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The role of perceived enjoyment and social norm in the adoption of technology with network externalities

Astrid Dickinger[1], Mitra Arami[2] and David Meyer[3]

[1]*Department of New Media Technology, MODUL University Vienna, Vienna, Austria;* [2]*Project Management Competence Center, University of Applied Science FH BFI, Vienna, Austria;* [3]*Department of Information Systems and Operations, Vienna University of Economics and Business Administration, Vienna, Austria*

Correspondence: Astrid Dickinger, Department of New Media Technology, MODUL University Vienna, Am Kahlenberg 1, A-1190 Vienna, Austria.
Tel: +43 1 320 3555 412;
Fax: +43 1 320 3555 903;
E-mail: astrid.dickinger@modul.ac.at

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Abstract
The emergence of highly interactive media and the increased connectivity among people call for an investigation of usage behaviour of those media. People tend to rely heavily on peer-to-peer interaction influencing the adoption of new media formats that enhance this interactivity. The first explorative phase of this research consists of interviews with experts and focus groups and builds the basis of the proposed framework and measurement model. Then, a Structural Equation Modelling approach is used to assess the relative importance and the strength between different constructs, including perceived enjoyment, social norm, usefulness, ease of use and intention to use. The results indicate that perceived enjoyment and social norm are important antecedents for the adoption of technology with network externalities.
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Introduction

Understanding the adoption of mobile services is important to industry players, researchers and marketers. According to Nysveen *et al*. (2005), there are three different traditions relevant in this context. First is the traditional adoption theory, which has its foundation in both marketing and information systems (IS) research; second, the uses and gratification research, which has its origin in media and communication theory; and the third is the domestication research, a tradition having its foundation in sociology. Traditional adoption and diffusion theory allows us to integrate the main drivers of adoption; gratification and domestication theory allows us to integrate the motives of users to adopt. These motives can include fun, perceived enjoyment, social norms and network externalities (Nysveen *et al*., 2005). The latter is particularly important since an increasing number of highly interactive services (e.g., Push to Talk, Messenger, Skype, etc.) emerge, which depend on a high number of people using them.

The analysis of external effects in network industries (and communication markets in particular) has a long tradition in the economic literature. The starting point for all authors is that both existing and new participants of a communication network benefit from its growth because the generated benefit for each customer increases when more participants can be reached. Artle & Averous (1973) find that the public-good-property of communication networks results in a self-sustaining growth of demand.

Squire (1973) builds an equilibrium model to find the optimal price of services and studies implications on social welfare. Rohlfs (1974), after refining these results, discusses implications on the pricing strategy for new services. Later, Oren & Smith (1981) investigate critical mass issues and the influence of different tariffs in communication markets. Katz & Shapiro (1985) state that network externalities occur when 'the utility that a user derives from consumption of [a] good increases with the number of other agents consuming the good', and distinguish between direct and indirect effects. They construct a firm competition model in communication networks, and also emphasise that a consumer's decision to participate is based on his expectations regarding the network size – without, however, modelling how these expectations are formed.

In the IS area, a number of theoretical models that involve network externalities have been developed by several researchers, for example, Chismar & Meier (1992) and Riggins *et al.* (1994). These models are a basis for theoretical network literature in economics, and support analysing IS products or services that show network characteristics. The general finding is that network externalities play an important role in the adoption and valuation of network goods. Some researchers (Au & Kauffman, 2001) found that diffusion theory should include network externalities to explain the likely conflict between being an early adopter of an untested technology and a late adopter of mature technology. Others extend the Technology Acceptance Model (TAM) to confirm a positive influence of network externalities for communication technology such as instant messaging and e-mail (Strader *et al.*, 2007). In this research, we follow the notion of Strader *et al*. (2007) based on Katz & Shapiro (1985) and propose a working definition of positive network externalities. They are understood as the increased utility of a communication medium as a result of increasing user numbers.

In addition to theoretical models based on network externalities, IS research has paid considerable attention to understanding the attitude towards and satisfaction with IS.

