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The relationships between online education resources, elearning readiness and knowledge acquisition attributes

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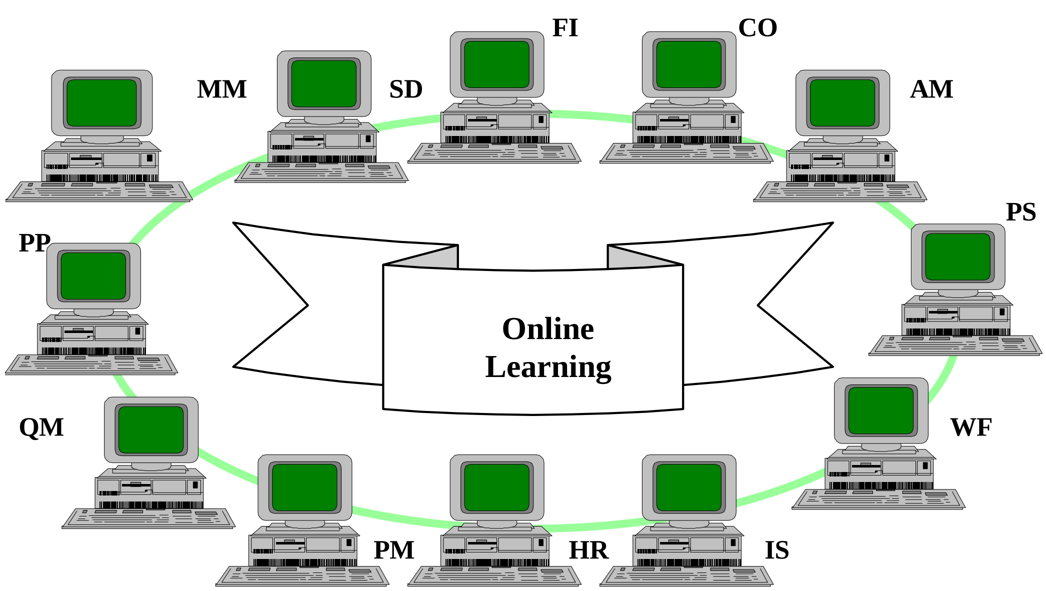


Integrated Online Education Resources

Submitted: 11 May 2003

The relationships between online education resources, e-learning readiness and knowledge acquisition attributes

Track: Academic with application in practice

Abstract:

Knowledge is seen as central to process, product innovation and improvement, to executive decision making and to organisational adaptation and renewal. The problems associated with unreliable and difficult access to the World Wide Web and the irresponsible use of e-technology manifest itself in reduced communication and collaboration among e-learners in an organisation, rising learning costs and discouraging online knowledge acquisition. Although e-technology is most often cited as essential for successful knowledge acquisition, little is known about the affect of online education resources and e-learning readiness in the process of knowledge acquisition. A survey of 118 middle-level managers and faculty who are engaged in daily knowledge acquisition activities was carried out to investigate the relationship between online education resources and a number of knowledge acquisition attributes. The findings suggest that online educational resources, and e-learning motivation enable e-learners' knowledge acquisition**.**

Keywords: E-learning motivation ♦ e-technology readiness ♦ knowledge acquisition ♦ online resources

Introduction

The quest to stay competitive in the global and uncertain economy is increasingly turning organisations towards knowledge acquisition and knowledge transfer. According to Peter Drucker, land, labour and capital – the classical factors of production – have become secondary to knowledge as the primary resource for the new economy (Drucker, 1992). Most recently, Drucker emphasised that the only competitive advantage of the developed countries is in the supply of knowledge workers; and that as "knowledge constantly makes itself obsolete", the developed nations need to work continually and systematically "on the productivity of knowledge and knowledge workers" (Drucker, 1997: 22).

