Easy as E-Mail? Probing the Slow Adoption of an Online Assignment Submission System

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Abstract
Understanding why people adopt or reject an information system is one of the most challenging issues in information systems research. This paper draws on the technology acceptance model (TAM) and diffusion of innovation theory, and analyses an online assignment submission system in a blended distance learning university, that apparently is very similar to an e-mail system. Such system is supposed to be valuable to students, but after seven years of implementation, it handled a minor portion of the assignments. Data collected via a Web survey from students who did not use the assignments system showed that their behavioral intention to use the system was influenced mainly by its perceived usefulness, its perceived ease of use, and students' attitude towards new technologies. The important insight emanating from the findings is that although course coordinators' and tutors' willingness to use the assignments system is a necessary pre-condition to its use by the students, it is not enough, and the system, as well as the work processes, should become more compatible with students' needs in order to become valuable to them.

Keywords: technology acceptance model (TAM), innovation diffusion, information systems adoption, value of information systems, distance learning.

Introduction
User acceptance of information technology innovation is a necessary condition for realizing its potential value (Agarwal & Prasad, 1997). Though the determinants of information technology acceptance have been widely researched (Davis, 1989; Delone & Mclean, 1992, 2003; Rogers, 1962, 2003), understanding why people adopt or reject an information system still remains one of the most challenging issues in Management Information Systems (MIS) research (Jeyaraj, Rottman, & Lacity, 2006; Venkatesh, Morris, Davis, & Davis, 2003).

This paper analyses an online assignment submission system in a blended distance learning university that apparently is very similar to an e-mail system. Such a system expedites the process of task handling and provides students with fast feedback on their work. This supposedly simple feature has been found as the most valued online activity by graduate MIS students (Levy, 2006), and should be expected to be valuable (Ahituv, 1980) especially in a distance or blended learning environment. However, after seven years of implementation, the analyzed system handled only 19% of the assignments. The paper is part of a comprehensive research, and it focuses on the students who have never used the system.

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The Research Model and Hypotheses

Figure 1 presents the proposed research model, which is based on the Technology Acceptance Model (TAM) (Davis, 1989; Davis, Bagozzi, & Warshaw, 1989; Venkatesh et al., 2003), as well as on Rogers' (1962, 1993) diffusion of innovation theory, and the vast prior research on information technology adoption (Jeyaraj et al., 2006).

According to TAM, behavioral intention is strongly influenced by two main constructs:
Perceived Usefulness – the degree to which an individual believes that using a particular system would enhance their performance.
Perceived Ease of Use – the degree to which an individual believes that using a particular system would be free of physical or mental effort.
The following hypotheses are based on TAM:
H1: Perceived Usefulness has a positive influence on behavioral intention.
H2: Perceived Ease of Use has a positive influence on behavioral intention.
H3: Perceived Ease of Use has a positive influence on Perceived Usefulness.