Several behavioural models for explaining/predicting the adoption and usage of information technology have been proposed in the IS literature. Our work is based on the main ideas of the Theory of Reasoned Action by Fishbein & Ajzen (1975) and the TAM by Davis (1989), and is extended to acknowledge the hedonic purpose of using information technology (Van der Heijden, 2004), which can be observed by the extensive usage of fun services among the young. TAM has been used for several years to predict the attitudes and behaviours of employees using new technologies in their workplace. Naturally, when a model is introduced and tested in a workplace context, the results may vary depending on the consumer context. Venkatesh & Davis (2000) extended the original TAM model to explain perceived usefulness and usage intentions in terms of social influence and cognitive instrumental processes. The extended model, referred to as TAM2, was tested in both voluntary and mandatory settings. In an attempt to integrate the main competing user acceptance models, Venkatesh *et al*. (2003) formulated the Unified Theory of Acceptance and Use of Technology. This model was found to outperform the individual models.

Most of these research projects and the development of a majority of models explaining technology acceptance focus on the utilitarian aspect of information system usage (Goodhue & Thompson, 1995). When it comes to mobile media, however, the main reasons for usage among young people are rather hedonic than instrumental ones (Nysveen *et al*., 2005). Communication over the mobile device with their peers is an end in itself; thus, perceived enjoyment and social norms are hypothesised to be among the most important driving factors towards Push to Talk (PTT) adoption when targeting young people (Wilska, 2003). Childers *et al*. (2001) and Dabholkar & Bagozzi (2002) argue that a hedonic factor may be an important addition to technology acceptance models. Therefore, the extensive work on perceived enjoyment and fun in IS use (Taylor & Todd, 1995; Van der Heijden & Sangstad, 2002; Van der Heijden, 2003, 2004), as well as the body of knowledge regarding the influence of peers and social norms (Karahanna & Straub, 1999; Hung *et al*., 2003), was taken into account in our work.

There has been limited attention to the idea of network externalities in adoption models, that is, the fact that the usage of peers may lead to higher usefulness and perceived enjoyment of another user. The paper at hand aims at filling this gap in research by extending existing technology acceptance theories.

Research design

To analyse the effect of peers on individuals' adoption behaviour, a service with high peer-to-peer interaction is analysed. This study exemplifies the suggested theory by analysing PTT and the relationship between certain antecedents to the adoption of this new service. PTT is an instantaneous voice communication service based on voice over IP technology working over a packet-based network such as GPRS and EDGE. Not being limited to one-to-one but enabling one-to-many communication, it represents a convenient way for group interaction (Josifovska, 2004). Thus, the effect of network externalities can be hypothesised since the more the customers use the service, the more the useful it will be for the individual.

Figure 1 depicts the underlying research methodology. In the explorative phase, literature review, qualitative expert interviews and focus groups serve as a guideline for the identification of key drivers for PTT adoption. The confirmatory phase tests and analyses the suggested model.

In the explorative phase of research, 10 experts were interviewed. Six experts were employees at the five Austrian cellular operators and responsible for PTT in

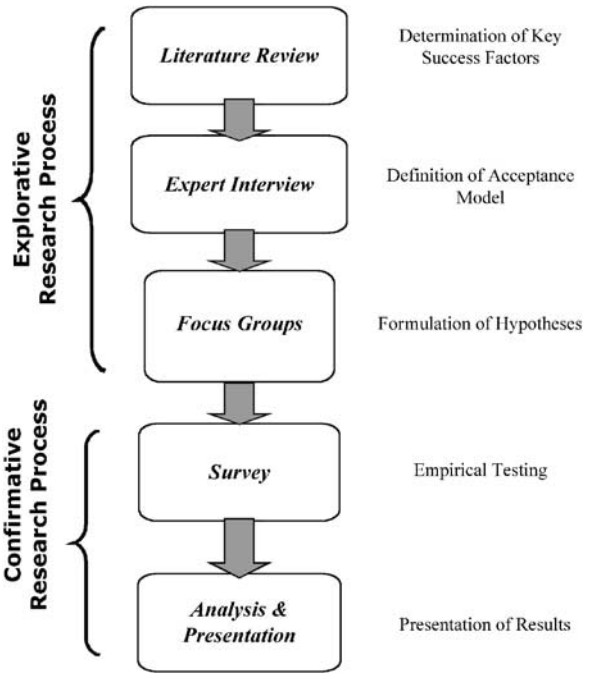

Figure 1 Research design.