The generally accepted idea that both tacit and explicit knowledge is becoming the true source of competitive advantage (Stewart, 1997) suggests that organisations which are unable to engage individual employees in surfacing, sharing and exploiting knowledge place themselves at long-term competitive risk. But acquiring knowledge relies on cyber and individual's continuous interaction, co-operation and exercise (Nonaka & Konno, 1998). So the new model of knowledge acquisition is about providing the enabling tools (i.e. technological infrastructure) in facilitating knowledge sharing, representation and transformation, as well as improving people's ability to acquire knowledge (Davis, 1998). The key to successfully implementing a learning organisation is to create an organisational culture in which the "mother of all studies after high school is online education" (Peters, 2002: 12).

Although there is a widespread recognition that technology provides the infrastructure for online education (Briedis, 2001; Davis, 1998; Mason, 1998; Pincas, 1998), there is little shared understanding of how technology enables knowledge acquisition. The literature on technology and knowledge acquisition presents a "confusion and incoherent practice of this new field of research and practice" (Handzic, 2001: 219). The review of the literature on the relationship between technology and knowledge management revealed large gaps in the body of knowledge in this area, with much theory and little empirical research. To this end, this research started by asking the following questions. What online resources should be incorporated into the learning process? How easy is to find communication systems (i.e. web sites) that would provide a platform for knowledge support? Does e-technology balance information overflow and potentially useful content? Can e-learning motivation ignored in the process of knowledge acquisition?

The answer to these questions is one of the objectives of this paper. In particular, there is an interest from academics and practitioners in addressing whether online resources and e-technology dimensions advance learners' knowledge acquisition and knowledge sharing practices. The goal of this study is to empirically explore the relationship between online education resources, e-technology and e-learning readiness, and a number of knowledge acquisition attributes. The study involves a questionnaire-based survey of middle-level managers and faculty from a number of organisations operating in the United Arab Emirates**.** These were subjected to a series of correlational and regression analyses. Future research and practical applications of the findings are discussed.

Online education resources and e-learning readiness

There is little doubt that the Internet is the most successful educational tool to have appeared in a long time (Mason, 1998) and has produced phenomenal growth in the extent and scope of education. Online education has created a new paradigm for teaching and learning different from the traditional classroom experience, and also different from earlier attempts at computer-based learning (Kearsley, 1998). That is because the Internet provides a higher equity of access, an infinite resource, motivational influence of authentic learning activities, e-learners inquiry and cooperative learning. Forman (1987) indicated that e-technology adds to the ability of learners to choose how, when, and where they participate in the learning experience and to bring together a vast wealth of previously unavailable learning resources. As a result, the use of e-technology for learning and teaching is causing a major change in the landscape of knowledge acquisition processes. There is no doubt that technology is an enabler of the development of virtual competence networks providing the infrastructure for communication, collaboration, virtual community and knowledge repository (Briedis, 2001).