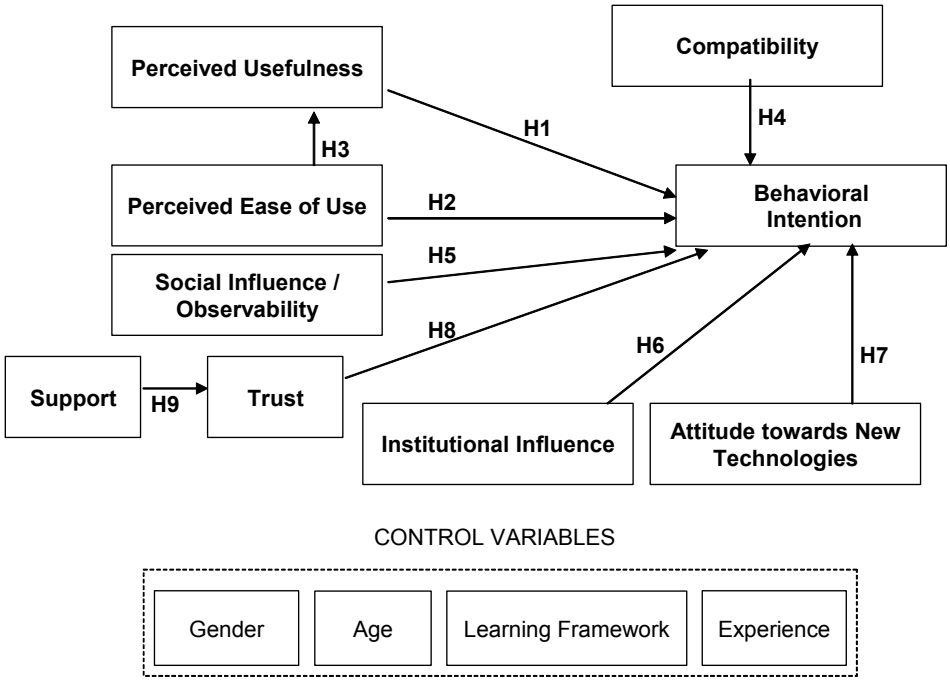

Figure 1. The Proposed Model

The following hypotheses are based on diffusion of innovation theory (Rogers, 2003) and information systems adoption research.
Compatibility is the extent to which adopting the innovation is compatible with what the potential users do.
H4: Compatibility has a positive influence on behavioral intention.
Observability is the degree to which the results of an innovation are visible to others. In this study, it is combined with *Social influence*, which refers to the influence of others, such as friends and classmates, on the individual (Ajzen & Fishbein, 1980).
H5: Social influence and observability have a positive effect on behavioral intention.
Institutional influence in this study refers to the influence of relevant organizations or institutions on the individual (Moore & Benbasat, 1991). In the context of the assignments system analyzed here, it refers to the University authorities, as well as the course coordinators and tutors.
H6: Institutional influence has a positive effect on behavioral intention.

Those who are more inclined to use new technologies are more likely to try new information systems.
H7: Attitude towards new technologies positively influences behavioral intention.
Trust in this context is defined as the extent to which the innovation adopter perceives the innovation provider to be trustworthy (Barnes & Huff, 2003).
H8: Trust has a positive influence on behavioral intention.
Support refers to user perceptions of the available help and technical support.
H9: Support has a positive influence on trust.

The model was controlled for:
- Gender.
- Age.
- Learning Framework – refers to whether the student is independent or enrolled in a learning center. The latter usually has more contact with tutors and classmates.
- Experience – proficiency in relevant information technologies (IT).

Methodology

The research model was tested on a representative sample of the over 40,000 students of the Open University of Israel, via a Web survey. This study is part of a comprehensive on-going research that analyses all the parties concerned with the assignments system of the Open University: the students, the course coordinators, the tutors and the University management.

The assignments system is a Web-based system that provides the students with the ability to submit their assignment online, trace its status, and receive feedback from the tutor together with the assignment grade. The students' use of the system is mainly voluntary, and it offers them an alternative to sending their assignment via regular mail or handing it in person if they choose to attend a class meeting. However, the option to use the assignments system was not available in all the courses and it depended on the course coordinator's willingness to use the system. As of 2007, the University management encourages the implementation of the system in all courses. Nevertheless, the students still have the choice not to use the system.

The assignments system was inaugurated in February 1999 (semester 1999b) and 123 assignments were submitted through it. Seven years later, during semester 2006b, 34,500 assignments were submitted via the system, which are only 19.2% of all the assignments, which were submitted on that semester. This paper focuses on the students who have never used the assignments system.

A pilot of the questionnaire was conducted in July 2007. An e-mail was sent to randomly chosen 300 non-users, 300 former users and 300 users, asking them to answer an anonymous Web survey concerning the assignments system. 23 (7.7%) non-users, 38 (12.7%) former users, and 73 (24.3%) users answered the pilot survey. Following the analysis of the 134 responses, the questionnaire was slightly refined. In August 2007, the final questionnaire was sent by e-mail to 3,000 randomly chosen students out of the 6,700 non-users population with known e-mail addresses. About 200 mails were returned with wrong address massages or other delivery failure announcements. 151 respondents answered the questionnaire within a week and additional 85 students after a reminder, resulting in a total of 236 responses, which is an overall 8.4% effective response rate (the unusable partial responses were excluded from the analysis). Non-response bias was assessed by comparing the early respondents and the late respondents (those who answered after the reminding email) based on Armstrong and Overton (1977). There were no significant differences between these two groups.