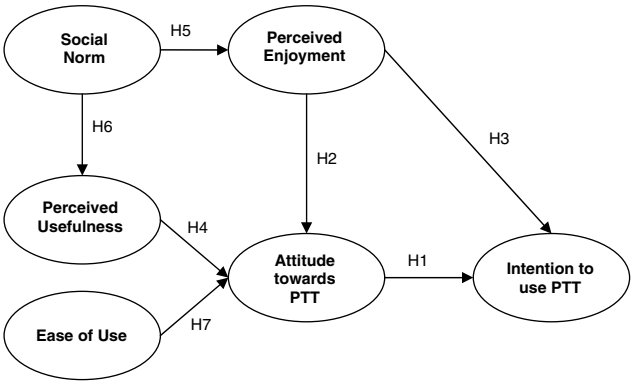

Figure 2 Adoption of PTT (Hypotheses model).

their company, either from a marketing or a technical point of view. The four other experts were responsible employees at two different vendors that offer PTT solutions. All interviews were conducted as semi-structured explorative interviews supported by a guideline. The questions covered drivers, inhibitors and the target groups for PTT.

The first focus group was an expert round table in which seven experts discussed the results of the interviews and the literature research beforehand. Except one, all were already previously interviewed during the expert interviews. The second focus group consisted of seven people between 23 and 29 years old who were potential users of the PTT service. The third focus group was made up of nine people between the ages of 24 and 34. Students, artists, self-employed persons and business managers were among the participants who were all voluntary mobile users. The main topics raised by the discussants were usefulness, ease of use, intention to use, social norm and perceived enjoyment. These factors were identified to mainly impact the intention to use PTT. In accordance with the literature, the experts and customers found the relationships established by TAM to be feasible. However, extensions would be required due to the argument that social norms drive usefulness and perceived enjoyment.

The goal of the empirical part of our research was the validation and testing of our model. After the model was built, we developed a questionnaire consisting of 30 randomised items. The constructs were measured using 5-point Likert scales after a pre-test. Data were collected in July 2004 in a field study. The interviewees had a short introduction to PTT and the handset. A standard script was used to ensure that all interviewees received the same information about the PTT service. Since it was just about to be introduced on the market, this procedure was necessary. The interviewees tested PTT through having a short conversation with other interviewees, thus gaining hands-on experience with the service. They then completed the questionnaire.

After data cleaning and omitting incomplete questionnaires, 218 out of 345 questionnaires were included in the further analysis. The respondents were between 12 and 46 years old, with a 70% majority below the age of 30.

The research model

The study uses six constructs: attitude towards PTT, perceived usefulness, ease of use, intention to use, social norm and perceived enjoyment. Figure 2 depicts the proposed research model.

In the following, we develop the corresponding hypotheses. Hypotheses 1, 4 and 7 are known from previous research (Davis, 1989) and are now tested in the PTT context to see whether they change when applied to a new domain. Additionally, we hypothesise that perceived enjoyment has an impact on attitude and intention to use (Hypotheses 2 and 3, respectively). All these are discussed in the following sections. A further contribution is testing the idea of network externalities in an adoption context by connecting social norms with perceived usefulness and perceived enjoyment (Hypotheses 6 and 5, respectively).