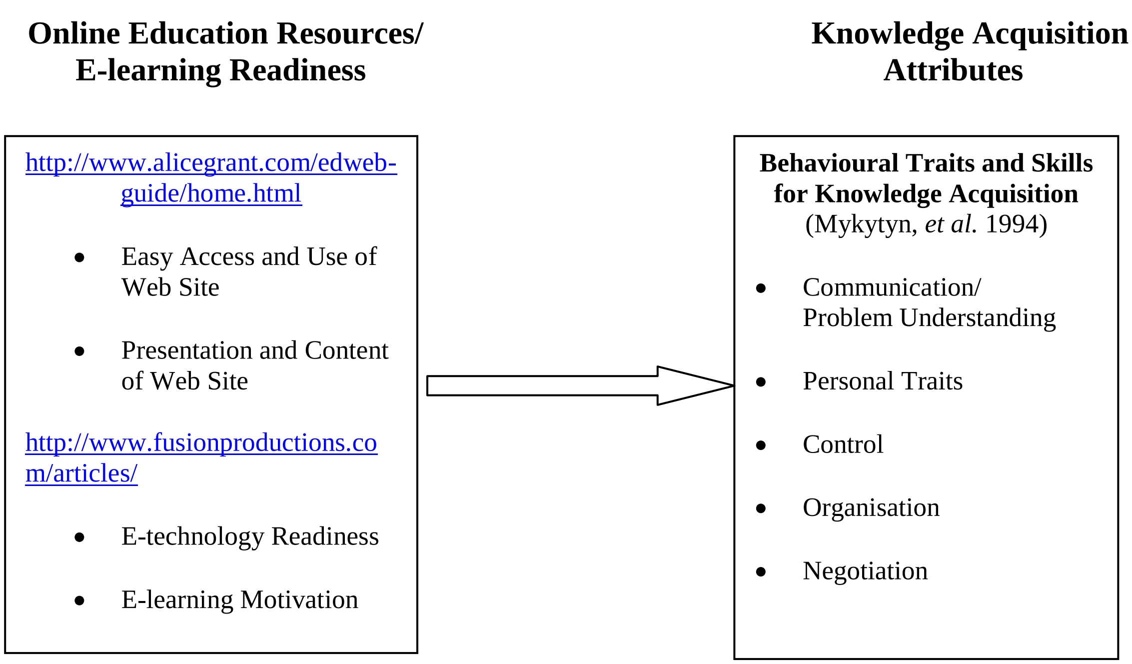
According to Davis (1998) information technology provides a network platform for collection, communication and analysis, and serves learners to share and transfer knowledge. It is expected that technology would help e-learners share and transfer knowledge (Davis, 1998), as well as play an important role in knowledge repositories, data mining and decision support systems (Hahn & Subramani, 2000). Hahn and Subramani (2000) identified the issues and challenges related to the utilisation of technology for knowledge management in three phases of deployment: set-up phase; the on-going utilisation; and finally long term effects of knowledge management support. They suggest that the most important consideration in the set-up phase is balancing information overload and potentially useful content. In the utilisation phase, the knowledge flow is an important issue, and the challenge is to balance additional workload and accurate content. A final issue raised is the long-term impact of the use of knowledge management systems on learning, innovation and experience development. Exploitation of existing solutions may be effective in the short term, but inhibit learning and innovation in the long term. The challenge is to find a balance between exploitation and exploration and be able to measure information overload and useful content.

In that regard, Alice Grant Consulting has attempted to address some of Hahn and Subramani's (2000) issues with its online resources evaluation measure. In particular, Alice Grant Consulting's EdWeb guide evaluation questionnaire assesses issues that are related to easy access and use a web site; information overload; presentation and content of the web site; and user information.

However, employment of information technology (i.e. e-technology) will not along solve all the knowledge management and acquisition problems (Hendriks, 1999). Some characteristics of human behaviour (Olesen & Myers, 1999) and knowledge itself (Hansen, 1999) put limitations to employ technology for managing and acquiring organisational knowledge. For example, in a study of successful knowledge management projects, Davenport, DeLong and Breers (1998) identified eight key factors that led to project success. One of Davenport et al.'s factor, which is related to human behaviour, is the "change of learner's motivational practices". Knowledge workers should be given the change to become familiar and motivated with e-technology before they plunge into e-learning. Because there is evidence of learners resistance, anxieties and reluctance to experiment with new ways of learning (Katz & Yablon, 2002), it is essential for knowledge management models to assess the motivation and readiness of e-learners. In that regard, Fusion Productions have attempted to evaluate e-learners readiness using two factors: a) e-technology readiness and b) e-learning motivation.

To summarise, technical infrastructure is an enabler to knowledge creation and communication (Davenport et al. 1998; Mason, 1998), and the change in motivational practices, along side with flexible knowledge structure, organisational culture and leadership, are essential facilitating factors in the development and long-term existence of learning networks (Briedis, 2001; Davenport et al. 1998). In relation to leadership for example, it was recently reported (Politis, 2001; 2002) that participative leadership styles are positively related to effective knowledge acquisition. It is thus plausible to predict that the dimensions of online education resources and e-learning readiness will be the predictive variables of knowledge acquisition attributes. These functional relationships are shown in the schematic diagram of Figure 1 below.

