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ITP4164

Keeping the Fingers Running: The Impact of IT Innovativeness on Job Relevant Uses of the Internet[1]

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ABSTRACT

This paper investigates whether organizational members job relevant use of Internet could be explained by personal innovativeness in information technology and other individual traits like age and experience with IT. To address this issue, the paper starts with an examination of job relevant versus private use of Internet. Thereafter the focus is on how personal innovativeness in information technology influences organizational members use of Internet. The results indicates that users perceive structural differences across various types of Internet usage areas, although it was not obtained any clear support for a distinction between job relevant and private use in this study. Additionally, the findings shows that the ratio of private use is considerable lower than job relevant use. The test of how individual traits influence use of Internet shows that the contribution from personal innovativeness has the greatest impact on employees' use of Internet.

INTRODUCTION

Despite of the recent dot-com bubble collapse and numerous e-commerce failures the Internet and the web remain as focused technologies being critical to present and future business developments. In addition to some dot-com successes, the brick and click companies and public institutions have become aggressive custodians and developers of e-services. Employees of (big) organizations are already active Internet users and their use is expected to grow (Charlton, Gittings, Leng, Little, and Neilson, 1998; Roberts 2000).

It is also still customary to find the argument that because of the globalization of business, the general shortened time for product development, the shortened product life expectancy, the need for defining new customer segments, and the ability to maintain an established customer base with new products and services, change will increasingly be a part of employees everyday life (Earl, 2000). To a large degree the increased business demands result in a continuous need for other information than can be typically found in organizations' databases and information systems.

Researchers have examined the role of managers and organizational solutions (including IT-department policies) in the development of appropriate Internet use (Spar and Bussgang, 1996; Scheuermann and Langford, 1997). Recognizing that at the end of the day each and every one of us must exhibit behaviors that the employer demands, we return to the individual employee and her or his relationship with the Internet. We are particularly interested in investigating individual employees' technology innovation attitudes and job relevant Internet use behaviors in an organizational setting. The article proceeds with the research question section, followed by methods considerations, leading into the analysis section. Next is the discussion section and the last section is the summary.

RESEARCH QUESTION, THEORY, HYPOTHESES, AND RESEARCH MODEL

The present project builds on previous research into individual traits, information technology (IT) use, and organizational relevance. The research question was formulated as follows: *What are the relationships among organizational members' willingness to try out new IT and other individual traits, and these traits' relationship with organizational relevant use of Internet relative to private oriented Internet use?*

The proposition that attitude influence behavior (Fishbein and Ajzen, 1975) is well established also in information systems (IS) research (for example, Mathieson, 1991; Karahanna and Straub, 1999.) Benefits from a particular technology might be defined in many ways but use is very frequently employed as a valid dependent proxy (Seddon, 1997; Harris, 2000). In this particular research setting Internet use was defined as the dependent behavioral construct. Because the Internet so easily can be employed for multiple purposes the issue has been raised that organizations must ensure relevant personal business Internet technology use[2] (Spar and Bussgang, 1996). This in contrast to electronic game-playing or use of the Internet for purely private matters (Dillon and Morris, 1996). However, it has also been argued that people should be allowed to spend time on non-productive tasks since any computer use may increase a person's computer literacy and general ability to take advantage of IT (Guthrie and Gray, 1996).

Based on the literature review Internet use was divided into the two categories of organizational related and private related – using the Internet as a vehicle for business information search being an example of the former, and using the Internet for banking being an example of the latter. Organizations would obviously promote business relevant Internet use and limit or prohibit private Internet use. The difference between the two categories may not be straightforward, for example, using the Internet to read news, for browsing, and even for locating home pages. Intuitively one would think that Internet shopping or Internet banking is private. However, limited private Internet activity, in particular in situations where the organization does not explicitly forbid it or implicitly encourage it to some degree, may make it difficult for employees to differentiate between categories of Internet use. Hence, we anticipated that persons who are active Internet users are more so across usage areas than less active users. The argumentation leads to the following hypothesis:

H1.a: Personal users of Internet will not exhibit structural differences across Internet usage areas.

Although personal Internet use may be structurally consistent across usage areas we anticipate that organizational relevant Internet use will exceed the use of Internet for private purposes:

H1.b: Personal organizational relevant Internet use will be greater than the use of the Internet for private purposes.

This paper appears in *Issues and Trends of Information Technology Management in Contemporary Organizations,* the proceedings of the Information Resources Management Association International Conference.