Attitude – intention

According to Fishbein & Ajzen (1975), 'attitude is a learned pre-disposition to respond in a consistently favourable or unfavourable manner with a given object'. It is a person's positive or negative feeling about performing a particular behaviour. Attitude is directly related to behavioural intention because people will only have intention to perform behaviours towards the things

for which they have positive feelings. In TAM2 (Venkatesh & Davis, 2000), attitude was dropped. However, Venkatesh *et al*. (2003) acknowledge the fact that attitude is an interesting construct. The literature review reveals that, in some cases, the relations with this construct are significant – in particular when cognitions (effort expectancy) are not included in the model (Venkatesh *et al*., 2003). This is the case for the research at hand. Furthermore, the setting of the research is not an organisational but an individual one. In most cases, the sample was drawn from an organisation; in our work, the use is voluntary among end users in Austria. According to Venkatesh *et al*. (2003), there are several streams in research with one focusing on persons' individual acceptance of technology and usage intention or usage as dependent variable (Davis *et al*., 1989; Compeau & Higgins, 1995). Furthermore, a second stream was identified with a focus on implementation at the organisational level (Leonard-Barton & Deschamps, 1988; Venkatesh *et al*., 2003) and task-technology-fit (Goodhue, 1995; Goodhue & Thompson, 1995). In our research, we focus on the first one: individual acceptance. Therefore, we strongly draw on theory from Davis (1989) and also include attitude in the model.

In our proposed model, the explanatory variables have an influence on attitude, which, in turn, affect the behavioural intention. In accordance with current conceptualisations of attitude in research, we consider attitude to be the user's summary evaluation (Ajzen, 2001) of a mobile service. This refers to the disposition towards a specific service rather than mobile services in general, as one service might be regarded positively by a user and another as completely invaluable. Considering the above arguments, we propose:

H1: *Attitude has a direct, positive effect on the intention to use PTT.*

Antecedents of attitude and intention

Perceived enjoyment A number of studies investigate the effect of perceived enjoyment in computer usage studies. The original TAM was extended with the construct of perceived enjoyment by Van der Heijden (2003) in a survey investigating the usage of web sites. A research project analysing the antecedents of perceived playfulness showed that speed, content, variety and focused attention are the most important factors (Chung & Tan, 2004). Lessons learned from human computer interaction, acceptance and usage surveys can be adapted to the mobile medium. Mobile communication is favoured by many young people because it is fun communicating with peers and they enjoy this new form of communication. This was discussed in the focus groups and the qualitative research. These findings led to a model suggesting an influence of perceived enjoyment on mobile service usage. In line with the literature (e.g., Moon & Kim, 2001; van der Heijden, 2004) that perceived enjoyment is an important factor influencing IS usage, we propose the following hypotheses:

H2: *Perceived enjoyment has a direct positive influence on the attitude towards PTT.*

H3: *Perceived enjoyment has a direct positive influence on the intention to use PTT.*

Perceived usefulness In line with TAM (Davis *et al*., 1989), we define perceived usefulness as 'the degree to which an individual believes that using the services will contribute to reaching a particular objective'. Consistent with the literature on information system usefulness (Davis, 1989; Taylor & Todd, 1995), we propose that increased usefulness is positively associated with the attitude towards usage of PTT services. The experts' and users' discussion in the qualitative phase showed that the potential of PTT in facilitating communication with more than one user at a time and the instant feedback on one's availability are main assets. As such we propose:

H4: *Perceived usefulness has a direct positive effect on the attitude towards PTT.*

Social norm Venkatesh *et al*. (2003) define social influence as 'the degree to which an individual perceives that important others believe he or she should use the new system.' Social influence is also included in the TAM (Davis, 1989) and Theory of Planned Behavior (Ajzen, 1991) as a determinant of behavioural intention. Cheung *et al*. (2000) found that social factors and facilitating conditions had the most influence on web usage. In more recent surveys on mobile technology usage, the results were similar: social norms are highly influential in explaining the adoption and use of new media (Webster & Trevino, 1995). Users are often influenced by social norms, peers and their surroundings. Hung *et al*. (2003) and Kleijnen *et al*. (2004) found that social norms had an influence on the intention to use a mobile service. The latter also acknowledge the moderating role of social norms for mobile service adoption. In this survey, we go a step further and propose that the more the users perceive social norms, the more they perceive the service as useful. This is also in line with the findings and reasoning drawn from the expert round table and focus groups. For new services that require considerable peer interaction and are designed as fun applications for the young, we argue that the perceived usefulness of the service is influenced by peers who also use them. This is also a component that involves perceived enjoyment because it is more fun to

use PTT if more of one's friends are also available via PTT. We argue:

H5: *Social norm has a positive effect on perceived enjoyment caused by PTT.*

H6: *Social norm has a positive effect on the perceived usefulness of PTT.*

Ease of use Ease of use deals with a more fundamental type of use characteristic. It involves the bare functional characteristics of PTT with regard to the service complexity, the speed of learning to use the service and the integration of the service in the mobile phone. Models measuring the acceptance of services acknowledge the effect of ease of use on attitude (Davis, 1989). It follows:

H7: *Ease of use has a direct positive effect on attitude.*

Evaluation of the measurement model

Table 1 summarises the items included in the questionnaire; it gives details on the factor loadings, the R^2, average variance extracted (AVE), construct reliability (CR) and the number of variables that were used for each construct. Owing to the fact that PTT is a new service with little attention in the literature, it was necessary to include two new questions in the measurement instrument (Intentions 2 and 3). Furthermore, in this research, the perceived enjoyment construct also has a perceived personal innovativeness component (P. Enjoyment 2). The items used in the questionnaire for the SEM can be found in the Appendix.

An exploratory factor analysis recovered our stipulated six latent factors from all items combined with low cross-loadings, except for social norm. R^2 values for the latent variables are in a satisfying range ($\geqslant 0.70$), with every item loading significantly on the construct it was supposed to measure. Furthermore, to test for reliability, we used Fornell & Larcker's (1981) approach: all factors have an excellent AVE as they are all above 0.5. Also, composite reliability (CR) is satisfactory.

Test of the research model

We used Mplus (Muthen & Muthen, 2004) for estimating the parameters of the model. Figure 3 shows the standardised regression coefficients; all are statistically significant (P-values of <0.001). Table 2 summarises the most widely used goodness-of-fit indices.

Most of the fit indices meet the recommended levels, showing that the theoretical model is supported by the data. The incremental fit measures TLI and CFI are well above the recommended level.

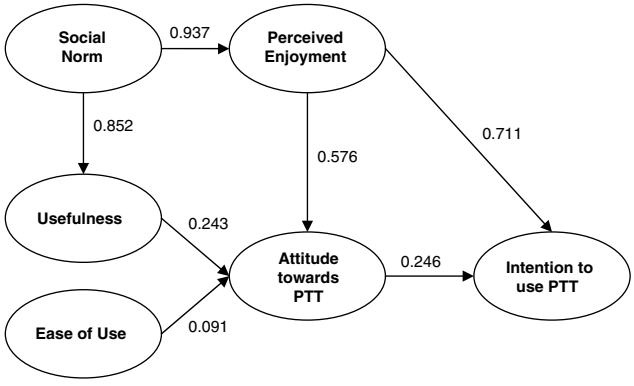

Figure 3 Adoption of PTT (Fitted model).

Table 1 Items, factor loadings, CR, AVE

Items	*Factor loadings*	R^2	*CR*	*AVE*
Attitude 1	0.870	0.718	0.91	0.77
Attitude 2	0.899			
Attitude 3	0.870			
Usefulness 1	0.820	0.727	0.94	0.85
Usefulness 2	0.972			
Usefulness 3	0.959			
Social norm 1	0.796	–	0.85	0.66
Social norm 2	0.750			
Social norm 3	0.892			
P. Enjoyment 1	0.787	0.878	0.70	0.53
P. Enjoyment 2	0.668			
Intention 1	0.938	0.855	0.92	0.78
Intention 2	0.890			
Intention 3	0.826			
Ease of use 1	0.904	–	0.88	0.71
Ease of use 2	0.699			
Ease of use 3	0.900			

Table 2 Goodness-of-fit-indices (Bentler, 1990; Hu & Bentler, 1999; Muthen & Muthen, 2004)

Goodness-of-fit measure	*Levels of acceptable fit*	*Calculated fit indices*
Root mean square error of approximation (RMSEA)	Acceptable values under 0.08	0.093
Tucker–Lewis index (TLI) or Non-normed fit index (NNFI)	Recommended level: >0.90	0.992
Comparative fit Index (CFI)	Recommended level: >0.90	0.970

All the paths in the model showed significant loadings with a *P*-value of <0.002. The examination of the coefficients detected strong effects of perceived enjoyment on the intention to use PTT and on attitude towards using a service. The high influence of perceived enjoyment on intention to use is in line with the findings of Childers *et al*. (2001) on hedonic service use. This demonstrates that the fun factor with regard to PTT drives intention to use it.