Figure 1 Summary of variables used in the paper



Knowledge acquisition attributes

Knowledge is usually classified as either explicit or tacit (Nonaka & Takeuchi, 1995; Nonaka, 1998). Explicit knowledge is described as formal, systematic knowledge that can be expressed or communicated without vagueness or ambiguity. It can be stored in books, manuals, and databases. Tacit knowledge, on the other hand, is considered as highly personal know-how that is derived from experience and beliefs and usually hard to articulate and communicate. It is about internal "meaning structures" in people's minds (Bourdreau & Couillard, 1999).

Although there is no one agreed definition of knowledge, knowledge often is defined in terms of its relationship with data and information. In theory, knowledge is described as deeper and richer information (Davenport & Prusak, 1998); information combined with experience, context, interpretation and reflection (Davenport et al. 1998); valuable information in action (Grayson & O'Dell, 1998); and information that has been internalised by a person to the degree that she or he can make use of it (Delvin, 1999). In addition to data and information, others recognise that knowledge is what people know, their social contact and interaction in performing tasks, their decision making, the way information flows and the enterprise's work culture (Pincas, 1998; Sallis & Jones, 2002).

With so many different prospectives describing the knowledge phenomena, where should organisations begin? What are the micro-processes that influence knowledge and its acquisition? A review of the literature reveals that, in addition to the technical infrastructure, the background, skills, training and traits of knowledge workers (KWs) are most often essential for successful knowledge acquisition (McGraw & Harbison-Briggs, 1989; Rolandi, 1986). In the literature, knowledge acquisition is defined as "acquiring information directly from domain experts" (Mykytyn, Mykytyn, & Raja, 1994: 98).

Mykytyn and colleagues (1994) revealed 26 behavioural skills and traits (attributes) that are essential for knowledge acquisition. These attributes are grouped into seven factors: communication/problem understanding, personal traits, control, organisation, negotiation, liberal arts and nonverbal communication. Communication/problem understanding is based on the subcategories of *interviewing* (asking the right questions in order to obtain the information needed); *listening* (paying attention to and concentrating on what is said); *sensitivity* (being aware of the implications of changes in how experts structure their knowledge); *open-minded* (having a mind open to new ideas both before and during knowledge elicitation sessions); *probing* (investigating and scrutinising thoroughly the expert's knowledge and responses); *conceptualising* (decomposing an expert's knowledge into its parts); *rational thinking* (drawing inferences or conclusions from known or assumed facts); and *hindsight* (understanding, after the event, of what should have done; the ability to draw upon and apply past experience). Personal traits are based on the subcategories of *empathy* (being able to understand how others feel; accurately determining what someone else thinks about an issue); *sense of humour* (being able to appreciate or express what is funny, amusing, or even ludicrous); *tolerance* (recognising and respecting the beliefs and practices of others); and *amiable* (having a pleasant disposition; being good-natured and friendly). Control is based on the subcategories of *politics* (understanding what motivates and influence employees); *organisational knowledge* (having a broad view of the company's goals and operations); *assertiveness* (insist on a course of action, even though it may be unpopular); and *salesmanship* (promoting your viewpoints regarding how expert knowledge is represented). Organisation is based on the subcategories of *leadership* (getting work done while keeping parties involved in knowledge acquisition and other phases of expert systems development satisfied); *speaking* (presenting your ideas in a manner easily understood by the expert); *writing* (preparing written documents that accurately communicate ideas in a manner easily understood by the intended readers); *management* (planning, organising and controlling expert system projects); and *domain knowledge* (possessing a strong working knowledge of the expert's domain). Negotiation is based on the subcategories of *diplomacy* (being able to say no without being too blunt; displaying tact in dealing with others; being sensitive to the feelings; pride; and prestige to others); *patience* (refining an expert's belief and points of view; tolerating an expert's possible lack of computer literacy and specificity); and *co-operation* (working with others productively; resolving conflict in an effective manner). *Liberal arts knowledge* (being broadly educated and well-informed; knowledge of subjects dealing with humanities, philosophy, literature, etc); and *nonverbal communication* (reinforcing the message to experts through gestures and facial expression).