Results

Demographic characteristics of the 236 students who answered the non-users survey are presented in Table 1. There were no gender differences in the model. Older students had less IT experience but otherwise there were no age differences. Surprisingly, the learning framework had no significant influence.

Table 1. Demographic characteristics of survey participants

Gender	**Men**	**Women**			
	50.8%	49.2%			
Learning framework	**Institutional**	**Independent**			
	53.4%	46.6%			
Age	**20-29**	**30-39**	**40-49**	**50-59**	**Over 60**
	49.1%	25.0%	14.0%	8.5%	3.4%

Data analysis was conducted with Partial Least Square (PLS) (Chin, 1998; Chin, Marcolin, & Newsted, 2003), using smartPLS 2.0 (beta) software (Ringle, Winde, & Will, 2005). PLS is a structured equation modeling method that analyzes how the items load on their constructs simultaneously with estimating all the paths in the model, and is widely used in MIS research (Gefen & Straub, 2005). PLS estimates all paths, loadings, and Average Variance Extracted (AVE) of principal constructs and construct reliability. Convergent and discriminant validity are shown when each item loads much higher on its assigned factor than on any other factor and when the square root of the AVE of each construct is much larger than the correlation of that construct with all other constructs. Appendix 1 contains the item loadings (confirmatory factor analysis in PLS). Appendix 2 details the mean, standard deviation and PLS reliability of the constructs, as well as the correlation among the constructs and their square root of the AVE. All these measures are above the limit values suggested in the literature (Gefen et al, 2000). Therefore, the findings support adequate convergent and discriminant validity of the constructs.