Furthermore, the individuals' attitudes significantly influence the intention to use PTT, but again, the effect of perceived enjoyment on intention is stronger. We could argue that it is more important for individuals to have fun using this communication tool.

Individuals' perceptions on perceived enjoyment and usefulness are strongly influenced by social norm with 0.937 and 0.852, respectively. This supports the previous assumption that the usefulness of PTT is determined by peers communicating via this service. PTT can only be successful when a critical mass is using it; therefore, the perceived network effect affects perceptions of usefulness. We conclude that if more peers use the service, it becomes more useful to the individual and more enjoyable at the same time.

When it comes to mobile service development, network operators have already identified ease of use as a success factor. The respondents indicated that the service is generally easy to use and allows them to quickly learn how it works.

In conclusion, the perception of usefulness and perceived enjoyment are strongly determined by peers using the service. The main driver of intention to use is again perceived enjoyment, whereas the attitude is influenced by perceived enjoyment and usefulness.

Discussion and future research avenues

This study has tested technology acceptance in a consumer context where a hedonic construct (perceived enjoyment), social norm and TAM concepts were included. The explorative phase, including a review of the existing literature and carrying out expert interviews and focus groups, showed that existing adoption models need extensions for highly interactive mobile communication technologies with network externalities. Thus, the research project developed and tested a structural model examining the role of usefulness, perceived enjoyment and social norm in influencing adoption intentions. The results confirm the structure of the model, which has two major implications regarding the role of social norm and perceived enjoyment in the adoption process. These insights into the relative roles of the models' components and influencing variables are of interest to marketers.

Unlike what was found in the workplace context (Davis, 1989; Davis *et al*., 1989), perceived enjoyment of using a mobile service is a more powerful determinant of attitudes and intentions than perceived usefulness. The influence of enjoyment on attitude is twice as strong as the influence of usefulness. The concept of enjoyment should be further explored. The focus can be two-fold, with one on the service that can be hedonic oriented; then, the service has a fun component. At the same time, the usage process can be enjoyable; therefore, the consumption process is considered enjoyable. Research, though, did not explore the enjoyment concept to its full extent. So far, more functional features such as usefulness and ease of use have been explored (Davis, 1989; Venkatesh *et al*., 2003).

Furthermore, with highly interactive services, social norm is a strong driver of usefulness and perceived enjoyment due to network effects. Network externalities have only been acknowledged as drivers of adoption more recently (Strader *et al*., 2007). Future research should investigate the connection between the level of interactivity of a communication system, social aspects and network externalities. Our results suggest that the level of interactivity and social contact have a positive influence on usefulness and enjoyment.

The study yields a number of important managerial implications. First, companies offering mobile services strongly relying on peer-to-peer interaction, such as PTT, should encourage customers to use their services and develop pricing and business models that motivate users to convince their peers to use the same services. Clearly, this will trigger the adoption process and motivate customers to use this particular service and may even lead to positive word of mouth – an important driver of diffusion of innovations (Rogers, 1995). The second implication for this industry is in the area of product design. This research shows that hedonic components of mobile services are important antecedents of attitude and intention to use. As a result, this should be taken into account at the product development stage. Even though usefulness is evidently important, the enjoyment that customers perceive while using the service are also key for its adoption, and thus, for the offering's commercial success. Third, the results show that attitudes – and even more so, enjoyment – have a major influence on the intention to use PTT. Thus, with mobile services still in

their infancy, companies should tailor their communication strategies to convey the message that interactive communication tools are fun to use and enable users to maintain social contacts in an enjoyable and efficient way. Furthermore, consumers need to be educated about the possibilities of mobile services to ensure that they develop positive attitudes towards them.