Attitudes that may explain use cover a range of issues (DeLone and McLean, 1992). We were particularly interested in exploring the relationship between the degree of innovative attitude toward Internet and its use, the relationship being a well established research issue (Citrin, Sprott, Silverman and Stem, 2000; Wolfradt and Doll, 2001). Previous research may indicate that the degree of personal innovativeness is not related to the level of computer use (Larsen, 1993; Larsen and Wetherbe, 1999). However, recent developments include Agarwal and Prasad's (1998) instrument on personal innovativeness in the domain of IT, defined as "*the willingness of an individual to try out any new information technology*" (pp. 206). Using the personal innovativeness instrument as the independent variable the following findings suggest that the higher the willingness to try out new IT:

- the more academics use present Internet services and the more the academics intend to use Internet in the (near) future (Pajo, 2000).
- among on-line shoppers, the higher the positive attitude toward Internet and the more these shoppers intend to take advantage of the Internet (Limayem, Khalifa, and Frini, 2000).
- the more adolescents intend to use the Internet – the personal innovativeness instrument explaining significantly more of the variance in intended use than any other variable representing global personality traits (Wolfradt and Doll, 2001).

The hypothesis indicated here reads:

H2: The higher the degree of personal innovativeness the higher the personal organizational relevant Internet use and the higher the private Internet use.

Previous research on IT-related personal innovativeness commonly include age, gender, experience (with IT), and education as items that might impact the degree of technology use (Brancheau and Wetherbe, 1990; Larsen, 1993; Thompson, Higgins and Howell, 1991; Rogers, 1995; Bannert and Arbinger, 1996; Larsen and Wetherbe,1999). Findings with regard to the relationship between these items and IT use are mixed but we propose the following hypothesis:

H3.a: The older the person the less the use of Internet for both organizational and private matters.

H3.b: Men will use Internet for both organizational related and private related matters more so than women.

H3.c: The more experience a person has with IT the more the use of Internet for both organizational and private matters.

H3.d: The higher the education the more the use of Internet for both organizational and private matters.

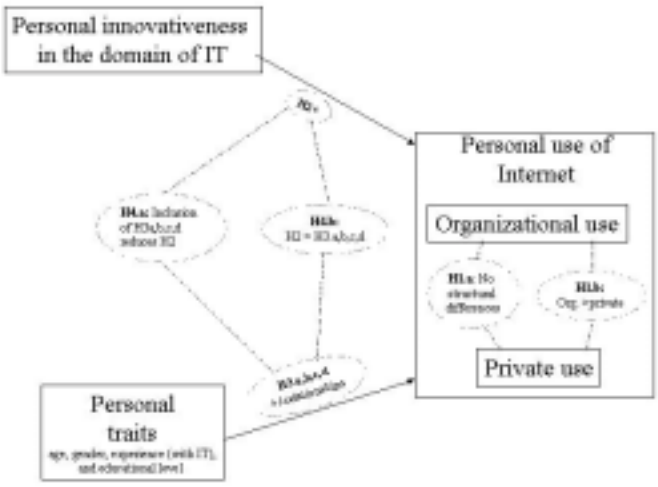
Items (for example; age, gender, experience, and educational level) that might be strongly related to the dependent variable are commonly included to ensure that relationships between focused independent and dependent variables are not spurious (Bollen, 1989; Judd, Smith and Kidder, 1991). It is usual to find that the strength of the relationship between focused independent and dependent variables is reduced when other items are included. Our proposition is that although this will occur also in this research setting, the personal innovativeness in the domain of IT will remain as the strongest predictor of Internet use:

H4.a: The inclusion of age, gender, experience (with IT), and educational level will reduce the relationship between the personal innovativeness and the use of the Internet for both organizational and private matters.

H4.b: After the inclusion of age, gender, experience (with IT), and educational level, personal innovativeness will remain the strongest predictor of the use of Internet for both organizational and private matters.

The research model is shown in Figure 1.

Figure 1: Research model including hypotheses



METHODS

A large oil company, where the Internet was made available to (near) all employees in April of 1997, agreed to participate in the study. Since variables and items had been used in previous research efforts and in those found reliable with acceptable validity, a questionnaire (see Appendix A) was developed as the vehicle for data collection. The language of the questionnaire was Norwegian. English items were first translated into Norwegian and then back into English by a second person to ensure wording reliability. All items were derived from previous research, for example, Agarwal and Prasad's (1998) four items instrument for measuring persons' innovativeness in the domain of IT. An early version of the instrument was presented to 10 prospective respondents who where asked about their own and their coworkers present Internet usage. The same individuals filled in a close-to-final version of the instrument without the researchers being present, but encouraged to write comments if items were found to be ambiguous or non-understandable. Valuable questionnaire improvements were made at each of these steps.