However, these behavioural skills and traits do not emerge spontaneously or in a vacuum. They evolve out of the context and the history of the organisation and their impact is conditioned by the subjective perceptions of knowledge workers whose experience is ruled by that history. This draws attention among other things (i.e. leadership and organisational culture) to *the methods and techniques for knowledge acquisition, modelling, technological infrastructure, representation and use of knowledge* (Schreiber et al. 1999). Technology for example, is the enabling medium that supports information collection, communication and analysis, thereby enabling knowledge management. Knowledge acquisition therefore utilises the power of information communication technologies such as the Internet or the business's local network (Abdullah, Benest, Evans & Kimble, 2002).

It is thus reasonable to propose that the factors representing e-technology (i.e. online education resources) will be predictive variables of knowledge acquisition of knowledge workers (KWs). The assumed connectedness between online education resources and knowledge acquisition is expressed by the following propositions.

P1: Easy access and use of web site will be positively related to knowledge acquisition attributes of KWs.

P2: Presentation and content of web site will be positively related to knowledge acquisition attributes of KWs.

Moreover, the change in motivational practices, along side with flexible knowledge structure, multiple channels for knowledge transfer and management support (Davenport, et al. 1998), were found to facilitate the development and long-term existence of learning networks (Briedis, 2001; Nonoka & Konno, 1998). It is thus reasonable to propose that the factors representing e-learners readiness will be predictive variables of knowledge acquisition of KWs. The assumed connectedness between e-learners readiness and knowledge acquisition is expressed by the following propositions.

P3: E-learning readiness will be positively related to knowledge acquisition attributes of KWs.

P4: E-learning motivation will be positively related to knowledge acquisition attributes of KWs.

Subjects and procedure

Sample

The study focused in organisations operating in the United Arab Emirates (UAE) which have been engaged in the process of knowledge management and acquisition for more than five years. The responding firms represented a cross-section of the UAE industry in terms of size, product, service and process type. A total of nine organisations from communications industry, education, public works, electricity and water, petroleum, banking, ports and shipbuilding, and aluminium products have participated in the study. All respondents were full-time employees of the participating organisations and volunteered to participate in the study. Questionnaires, written in English, containing items measuring the above dimensions were distributed to 153 employees of the nine firms. A total of 118 employees returned usable questionnaires; yielding a 77.1 per cent response rate. The respondents were 11 percent female and 89 percent males and all were engaged in knowledge acquisition activities. In terms of education, 100 per cent of the respondents had attained some sort of technical or university qualification in the English language, and all had access to e-technology.

Respondents were asked to name the web site visited last yielding the following response rate: 20 % visited the Higher Colleges of Technology site (http://hct.ac.ae/), 16 % Goggle (http://www.google.com/), 14 % Yahoo (http://www.yahoo.com/), 12 % Cisco Systems (http://www.cisco.com/), 8 % the Gulf News (http://www.gulf-news.com/), 6 % AACSB International (http://www.aacsb.edu/), and 5 % BBC Information (http://www.bbc.co.uk/). The remaining 19 % visited other web site, such as, Workforce (http://www.workforce.com/), Electronic Journal of Knowledge Management (http://www.ejkm.com/), Emerald Publications (http://gessler.emeraldinsight.com/), and other educational and/or research sites.

Analytical procedure

The analysis of moment structures (AMOS, version 4.0) was used for the factor analysis (measurement model) and for the regression analysis (path model). In past work using AMOS, researchers attempting to model relationships among a large number of latent variables have found it difficult to fit models because there should be at least five cases for each latent variable in the model (Bagozzi & Yi, 1988). Therefore, steps are taken to reduce the number of measurements in the theoretical model being presented (Joreskog & Sorbom, 1989).

