Cloud Computing: A Comparison Between Educational Technology Experts' and Information Professionals' Perspectives

Noa Aharony
Department of Information Science, Bar-Ilan University
Noa.aharony@biu.ac.il

Abstarct
Cloud computing is a new trend in Information Technology (IT) and its paradigm emerged in 2007 (Nasir & Niazi, 2011). Due to the growth of cloud computing, the question arises as to what factors may influence educational technology experts and information professionals when adopting new technologies (such as cloud computing) within their organizations. This study focuses on these two groups particularly because of their close relation with information technology. The research seeks to explore whether these two groups are familiar with technological innovations and whether they are ready to accept them. Furthermore, the study will investigate whether there are differences between these two savvy technology groups concerning adopting cloud computing.

Keywords: cloud computing, educational technology experts, information professionals, Technology Acceptance Model

Introduction
The National Institute of Standards and Technology (NIST) defines cloud computing as a "model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction" (Mell & Grance, 2011, p. 2).

This study focuses on educational technology experts and information professionals particularly because of their close relation with information technology. Researchers expect these two professional groups to be early adopters of new technologies, as well as technology gatekeepers. The research seeks to explore whether these two groups are familiar with technological innovations and whether they are ready to accept them within their organizations. Furthermore, the study will investigate whether there are differences between these two savvy technology groups concerning adopting cloud computing. As the phenomenon of cloud computing is relatively new, there are not many surveys that focus on it. Further, no one has so far compared these two groups of professionals. Hence, it will be interesting and challenging to investigate this issue from both angles. The research may contribute to an understanding of the variables that influence these two groups' attitudes towards cloud computing, and may lead to further inquiry in this field.

The current study uses the Technology Acceptance Model (TAM), a well-known theory for explaining individuals' technology behaviors (Davis, 1989; Venkatesh, Morris, & Ackerman 2000), as well as personal characteristics such as cognitive appraisal, and openness to

experience. From these theoretical bases we can predict factors that may influence respondents' behavioral intention to adopt cloud computing within their organizations.

Literature Review

Cloud computing

Assuming that cloud computing is a delivery of service, it can be divided into three categories: Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS). SaaS means that the software or applications are run in the cloud and the user can access them via the Internet, without knowing about the infrastructure that runs them (Mell & Grance, 2011; Rittinghouse & Ransome, 2010). PaaS presents effective tools for developers to create the applications without delving into the details underlying the service, such as networks, operating systems, or storage. Therefore, developers focus on innovations and do not worry about infrastructure problems (Buyya, Broberg, & Goscinski, 2011; Mell & Grance, 2011). IaaS enables users to manage cloud servers as they would ordinary physical servers. IaaS allows users to not take into consideration factors as purchasing the latest technology, maintenance, and upgrading of software and tracking software licenses (Buyya, Broberg, & Goscinski, 2011; Rittinghouse & Ransome, 2010).

Technology Acceptance Model (TAM)

The TAM, the theoretical base for the current study, is a well-known model for predicting information systems use (McGill & Bax, 2007). It was introduced by Davis (1989) and is grounded in the Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975). The TAM introduces two main constructs: perceived usefulness (PU) and perceived ease of use (PEOU) as factors that may influence individuals' behavioral intention to use a certain technology. Perceived usefulness is defined as the degree to which an individual believes that using a certain technology would enhance his or her job performance (Davis, 1989). Perceived ease of use addresses the degree to which the individual supposes that using a new technology application would be free of effort. The current study concentrates on one element of the TAM: PEOU.

Personal innovativeness

Another variable that may predict respondents' intentions to use cloud computing is personal innovativeness, a variable that potentially influences how people respond to innovations (Jeong, Yoo, & Heo, 2009). Agarwal and Prasad (1998) suggested that the personal innovativeness construct (PIIT) is associated with information technology and propose that it be defined as the willingness to try out new information technology. PIIT is perceived as a stable descriptor of individuals across various situations.

Openness to experience

Another construct that may influence respondents' willingness to use cloud computing is openness to experience. This characteristic pertains to creativity, curiosity, intellectualism, and preference for novelty. Furthermore, those who are high on openness to experience are regarded as open to challenges, thoughts, and emotions (McCrae & Costa, 2003), and are motivated towards new situations (Sorrentino & Roney, 1999).

Cognitive appraisal: Challenge and threat

This section highlights the personality characteristics of challenge and threat that might affect respondents' behavioral intention to use cloud computing. Lazarus and Folkman (1984) suggested that cognitive appraisal is the person's judgment of an event or a situation which is associated with (and has a capacity for) well-being. Challenge and threat take place when dealing with stressful situations. Challenge takes place when the individual finds that resources

meet situational demands; threat occurs when the individual evaluates the situation and finds that resources do not meet situational demands.

