COV3	0.44	**0.90**	0.29	0.31	0.50
Productivity	COV4	0.40	**0.84**	0.28	0.35	0.54
Control	COV5	0.36	**0.75**	0.22	0.26	0.41
The system offers the possibility to learn about the offered courses.	FA1	0.33	0.13	0.51	0.33	0.38
The system offers the possibility to download course materials.	FA2	0.41	0.24	0.85	0.63	0.49
The system offers the possibility to exchange opinions with other students.	FA3	0.33	0.36	0.48	0.24	0.37
The system provides information about seminars and lectures.	FA4	0.34	0.30	0.76	0.56	0.50
The system offers the possibility to use a forum.	FA5	0.39	0.37	0.67	0.41	0.40
I use the system on a regular basis.	USE1	0.44	0.39	0.54	**0.81**	0.60
I use the system to access my course materials.	USE2	0.38	0.27	0.63	**0.83**	0.58
I am using the system regularly.	USE3	0.39	0.32	0.49	**0.80**	0.60
I use the system to get information about my lectures and seminars.	USE4	0.30	0.30	0.52	**0.70**	0.55
The system helps me to manage my course materials.	PROD1	0.47	0.49	0.56	0.63	**0.83**
The system increases my productivity.	PROD2	0.44	0.44	0.42	0.48	**0.78**
The system helps me to get my course materials more quickly.	PROD3	0.42	0.46	0.53	0.67	**0.82**

Table 1. Measurement Model, Factor Loadings and Cross-Loadings

4 Data Analysis and Results

4.1 Scale Validation

We validated our measures and tested our model by using Partial least squares (PLS) (Chin 1998). In order to check if COM and COV were correlated, we used SPSS and tested the correlation between the factor scores of those constructs. For constructs with reflective measures, we assessed internal consistency and convergent validity by examining item loading, composite reliability, and average variance extracted (AVE). Table 1 illustrates the factor loadings (in bold type) and cross-loadings. All factor loadings are significant ($p = 0.000$) and lie above the recommended threshold of 0.7 (Chin 1998). Composite reliabilities (CR) and Cronbach's alpha (CA) are above 0.8 and each AVE is above 0.50, indicating that the measurements are reliable and the latent construct can account for at least 50 percent of the variance in the items (Table 2) (Nunnally and Bernstein 1994, Jöreskog et al. 2001). Discriminant validity was also achieved since the squared correlations between each pair of latent variables are less than the AVE (Fornell and Larcker 1981).

Note that measures such as factor loading and average variance extracted are not applicable for the evaluation of formative constructs. Because these measures assume high internal consistency (high intercorrelating indicators) they are inappropriate for formative indicators, where no theoretical assumption is made about inter-item correlation (Straub et al. 2004, Petter et al. 2007).

Construct	Composite Reliabilities	Cronbach's Alpha	AVE	COM	COV	FA	USE	PROD
COM	0.91	0.89	0.64	1				
COV	0.91	0.88	0.67	0.4728	1			
FA	n/a	n/a	n/a	0.5191	0.3726	1		
USE	0.87	0.79	0.62	0.4794	0.4047	0.6941	1	
PROD	0.85	0.74	0.66	0.5434	0.5693	0.6314	0.743	1

Table 2. Reliabilities and Correlation Matrix

For functional affordance we assessed construct validity by using principal components analysis to examine the item weightings for measures (Petter et al. 2007). Three weightings are significant while the two other paths are insignificant (see Table 3). However, small absolute and insignificant weights should not inevitably be misinterpreted as a poor measurement model (Chin 1998). Instead one should further distinguish the relative and absolute contribution of the indicators to their respective construct (Cenfetelli and Bassellier 2009). In order to assess an indicator's absolute importance to the construct Cenfetelli and Bassellier (2009) suggest checking bivariate correlations (loadings) between the indicators and the construct. For FA3 and FA5 the loadings are positive and significant thus these items can be considered to be an important aspect of FA (Table 1). The insignificant weight of FA3 and FA5 should be interpreted as their relative contribution to FA after controlling for the other functions. In sum, these results are consistent with our expectation that the five different functions might not be equally important to the functional affordance construct. To ensure that multicollinearity does not pose a problem, we used the variance inflation factor (VIF) statistic to determine if measures are too highly correlated. Multicollinearity is a concern if the VIF is higher than 3.3 for formative measures (Diamantopoulos and Siguaw 2006). Table 3 shows that VIF values for all items are below the threshold.