Following the recommendations of Sommer, Bae and Luthans (1995), we first developed the measurement model and then, with this held, a structural model was developed. Using confirmatory factor analysis (CFA) we first assessed the validity of the measurement model with the variables used in the paper. Given adequate validity of those measures, we reduced the number of indicators in the model by creating a composite scale for each latent variable (Politis, 2001). Joreskog and Sorbom (1989) showed that it is possible to compute an estimated score ($\xi^{\wedge}$) for each subject using factor score regression weights (ω_i), which are given in the output of structural equation modelling (SEM) statistics program. This is shown in equation (1).

$$\xi^{\wedge}_i = \sum \omega_i x_i \qquad (1)$$

Where:

$\xi^{\wedge}_i$ = is the estimated score;

ω = is the row vector of factor score regression weights; and

x = is a column vector of the subject's observed indicator variables.

For example, the composite scale of e-learning motivation was created from its three indicator variables in the measurement model. Then we determined the reliability alpha (α) for each composite latent variable. Given the reliability estimates, we built this information into the structural model (path) model to examine the relationship between the composite latent variables. Munck (1979) showed that it is possible to fix both the regression coefficients (λ_i), which reflect the regression of each composite variable on its latent variable, and the measurement error variances (θ_{ii}) associated with each composite variable. Munck showed that in the situation where the matrix to be analysed is a matrix of correlations among the composite variables, then the parameters of λ and θ can be computed using equations (2) and (3) respectively. The variances of the composite variables in this case are equal to 1.

$$\lambda = \sqrt{\alpha} \tag{2}$$

$$\theta = 1 - \alpha \tag{3}$$

However, in the situation where the matrix to be analysed is a matrix of covariances amongst the composite variables, then Munck showed that the parameters of λ and θ can be computed using equations (4) and (5) respectively.

$$\lambda = \sigma \sqrt{\alpha} \tag{4}$$

$$\theta = \sigma^2 (1 - \alpha) \tag{5}$$

Where:

λ = regression coefficients;

θ = measurement error variances;

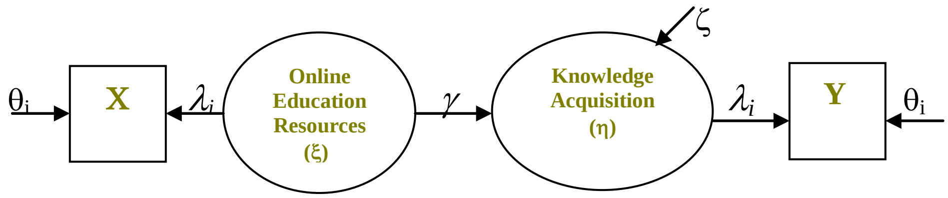
α = reliability coefficient for each composite latent variable;

σ = standard deviation of composite measure; and

σ^2 = variance of composite measure.

In the causal modelling the covariance-based methods are exemplified by software packages such as LISREL, EQS, AMOS, etc. Because AMOS is been used in this paper, equations (4) and (5) were employed to compute regression coefficients (λ_i) and measurement error variances (θ_{ii}). In turn these values have been used as fixed parameters in the structural model as shown in the simplified path model of Figure 2 below.

Figure 2 Simplified structural (path) model



Where: X and Y = composite latent variables derived from measurement model;

λ_i = regression coefficients computed by equation (4);

θ_i = measurement error variances computed by equation (5); and

γ = the regression coefficient of the regression of η on ξ.