Self-efficacy

An additional variable that may influence participants' behavioral intention to use cloud computing is self-efficacy. The term was introduced by Bandura and refers to individuals' beliefs that they possess the resources and skills needed to perform and succeed in a specific assignment. Self-efficacy affects people's motivation and behavior (Bandura, 1977).

Hypotheses

Assuming that PEOU, personal innovativeness, cognitive appraisal, and openness to experience may predict respondents' behavioral intention to use cloud computing, the underlying assumptions of this study are:

(H1). Educational technology experts' scores in computer competence will be higher than those of information professionals.

(H2). Educational technology experts' scores in PEOU and personal innovativeness will be higher than those of information professionals.

(H3). Educational technology experts will have lower scores in threat and higher ones in challenge, when compared with those of informational professionals'.

(H4). Educational technology experts' scores in self-efficacy will be higher than information professionals'.

(H5). Educational technology experts' scores in openness to experience will be higher than information professionals'.

Methodology

Data collection

This research was conducted in Israel during the second semester of the 2013 academic year and encompassed two groups: educational technology experts and information professionals. The researchers sent a mail to Israeli educational technology experts and a message to an Israeli information professional group explaining the study's purpose and asking to complete the questionnaire. 68 responses were received from the educational technology experts. The information professionals group encompasses about 450 members, 138 responses were received, giving a reply percentage of 30.66%. In order to have a similar number of educational technology experts and of information professionals, researchers performed a matching technique according to different criteria such as age and education. Researchers matched 68 information professionals to the educational technology experts. The entire sample consisted of 136 respondents.

Data analysis

Of the educational technology experts, 31 (45.6%) were male and 37 (54.4%) were female. Among information professionals, 15 (22.1%) were male and 53 (77.9%) were female. The educational technology experts' average age was 46.51, while that of the information professionals was 47.23. In order to examine differences among the two groups concerning age, a T-test was conducted. No significant difference was found between the two groups, $t = .43$, $p > .05$. Concerning their education, in each groups 6 (8.8%) respondents had a Bachelor's degree, and 62 (91.2%) had a M.A. or Ph.D. Examining the whole sample 12 (8.8%) had a Bachelor's degree, and 124 (91.2%) had a M.A. or Ph.D.

Measures

Researchers used seven questionnaires to gather the following data: personal details, computer competence, attitudes to cloud computing, behavioral intention, openness to experience, cognitive appraisal, and self-efficacy (Appendix 1).

Results

In order to examine whether there are differences between the two groups concerning computer competence (social media use, internet searching and *Moodle*), cognitive appraisal (threat and challenge, and self-efficacy), and variables related to the TAM (PEOU, personal innovativeness, and behavioral intention) a series of one-way MANOVA was performed. The MANOVA revealed a significant difference between the two groups concerning computer competence, F (3, 132) = 9.75, $p < .001$, $\eta^2 = .19$. Means, standard deviations, and the MANOVA analysis for each group are presented in Table 1.

Table 1. Means and standard deviations of respondents' computer competence

Measures	ET Experts		Information Professionals			
	M	*SD*	*M*	*SD*	*F* (1,134)	*Eta²*
Moodle	3.98	1.31	2.55	1.74	29.99***	.18
Internet	4.95	.20	4.94	.29	.11	.00
Social Media	4.30	.93	4.17	1.00	.65	.01

***p < .001

Univariate ANOVA analysis revealed significant differences between the two groups concerning *Moodle* use. It seems that educational technology experts' *Moodle* use is higher than that of information professionals'.

In order to examine whether there are differences between the two groups concerning cognitive appraisal, PEOU, personal innovativeness and behavioral intention to use cloud computing, a MANOVA was performed. The MANOVA revealed significant differences between the two groups concerning all variables except challenge, F (7, 128) = 3.03, $p < .01$, $\eta^2 = .14$. Means, standard deviations, and the MANOVA analysis for each group are presented in Table 2.

Table 2. Means and standard deviations of respondents' openness, cognitive appraisal, and TAM

Measures	ET Experts		Information Professionals			
	M	*SD*	*M*	*SD*	*F* (1,134)	*Eta²*
Openness	4.14	.52	3.72	.65	17.14***	.11
Threat	1.33	.55	1.57	.63	5.62*	.04
Challenge	3.37	.86	3.31	.91	.17	.00
Self-efficacy	4.46	.52	4.25	.61	4.28*	.03
Innovativeness	5.84	1.07	5.28	1.39	6.81**	.05
EOU	6.17	.87	5.74	1.16	5.92*	.04
Intention	6.41	.81	5.90	1.17	8.62**	.06

* p < .05, **p < .01, ***p < .001

Table 2 reveals that educational technology experts' scores are higher than those of information professionals in all measures except threat, which is lower than information professionals'.