Construct	Items	Outer weights	VIF
Functional Affordance	FA1	0.207*	1.224
	FA2	0.555***	1.325
	FA3	0.148	1.354
	FA4	0.298*	1.712
	FA5	0.190	1.811
***p<0.001, **p<0.01, *p<0.05			

Table 3. Factor Weights and Variance Inflation Factor

4.2 Common Method Bias

As with all self-reported data, there is a potential for common method bias (CMB) resulting from multiple sources such as consistency motif and social desirability (Podsakoff et al. 2003). To check for CMB we included a common method factor in the PLS model whose indicators included all the principal constructs' indicators. We then calculated each indicator's variances substantively explained by the principal construct and by the method. We followed the approach as proposed by Liang at al. (2007) but only included the reflective constructs, because to the best of our knowledge there still is no agreed upon method for testing CMB for formative constructs. The results demonstrate that the average substantively explained variance of the indicators is 0.65, while the average method-based variance is 0.005. The ratio of substantive variance to method variance is about 130:1. In addition, none of the method factor loadings are significant. Given the small magnitude and insignificance of

method variance, we contend that the method is unlikely to be a serious concern for this study. Since the questions were randomly shuffled within the survey we assume that CMB does also not pose a problem for the formative FA items.

4.3 Structural Model

Figure 2 provides the R^2 and path coefficients along with their respective significance levels from PLS analysis. The link between functional affordance (FA) and IT use is significant ($\beta = 0.581$, $p < 0.001$), thus offering evidence for H1. H2 predicts that communication of values (COV) and communication of meaning (COM) will be positively correlated. The correlation between COV and COM is significant and therefore supports H2 ($\beta = 0.47$, $p < 0.001$). An additional factorial analysis supported discriminant validity; thus COV and COM can be interpreted as sub-constructs of symbolic expression. As for H3A and H3B, Figure 3 shows a significant link from COM to FA ($\beta = 0.442$, $p < 0.001$) and from COV to FA ($\beta = 0.164$; $p < 0.05$). We thus found support for H3A and H3B. H4A and H4B hypothesize that COM and COV directly impact IT use. We could find a significant correlation between COV and IT use ($\beta = 0.156$, $p < 0.01$) whereas the path between COM and IT use is not significant. We further tested if the effect of COM on IT use is mediated by FA. To test the mediation, we removed FA from the model and found that the link from COM to FA became significant ($\beta = 0.364$, $p < 0.001$). This finding indicates that the effect of COM on IT use is fully mediated by FA. The effect of IT use on individual productivity is significant ($\beta = 0.744$, $p < 0.001$) thus supporting H5. R^2 values indicate the amount of variance in the construct that is explained by the path model. The results as shown in Figure 2 indicate that the model explained 52% of the variance in IT use. Similarly, 29% of the variance in FA was explained by COM and COV. The model explained 55% of the variance in individual productivity. With regard to the four control variables included in the model, none of them were significantly related to IT use or individual productivity. Thus, we conclude that the variance in IT use as well as individual productivity does not depend on the control variables.

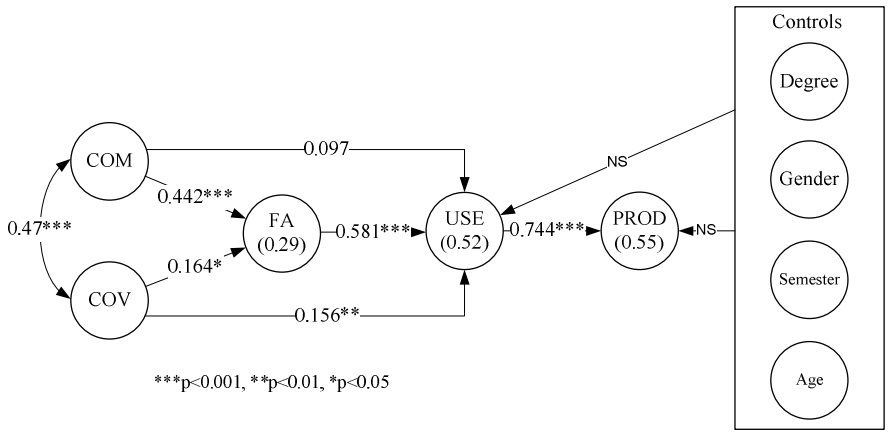

Figure 2. Research Model Results (R^2 in parentheses)