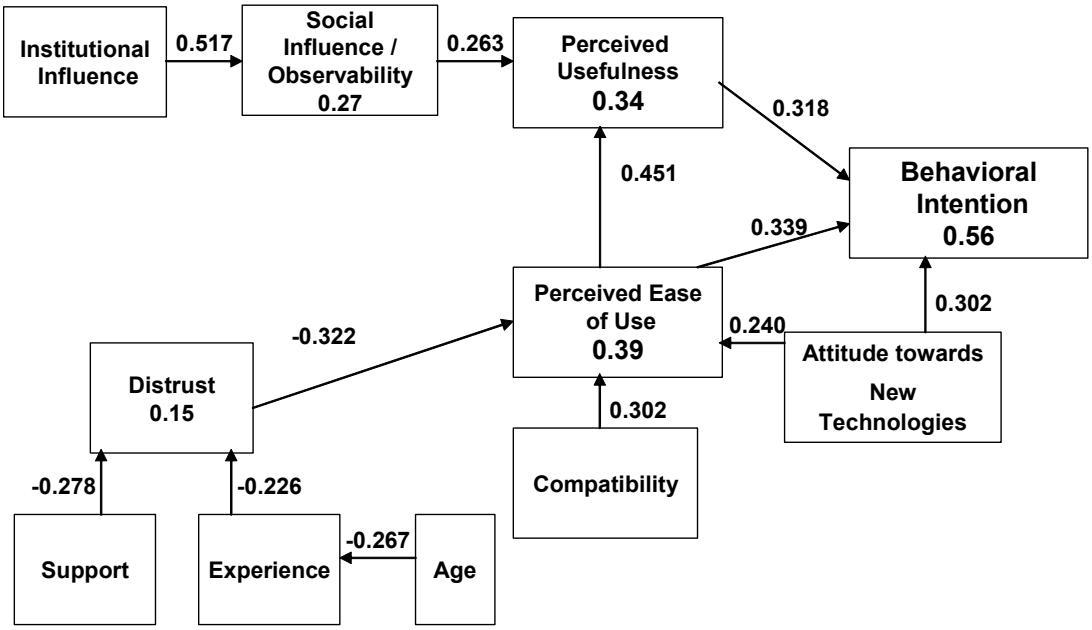

Figure 2. PLS Results for the Proposed Research Model

Figure 2 shows the standardized PLS path coefficients model. The coefficients are shown on top of the arrows, and all are significant at least at the .05 level. The R-squared values are shown inside the box of the relevant constructs. All other paths between constructs were insignificant.

Behavioral intention to use the assignment system was significantly influenced directly by perceived usefulness (PU), perceived ease of use (PEOU) and attitude towards new technologies. As expected by the TAM literature, PEOU strongly affected PU. However, compatibility enhanced PEOU, and therefore had an indirect influence on behavioral intention. Institutional influence affected the social influence/observability construct, which affected PU so it also had an indirect influence on behavioral intention. Distrust negatively influenced PEOU, and the participants' perceptions of the available support, as well as their IT experience reduced their level of distrust.

Discussion and Conclusion

The participants of this study did not use the assignments system and since the R-squared value of the behavioral intention construct was 0.563, the results suggest an explanation to their disinclination to do so. Overall, the average values of the main constructs that influence behavioral intention were quite low, from 4.2 to 4.6 out of 7 (see appendix 2), meaning that the participants did not perceive the assignments system as very useful, easy to use or compatible, and they were not keen to use new technologies either. However, they had relevant experience (average 6.0) and trusted the system providers. The relatively low values of the institutional influence (4.5) and social influence/observability (3.9) constructs and their indirect influence on behavioral intention suggest that these students may have not been sufficiently exposed to the assignments system or may have not been sufficiently encouraged to use it.

This study is part of a comprehensive analysis of the assignments system, and in the next stages, these results will be compared to those obtained from students who use the system. This will contribute to the understanding of the difference between initial use of an innovation and intentions to continue such use in the future by those who have already used it (Agarwal & Prasad, 1997). The practical implications of this study are first, that although course coordinators and tutors willingness to use the assignments system is a necessary pre-condition to its use by the students, it is not enough, and the system and work processes should become more compatible with students' needs in order to become valuable to them. Secondly, more institutional influence may enhance the rate of adoption. Some of these measures are already being implemented.

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Appendix 1. Convergent and Discriminant Analysis