The questionnaire was distributed using an internal post system to 500 administrative workers drawn randomly from a pool of 15,000 candidates. Respondents were guaranteed individual anonymity – only aggregated results would be reported. Anonymity was strongly stressed because the company had implemented a no-electronic-games policy. Otherwise respondents may automatically have under-reported their real level of Internet use for private purposes. Returns were by ordinary mail. By the end of March 1999, 328 usable questionnaires were returned, for a response rate of 66 percent.

The recommended two step procedure of checking item data quality measurement before hypothesis and relationship testing was followed (Anderson and Gerbing, 1988). Items were checked for skewness and kurtosis. Internet banking and Internet shopping yielded approximately skewness=4 and kurtosis=15, which might indicate a problem (Kline, 1998). However, data representing use of a specific IT type might behave erratically, warranting careful consideration but not immediate deletion. In the sample only 1 questionnaire contained missing values for a fill-in rate of nearly 100 hundred percent.

For the analyses factor analysis, Tukey's follow up procedure for differences among means, structural equation modeling (SEM) using LISREL, and stepwise regression was employed. All reliability and validity controls will be discussed in the analysis section, the reason being that hypotheses include them.

ANALYSIS

The testing method for **H1.a** was factor analysis. The maximum likelihood calculation using the varimax and oblim methods documented two factors yielding the similar result of no clear patterns except for Internet surfing and travel information clearly loading on separate factors. The clearest pattern appeared when using the principal component analysis with varimax methods, as shown in Table 1.

Table 1: Factor analysis of Internet use items

Items	Factor 1	Factor 2
Information seeking	0.58	0.41
Reading news	**0.62**	0.11
Travel information	**0.80**	0.11
Home page reading	**0.74**	0.22
Internett surfing	0.61	0.51
Private banking	**0.63**	-0.37
Shopping products	0.06	**0.51**
Percent of variance explained	87.6	12.4
Cronbach's Alpha	0.77	n.a.

Notes: Extraction method is *principal component analysis* and rotation method is *varimax*. Numbers in bold represent items that clearly load on one factor – using the rules of item loading >=0.50, no other loading >=0.40, and difference between loadings for one item >=0.20.

The factor analysis shows that most items load on Factor 1 and that the only item that clearly loads on Factor 2 is 'Shopping products'. The two items of 'Information seeking' and 'Internet surfing' may load on both factors, although the highest loading values occur for Factor 1. Judging these results conservatively **H1.a** that postulated no structural differences among Internet use items is rejected.

The one way Anova test for exploring **H1.b**, detecting differences among Internet use item means, was significant (F=106.64, p<0.01). The Tukey B follow up procedure documented the patterns shown in Table 2.

Table 2: Groupings of Internet use item means

Items	Group 1	Group 2	Group 3	Group 4	Group 5
Information seeking	3.84				
Reading news		3.17			
Travel information			2.60		
Home page reading				2.17	
Internett surfing				2.00	
Private banking					1.34
Shopping products					1.28

Notes: Follow up procedure is Tukey B. Numbers represent Internet use mean values

The analysis put Internet use item means into groupings with no overlaps. As measured in this research there is a significant difference in Internet use levels among items. The private use items of 'banking' and 'shopping' form a common group. As can be seen in Table 2 the means for these two items are very low, in fact approaching the absolute minimum numeric value of 1. Comparing the two means of banking and shopping with the other Internet use areas the indication is that **H1.b** is supported, that is, organizational relevant Internet use is more frequent than private Internet use.

The test results with regard to skewness, kurtosis, factor loadings (Table 1), and means groupings (Table 2) indicates that Internet banking and shopping are problematic items. Indeed the initial 'complete' LISREL model, allowing for free correlates among items and latent constructs, confirms the concerns. The model fits the data (Chi-Square (C-S)=90.31[p<0.0, Degrees of Freedom (DF)= 43], Root mean square error of approximation (RMSEA)=0.06[p(close fit)=0.20], Comparative fit index (CFI)=0.97, and Non normed fit index (NNFI)=0.96). However, Internet banking's loading to the latent construct of 'Organizational use of Internet'=0.12 and Internet shopping=0.09. Due to their low loadings both items were dropped from further modeling (see Figure 2 for the complete model).