Discussion and limitations

All hypotheses were accepted, indicating differences between the two groups. H(1) addresses differences concerning computer competence, revealing that educational technology experts' scores are higher than information professionals'. A significant difference was found concerning *Moodle* use. The fact that educational technology experts' scores are higher than those of information professionals may indicate that this group focuses more on technology than information professionals, who use technology as a vehicle in their working environment. The significant difference concerning *Moodle* is not surprising, and can be explained as a result of the different jobs, both groups have. Generally, educational technology experts use technological systems for teaching purposes, and sometimes help develop and improve them. On the other hand, information professionals do not usually teach, but specialize in conducting online searches and providing information to their patrons. Thus, it is obvious there will be a significant difference between the two groups concerning *Moodle* use.

H(2) addresses the TAM variables, and also illustrates significant differences between the two groups. Educational technology experts' scores are higher in PEOU and in personal innovativeness. This finding can be added to our previous assumption: educational technology experts are more computer savvy and technology oriented than information professionals. Again, it seems that the main orientation and focus of educational technologists is technology; thus they perceive cloud computing as easier to use, are more personally innovative and have a higher behavioral intention to use novel technology. At the same time, information professionals use technology in their workplace, but it seems they are less technology oriented. They use it, but they may consider it as only one important component of their work among others. H(3) and H(4) refer to the cognitive appraisal variables, indicating that educational technology experts are less threatened, more challenged, and display more self-efficacy than information professionals when considering cloud computing. This finding is in accord with H(5), showing that educational technology experts are more open to experience than information professionals.

Summarizing the results conveys the sense that there are differences between these two professions that use technology daily. It seems that each group has a different perspective about technology. Educational technology experts view it as the chief component of their work environment. While information professionals perceive its importance, and understand that they should make use of new technology in their workplaces, however, it is not the only factor in their work environment. Perhaps they assume that technology is only a tool in their main work that aims to search, evaluate, and disseminate information. Therefore, because newest technologies are not the main focus of information professionals, it seems that if information organizations directors would like their employees to enhance their use of technological innovations, they should expose them to the latest technologies, emphasizing their usefulness, ease of use, and benefits.

This study has several limitations. The first is that the research focused on these professions only in Israel. We suggest that if an international perspective towards cloud computing is to be achieved; the study should be conducted in other countries. Moreover, a future study may also use qualitative methods such as open questions or interviews to supplement the quantitative analysis and thereby enrich the findings by adding other dimensions to the inquiry process.

References

Agarwal, R., & Prasad, J. (1998). A conceptual and operational definition of personal innovativeness in the domain of information technology. *Information Systems Research, 9*(2), 204-215.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191-215.

Buyya, R., Broberg, J., & Goscinski, A. (Eds.). (2011). *Cloud computing: Principles and paradigms.* Hoboken, NJ: Wiley. doi: 10.1002/9780470940105.ch1

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13*(3), 319-339.

Fishbein, M., & Ajzen, I. (1975*). Belief, attitude, intention, and behavior: An introduction to theory and research*. Reading, MA: Addison-Wesley.

Jeong, N., Yoo, Y., & Heo, T. (2009). Moderating effect of personal innovativeness on mobile-RFID services: Based on Warshaw's purchase intention model. *Technological Forecasting & Social Change*, *76*, 154-164.

Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. New York, NY: Springer.

McCrae, R. R., & Costa, P. T. (1997). Conceptions and correlates of openness to experience (pp. 825-847). In R. Hogan, J. Johnson, & S. Briggs (Eds.), *Handbook of Personality Psychology*. London, England, UK: Academic Press.

McGill, Y., & Bax, S. (2007). From beliefs to success: Utilizing an expanded TAM to predict web page development success. *International Journal of Technology and Human Interaction*, *3*(3). doi: 10.4018/jthi.2007070104

Mell. P., & Grance, T. (2011). *The NIST definition of cloud computing.* Recommendations of the National Institute of Standards and Technology. Retrieved from: http://csrc.nist.gov/publications/nistpubs/800-145/SP800-145.pdf

Nasir, U., & Niazi, M. (2011). Cloud computing adoption assessment model (CAAM) (pp. 34-37). Proceedings of the 12th International Conference on Product Focused Software Development and Process Improvement. New York, NY: ACM.

Rittinghouse, J., & Ransome, J. (2010). *Cloud computing implementation, management, and security*. CRC Press, Taylor & Francis Group.

Sorrentino, R. M., & Roney, C. J. R. (1999). *The uncertain mind: Individual differences in facing the unknown*. Philadelphia, PA: Psychology Press.

Venkatesh, V., Morris, M. G., & Ackerman, P. L. (2000). A longitudinal field investigation of gender differences in individual technology adoption decision-making processes. *Organizational Behavior and Human Decision Processes, 83*(1), 33-60.