Although this study provides new insights into mobile services with network externalities, we demonstrated that there are still various research avenues to pursue. Further conceptual work and testing of hypotheses – possibly drawing upon theories in marketing, consumer behaviour, psychology and diffusion – is imperative to understand the phenomenon of mobile services (Davis *et al*., 1989; Rodgers & Thorson, 2000). The empirical evidence also shows the need for ongoing research acknowledging the different prerequisites for usage of hedonic-driven services.

About the authors

Astrid Dickinger is Assistant Professor at the Department of New Media Technology at MODUL University Vienna. Previously, she was Assistant Professor at the Vienna University of Economics and Business Administration, where she completed her dissertation. Her research interests are in the areas of service quality, models of consumer behaviour and acceptance of innovations.

Mitra Arami received an MSc degree in Computer Science from the Technical University of Vienna (TU), and leads projects in the Energy and Telco industry. She received her Ph.D. from TU in 2006. She has published several papers, articles and books, and her research interests are in M-Commerce, Project Management and Diversity.

David Meyer was born in Vienna, Austria, in 1973. He received a diploma in applied computer science from the University of Vienna in 1998 and a Ph.D. from the Vienna University of Economics and Business Administration in 2003, where he is currently an assistant professor. His research interests currently include management support systems and data mining.

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Appendix: Items used in the structural equation model

Code	*English item*	*German item*	*Adapted from*
Usefulness 1	PTT helps me to accomplish my task more quickly	PTT hilft mir Zeit zu sparen	Davis (1989)
Usefulness 2	PTT is useful for me	Für mich ist PTT sinnvoll	Davis *et al*. (1989)
Usefulness 3	PTT is valuable for my communication effectiveness	Für mich ist PTT nützlich bei der Kommunikation	Davis *et al*. (1989)
Ease of use 1	I find PTT easy to use	Ich finde PTT einfach zu bedienen	Davis *et al*. (1989)
Ease of use 2	For me it is easy to learn how to operate PTT	Für mich ist es leicht zu lernen wie man PTT nutzt	Davis *et al*. (1989)
Ease of use 3	PTT is easily clear and understandable	Ich finde PTT ist leicht verständlich	Moore & Benbasat (1991)
P. Enjoyment 1	I enjoy using	PTT zu nutzen macht Spass	Agarwal & Karahanna (2000)
P. Enjoyment 2	I like to use new technologies	Ich mag Dienste die 'in und neu' sind	Goldsmith & Hofacker (1991)
Social norm 1	I would use PTT if my friends use it	Ich würde PTT verwenden wenn es meine Freunde auch verwenden	Thompson *et al*. (1991), Venkatesh *et al*. (2003)
Social norm 2	I would use PTT if my family uses it	Ich würde PTT verwenden wenn es meine Familie auch verwendet	Thompson *et al*. (1991), Venkatesh *et al*. (2003)
Social norm 3	I think my friends find PTT good	Ich glaube meine Freunde finden PTT gut	Taylor & Todd (1995)
Intention 1	I will use PTT in the future	Ich werde PTT künftig nutzen	Taylor & Todd (1995), Venkatesh *et al*. (2003)
Intention 2	If I buy a new mobile handset, I will pay attention to PTT capability of the handset	Ich werde beim nächsten Handykauf darauf achten, dass PTT vorgesehen ist	New
Intention 3	If I change the mobile operator, I will ensure that they offer PTT	Ich werde beim nächsten Betreiberwechsel darauf achten, das PTT vorgesehen ist	New
Attitude 1	Using PTT is: Wise –Foolish	Die Nutzung von PTT ist: Sinnvoll – Nicht Sinnvoll	Taylor & Todd (1995)
Attitude 2	Using PTT is: Good –Bad	Die Nutzung von PTT ist: Gut – Schlecht	Taylor & Todd (1995)
Attitude 3	Using PTT is: Favourable –Unfavourable	Die Nutzung von PTT ist: Positiv – Negativ	Taylor & Todd (1995)