The redefined model including 'Personal innovativeness' and 'Organizational use of Internet' with their items specified resulted in an improved fit (C-S=49.22[p<0.0, DF= 26], RMSEA = 0.052 [p(close fit) = 0.41], CFI = 0.98 and NNFI = 0.98) above suggested cut-off levels. The square of the correlation between the two latent variables is approximately 0.12 which is less than the variance explained between each latent construct and its items, hence discriminant validity is regarded as adequate (Fornell and Larcker, 1981). The composite reliability for 'Personal innovativeness'=0.91 and 0.79 for 'Organizational Internet use' both of which are above the 0.70 recommended threshold. The conclusion is that the model can be accepted. The loading factor on the path between the two latent constructs is 0.35, p<0.01. Hypothesis **2** is supported, the higher the degree of personal innovativeness the higher the organizational use of Internet.

The LISREL results for testing the full model including personal traits items is shown in Figure 2.

Figure 2: Complete structural equation model

Notes: Model goodness of fit: C-S=115.30[p<0.0, DF= 54]), RMSEA = 0.059 [p(close fit) = 0.15], CFI = 0.96 and NNFI = 0.94.

The results indicate that:

H3.a is supported, the older the person the less the organizational use of Internet.

H3.b is supported, men are more inclined to use the Internet than women.

H3.c is supported, the longer the IT experience the higher the organizational use of Internet.

H3.d is not supported, in the present sample higher degree of education does not result in a higher degree of organizational use of Internet.

When age, gender, experience, and education was introduced the (regression standardized) coefficient between 'Personal innovativeness' and 'Organizational use of Internet' was reduced from 0.35 to 0.27, that is 23 percent. This indicates that **H4.a** is supported. However, the coefficient is significant p<0.01 with and without these personal trait items. Although a change in the predicted direction, the observed change might be a result of other factors (such as operationalization, measurement method, and sample characteristics). The major conclusion is therefore that the inclusion of age, gender, experience and education do not necessarily reduce the impact of 'Personal innovativeness' on 'Organizational use of Internet. **H4.a** is not supported.

Stepwise regression was used to explore Hypothesis **H4.b**. The first model (adjusted R-square=0.10, p<0.01) includes only 'Personal innovativeness' (beta=0.32, p<0.01). The second model (adjusted R-square=0.12, p<0.01) consists of 'Personal innovativeness' (beta=0.27, p<0.01) and 'Age' (beta=-0.17, p<0.01). Since gender, experience, and educational level were not included in the stepwise regression the conclusion is that **H4.b** is supported. 'Personal innovativeness' contributes most to 'Organizational use of Internet'.

DISCUSSION

End-users perceived structural differences across various types of Internet usage areas, although emerging conceptual categories were

not fully clear cut. In the factor analyses private banking and shopping products loaded on different factors. Additionally, the ratio of Internet use in these two areas was very low. The latter indicates that the organizational policy of not using the Internet for private purposes is understood.

Other usage items, at least as measured here, may blend organizational and private use. For example, a manager may expect his professionals (say, economists and engineers) to read news within their professional field, but would object to having them spend hours looking up trivial matters. Yet another caveat is that users may not know whether news is insignificant or not until having read them. By default the proportion of trivial news might be greater than relevant news.

In the present sample personal innovativeness was found to have the greatest impact on employees' use of Internet. This finding supports previous theoretical as well as empirical research stating that personal innovativeness is a central construct in understanding and explaining innovation adoption (Larsen, 1993; Agarwal and Prasad, 1998). However, the Agarwal and Prasad instrument may not necessarily measure personal innovativeness correctly. The four items in the instrument carries strong resemblance to the 'attitude toward change' instrument (Ettlie, 1983; Ettlie and O'Kefee, 1982). The latter instrument includes 12 items divided equally between a factor explaining persons' attitude toward change and a factor representing a preference for the established order. The Agarwal and Prasad instrument may therefore not tap the richness of personal innovativeness. Additionally, Agarwal and Prasad tap persons' willingness to experiment with IT. The inference here is that use of the technology is necessary in order to experiment. Therefore, use of IT for experimental purposes may be viewed as a dimension of technology use (alongside using the technology for strictly job relevant purposes, using the technology to staying informed, etc.) In fact, a factor analysis divides the four items representing personal innovativeness and the five items representing Internet use into two separate factors with no overlaps. It may also be argued that the more a person uses IT the more he or she would be willing to experiment with it – the causal relationship being reversed when compared to the present research's model (and previous publications utilizing the personal innovativeness instrument). Hence, the combined usage results presented here may be viewed as a basis for increased understanding IT use. These arguments indicate that our understanding of organization relevant IT innovation through personal innovativeness needs further elaboration.