5 Discussion and Conclusion

In this paper, we transferred Markus and Silver's (2008) extensions of AST to research on adoptive behaviour by illustrating and discussing how IS researchers might use AST-based concepts in quantitative studies. The primary goal of this research was to develop a causal model in order to understand how various structurational features that are provided by IT systems affect the use of IT systems. Compared to already established theories such as TAM, we propose a fresh approach to the study of IT adoption and IT use. To this end, we tested a new model that links the structurational concepts of functional affordances, communication of values and meaning to IT use. We divided the construct of symbolic expression into communication of values and communication of meaning and

provided some evidence that symbolic expression is a multifaceted construct. It consists of different types of values and meanings that are conveyed by an IT system. The correlation between communication of values and communication of meaning indicates that values conveyed by an IT system positively influence the understanding of the system, and vice versa. Communication of values have a positive impact on functional affordance which shows that values conveyed by an IT system positively affect how functionalities are perceived. In the case of the present study, the SIS supports values such as efficiency, productivity and control which ultimately impact the awareness of the functionalities offered by the SIS. Communication of meaning positively affects functional affordance as well, and provides some evidence that the understanding of the underlying functionalities contributes to the awareness of the functionalities afforded by the SIS. Interestingly, our study provides some evidence that only communication of values directly affects IT use. We could find support for the mediating role of functional affordance for communication of meaning. Thus, the values communicated by the SIS do not only influence the awareness of the functionalities but also the use of the SIS, while the communication of meaning indirectly influences the use of the SIS through the functional affordance. In sum, these results indicate that if users perceive the values as intended by the system developers and develop an understanding of the IT system (its functionalities) they seem to be inclined to being guided by the IT system and its functionalities. Altogether, the structural features provided by the SIS account for over 50% of variance in IT use. Especially the construct of functional affordance shows a large direct impact on IT use with an effect size of 0.52 (Chin 1998). Furthermore, as expected we found a strong significant relation between IT use and individual productivity.

The research model offers several advantages to researchers and practitioners interested in the social dynamics of human-IT interaction. The conceptualization based on AST encourages researchers as well as practitioners to investigate the relation between human agents and the IT system in more detail since the functional affordance construct has to be adapted to every new IT system and the user groups in focus. Researchers have to realize which kinds of functionalities are provided to a certain user group to support a specific task in order to develop items that grasp the functional affordance of an IT system. The same applies to communication of values and meaning. Researchers have to be aware of what kind of values an IT system is supposed to provide; e.g. an ERP system should convey different values than collaborative tools. Thus, our research comes together nicely with Jones and Karsten's (2008) call for more attention on the interaction between technology and human action. An obvious limitation of our research pertains to the sample and the IT system that was investigated. Focusing only on the students as the target users of the SIS allowed us to control for extraneous factors such as different use intentions and objectives, different user types and so forth. Future research should examine the model across different populations and different IT systems, especially where IT use is completely voluntary. However, the proposed model explains a large variance of IT use in this mandatory setting and therefore seems to be applicable to situations where users are more or less forced to use a certain system. In a mandatory setting, the provision of "right" structures (functionalities, values and meaning) to support a task might even be more important than in a voluntary setting since users do not have a choice to switch to another IT system. Despite the aforementioned limitations, our research adds to the existing knowledge on technology application and use. The structurational potential of IT systems (symbolic expression and functional affordance) cannot fully determine individual outcomes since IT systems are embedded in an organizational environment that provides different structures such as norms and values. However, Giddens acknowledges the value of decomposing structuration by taking institutions as a backdrop and by focusing on the structural potential of technical objects that shape and generate social structures (Giddens 1984). This bracketing artificially segments structuration, but it is still admissible and justified for methodological purposes (Poole and DeSanctis 2003). Until now only a few studies have investigated the use of IT systems at a feature level (see i.e. Jasperson et al. 2005, Cenfetelli et al. 2008, Sun and Fricke 2009). In detailing AST and Markus and Silver's (2008) concepts, we have developed a foundation for the quantitative study of IT adoption that will hopefully contribute to the knowledge on IT adoption and open up new perspectives in IS research.

6 References

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