	Age	ATNT	BI	COM	DisTRUST	EXP	II	PEOU	PU	SI/OB	Support
Age	**1.000**	-0.051	0.066	0.132	-0.040	-0.267	-0.001	0.055	-0.003	0.045	0.042
ATNT1	-0.005	**0.944**	0.545	0.228	-0.239	0.307	0.061	0.380	0.376	0.147	0.331
ATNT2	-0.099	**0.914**	0.451	0.129	-0.141	0.341	0.141	0.295	0.281	0.144	0.355
BI1	0.020	0.480	**0.857**	0.290	-0.239	0.269	0.068	0.497	0.558	0.257	0.190
BI2	0.136	0.465	**0.872**	0.490	-0.338	0.243	0.140	0.574	0.556	0.277	0.250
BI3	0.002	0.438	**0.833**	0.378	-0.296	0.253	0.107	0.504	0.419	0.339	0.273
COM1	-0.050	0.147	0.337	**0.724**	-0.269	0.050	0.109	0.336	0.312	0.045	0.059
COM2	0.237	0.147	0.338	**0.764**	-0.275	0.140	-0.058	0.359	0.136	0.145	0.074
DisTrust1	-0.019	-0.075	-0.187	-0.223	**0.786**	-0.234	0.073	-0.323	-0.060	0.016	-0.190
DisTrust2	0.057	-0.122	-0.213	-0.195	**0.732**	-0.245	0.042	-0.247	0.014	-0.022	-0.162
DisTrust3	-0.091	-0.251	-0.354	-0.383	**0.808**	-0.183	0.045	-0.492	-0.216	-0.132	-0.340
Exp1	-0.259	0.250	0.255	0.079	-0.177	**0.790**	-0.146	0.172	0.135	-0.029	0.194
Exp2	-0.201	0.278	0.193	0.109	-0.219	**0.851**	-0.105	0.115	0.011	-0.094	0.183
Exp3	-0.192	0.314	0.276	0.126	-0.271	**0.801**	-0.003	0.179	-0.024	-0.019	0.059
II1	-0.014	0.076	0.106	-0.033	0.080	-0.049	**0.876**	0.124	0.160	0.507	0.177
II2	-0.026	0.069	0.045	-0.072	0.118	-0.131	**0.883**	0.071	0.180	0.421	0.145
II3	0.061	0.125	0.178	0.277	-0.084	-0.075	**0.621**	0.107	0.265	0.277	0.121
PEOU1	0.061	0.276	0.467	0.376	-0.398	0.046	0.059	**0.827**	0.406	0.181	0.292
PEOU2	0.035	0.347	0.577	0.420	-0.426	0.265	0.145	**0.879**	0.481	0.272	0.406
PU1	0.045	0.306	0.487	0.257	-0.124	0.019	0.197	0.459	**0.799**	0.376	0.288
PU2	-0.024	0.292	0.518	0.209	-0.054	0.008	0.191	0.403	**0.780**	0.273	0.218
PU3	0.030	0.251	0.444	0.241	-0.110	0.024	0.126	0.405	**0.799**	0.266	0.297
PU4	-0.067	0.276	0.446	0.227	-0.156	0.111	0.219	0.372	**0.774**	0.288	0.312
OB1	0.030	0.113	0.267	0.087	-0.105	-0.012	0.422	0.193	0.245	**0.860**	0.129
OB2	0.028	0.113	0.182	0.055	0.008	-0.111	0.452	0.194	0.359	**0.788**	0.171
SI1	0.028	0.106	0.339	0.146	-0.105	-0.045	0.431	0.312	0.344	**0.868**	0.180
SI2	0.065	0.187	0.337	0.143	-0.052	-0.008	0.400	0.184	0.311	**0.790**	0.134
Support1	0.049	0.311	0.256	0.067	-0.301	0.154	0.117	0.382	0.314	0.142	**0.928**
Support2	0.028	0.369	0.256	0.099	-0.286	0.172	0.231	0.382	0.337	0.206	**0.920**

Appendix 2. Mean, Standard Deviation, and PLS reliability together with the correlation among the constructs and their square root of the AVE

	Mean	Standard Deviation	PLS Reliability	ATNT	Age	BI	COM	DisTRUST	EXP	II	PEOU	PU	SI/OB	Support
ATNT	4.509	1.764	0.927	**0.864**										
Age	33.51	11.76	Single	-0.051	**1.000**									
BI	4.997	1.480	0.890	0.540	0.066	**0.729**								
COM	4.161	1.609	0.713	0.197	0.132	0.454	**0.554**							
DisTRUST	3.133	1.407	0.819	-0.210	-0.040	-0.341	-0.366	**0.602**						
EXP	6.007	1.239	0.855	0.346	-0.267	0.298	0.129	-0.274	**0.663**					
II	4.531	0.894	0.842	0.104	-0.001	0.123	0.030	0.068	-0.102	**0.644**				
PEOU	4.206	1.412	0.843	0.368	0.055	0.616	0.468	-0.483	0.192	0.124	**0.729**			
PU	4.611	1.391	0.868	0.358	-0.003	0.603	0.297	-0.140	0.049	0.233	0.522	**0.621**		
SI/OB	3.884	1.451	0.897	0.156	0.045	0.338	0.129	-0.074	-0.057	0.517	0.269	0.385	**0.685**	
Support	4.947	1.429	0.921	0.367	0.042	0.277	0.090	-0.318	0.176	0.186	0.414	0.352	0.187	**0.854**