Age, gender and experience with IT display a significant relationship with Internet use. Among these items age is the most significant driver of usage behavior. However, personal innovativeness was found to be the best predictor of Internet use.

The findings from the present study must be considered in the light of the study's limitations, in particularly the use of cross-sectional survey data. Correlation designs lack the ability to explicit test directionality. However, this does not imply that the present research model is invalid. Theories of personal innovativeness (behavioral, diffusion, and marketing) and the present SEM analyses provide support for causal relationships. In spite of this conclusive statements about causality cannot be made since alternative explanations cannot be ruled out. At least one cannot disregard the possibility of reciprocal interactions among the factors studied. Further research, in particular experimental and longitudinal studies, is clearly needed to address these issues.

In addition to the limitations above, this study offers several challenges for future studies. First, the relationships in the hypothesized model can be moderated by other variables such as organizational specific Internet usage regulations, local managements statements about appropriate Internet use, etc. However, the main contribution of this research has been to show the direct relationship of personal innovativeness and personal traits. Future research should break with this initial stage and focus on the meaning of the term Internet and IT use and variables that may moderate or intervene between relationships in the model forwarded here.

From a management perspective, the finding of this study demonstrates that the willingness of an employee to try out new information technology is important for attainment of usage behavior. The message to managers is that they should look at personal innovativeness in IT as a personal trait that has the potential to improve the usage of new IT.

SUMMARY

This study was a test of using the concept of personal innovativeness for the investigation of job relevant Internet usage. Personal innovativeness and four other personal traits was operationalized and tested to predict employees' job relevant use of Internet, based on data collected from 328 individuals.

The results presented here indicate that organizational members perceive structural differences across various types of Internet usage. However, there was not obtained any support for unequivocal categories of Internet use. Treating 'private banking' and 'shopping products' as private usage areas indicated that a very low portion of the total use of Internet consists of private doings.

The results also found that personal innovativeness was positively related with employees' use of Internet. Both age and gender was negatively related with Internet use. Finally, experience with IT was found to be positively related to use of Internet. However, personal innovativeness was demonstrated to be the most important antecedent of employees' use of Internet.

ENDNOTES

1 The authors are listed in alphabetical order but have contributed equally to the article.

2 "Organizational members' IT use" is in the literature dentoed "employees' IT use," "end-users' IT-use," "individual use" or "personal use." The terms are oftentimes used interchangeably - individual and personal being mostly employed here.

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APPENDIX A: QUESTIONNAIRE ITEMS

Personal willingness to try out new information technology – Personal innovativeness (Agarwal and Prasad, 1998) – using a Likert type scale ranging from 1(strongly disagree) to 5(strongly agree):

- I1 If I heard about a new information technology, I would look for ways to experiment with it.
- I2 Among my peers, I am usually the first to try out new information technologies.
- I3 I like to experiment with new information technologies.
- I4 In general, I am hesitant to try out new information technologies.

The use of Internet technologies. The introduction to Internet use items read:

'Sometimes I use the Internet to:'. using a Likert type scale ranging from 1(not a correct description) to 7(an exactly correct description):

- U1 seek information of interest to me (for example using Kvasir, AltaVista, etc.)
- U2 read newspaper headlines (examples of national newspapers provided).
- U3 explore information about soon upcoming travel whether business or private.
- U4 look up home pages of areas of interest to me (literature, sports, private economy, chess, etc.
- U5 surfing the Internet (as time allows).
- U6 pay my bills and check account balances.
- U7 shop products (for example, books, CDs, or other merchandise).

Personal traits:

P1 Age	A scale: 1=<25, 2=25-35, 3=36-45, 4=46-55, 5=>55
P2 Gender	1=male, 2=female
P3 Experience	Number of years (in absolute figure) respondent has used a
With IT	PC, irrespective of us at work or at home
P4 Educational level	A scale ranging from 1(primary school) to 6(doctoral degree)