Each estimated coefficient can be tested for statistical significance for the predicted causal relationship. A mixture of fit-indices was employed to assess the overall fit of the measurement models. (Note: The same fit indices were also used to assess the fit of the path model.) The ratio of chi-square to degrees of freedom (χ^2/df) has been computed, with ratios of less than 2.0 indicating a good fit. However, since absolute indices can be adversely effected by sample size (Loehlin, 1992), four other relative indices (GFI, AGFI, CFI and TLI) were computed to provide a more robust evaluation of model fit (Tanaka, 1987; Tucker & Lewis, 1973). For GFI, AGFI, CFI and TLI, coefficients closer to unity indicate a good fit, with acceptable levels of fit being above 0.90 (Marsh, Balla & McDonald, 1988). For RMR and RMSEA, evidence of good fit is considered to be values less than 0.05; values from 0.05 to 0.10 are indicative of moderate fit and values greater than 0.10 are taken to be evidence of poorly fitting model (Browne & Cudeck, 1993).

Measurement models

As shown in Figure 1, the categories of variables that we measured on the survey are easy access and use of web site; presentation and content of web site; e-technology readiness; and e-learning motivation; and employees' (KWs) behavioural traits and skills that are essential for knowledge acquisition.

Independent variables

Online education resources – e-learning readiness

The research reported in this paper operationalised online education resources using Alice Grant Consulting's EdWeb guide evaluation questionnaire and Fusion Productions e-learning readiness questionnaire. The EdWeb questionnaire consists of 12 items which are grouped into two factors: a) easy access and use of web site and b) presentation and content of web site, while the e-learning readiness questionnaire consists of 6 items which are grouped into additional two factors: c) e-technology readiness and d) e-learning motivation. Because these instruments have not been empirically tested, an exploratory factor analysis (EFA) was carried out to assess their construct validity. (Note: construct validity asks what the instrument is really measuring.) Using varimax rotation the instruments produced four factors with 15 of the 18 items loading clearly at 0.40 and above: these factors accounted for 61.5% of the variance. (Note: 3 items loaded on more than one factor, so as items 9 and 12.) Table I contains the loadings of these four factors.

The instrument's construct validity was further assessed using AMOS 4.0. The initial model to be tested (the "base" model) consists of the four factors corresponding to the four subscales proposed by Alice Grant Consulting and Fusion Productions, presented earlier in this paper. It contains factors related to *easy access and use of web site* (defined by items 5, 6, 7, 8, 10,11 and 12), *presentation and content of web site* (items 1, 2, 3, 4 and 9), *e-technology readiness* (items 13, 14 and 15), and *e-learning motivation* (items 16, 17 and 18).

The results indicate that the "base" model does not fit the data well since the values of GFI, AGFI, TLI and CFI fell below the recommended level of 0.90. So, items were removed when modification indices suggested strong cross loading or when AMOS showed non-significant paths. Better model fit was obtained when items 3, 8 and 12 were dropped from the "base" model. Item 3 was dropped due to its low factor loading (0.14) and its low *t*-value (1.90), whereas items 8 and 12 were dropped because the modification indices suggested that they should load on more than one factor (cross loading) and even better fit was obtained by dropping them.

Table I Factor loadings for online education resources and e-learning readiness

Item	Factor Loading$^{\alpha}$ 1	2	3	4
1. Easy Access & Use of Web Site				
11. I liked the web site	0.83			
10. The information on the web site was useful	0.74			
12. The web site has encouraged me to visit it again	0.71	0.26		0.47
6. Web site pages were clearly laid out	0.59			
7. The content on web site was easy to read	0.53			
8. The web site links were easy to read	0.43	0.25		0.69
5. Web site pages & images were quick to download	0.40			
2. Presentation & Content of Web Site				
2. It was easy to find my way around the web site		0.77		
4. On the web site I found what I was looking for quickly and easily		0.75		
1. It was easy to find an online educational web site		0.69		
3. The web site was well organised and clear to understand	0.47	0.50		0.25
9. There is too much information on the web site		0.40		
3. E-technology Readiness				
14. I enjoy spending time browsing the World Wide Web			0.76	
15. I have access to reliable Internet connection with at least a 56 K modem connection			0.70	
13. I use a computer on a regular basis			0.44	
4. E-learning Motivation				
16. I do enjoy trying new things such as the Internet				0.85
17. I am a self-starter				0.68
18. I have a desire to obtain new skills for future job opportunities				0.41

Factor: 1 = Easy Access and Use of Web Site; 2 = Presentation and Content of Web Site; 3 = E-technology Readiness; 4 = E-learning Motivation.

N = 118

The new four-factor model without items 3, 8 and 12, yielded good fit (χ^2 = 176.4; df = 81; χ^2/df = 2.18; ρ = 0.009; GFI = 0.91; AGFI = 0.89; TLI = 0.90; CFI = 0.91; RMR = 0.090; and RMSEA = 0.099). Consequently, the factors of *easy access and use of web site* (5 items, α = 0.72); *presentation and content of web site* (4 items, α = 0.74); *e-technology readiness* (3 items, α = 0.70); and *e-learning motivation* (3 items, α = 0.70), were used in the structural equations analyses described below.

Dependent variables

Knowledge acquisition attributes

Knowledge acquisition variables were assessed using the Mykytyn, et al.'s (1994) 26-skill/traits instrument. The initial model to be tested, the "base" model, contained Mykytyn, et al.'s (1994) factors of *communication/problem understanding* (8 items), *personal traits* (4 items), *control* (4 items), *organization* (5 items), *negotiation* (3 items), and *liberal/nonverbal communication* (2 items). The results indicate that the "base" model does not fit the data well since the values of GFI, AGFI, TLI and CFI fell below the recommended level of 0.90.

Thus, items were removed when modification indices suggested strong cross loading or when AMOS showed non-significant paths. Through this process a new four-factor model emerged which fits the data reasonably well (χ^2 = 582.3; df = 198; χ^2/df = 2.94; ρ = 0.010; GFI = 0.88; AGFI = 0.85; TLI = 0.86; CFI = 0.90; RMR = 0.100; and RMSEA = 0.099). The CFA results supported four composite factors: *communication/negotiation* (8 skill/traits, α = 0.83); *personal traits/ problem understanding* (7 skill/traits, α = 0.78); *control* (4 skill/traits, α = 0.70); and *organisation* (5 skill/traits, α = 0.71). These were used in the structural equations analyses described below. Two skill/traits were dropped due to poor loading, of the order of $\leq$ 0.13, not supporting the factor of liberal arts/non-verbal communication.

Given adequate validity of above measures, we reduced the number of indicators by creating a composite scale for each latent variable. Means, standard deviations (SDs), and intercorrelations of online education resources, e-learning readiness variables and knowledge acquisition attributes are shown on Table II.

Table II

Means, SDs, and intercorrelations of online education resources/e-learning readiness and knowledge acquisition attributes

Latent variable	Mean[a]	SD(σ)	1	2	3	4	5	6	7	8
Online Education Resources/ E-learning Readiness										
1. Easy Access and Use of Web Site	5.39	0.96	**.72**[b]							
2. Presentation and Content of Web Site	5.62	0.80	.55**	**.74**						
3. E-technology Readiness	6.13	0.70	.40**	.27**	**.70**					
4. E-learning Motivation	5.92	0.78	.18*	.21*	.10	**.70**				
Knowledge acquisition attributes										
5. Communication/ Negotiation	5.24	0.85	.19*	.21*	.15	.19*	**.83**			
6. Personal traits/ problem understanding	5.76	0.71	.14	.14*	.17	.15	.58**	**.78**		
7. Control	5.51	0.79	-.08	.09	-.10	-.05	.24**	.12	**.70**	
8. Organisation	5.69	0.67	.18	-.16	.12	.19*	.23*	.21*	.25**	**.71**

[a] N = 118.

[b] Coefficient alphas (αs) are located on the diagonal.

* Correlation is significant at the 0.05 level.

** Correlation is significant at the 0.01 level.

Path modelling

Having outlined the formulae associated with the computations of λ_i and θ_i, we then calculated the parameters in the path model (i.e., λ_i and θ_i). Table III contain the means, SDs, reliability estimates, λ_i and θ_i, estimates.

Table III

Descriptive statistics, reliabilities, λ and θ estimates

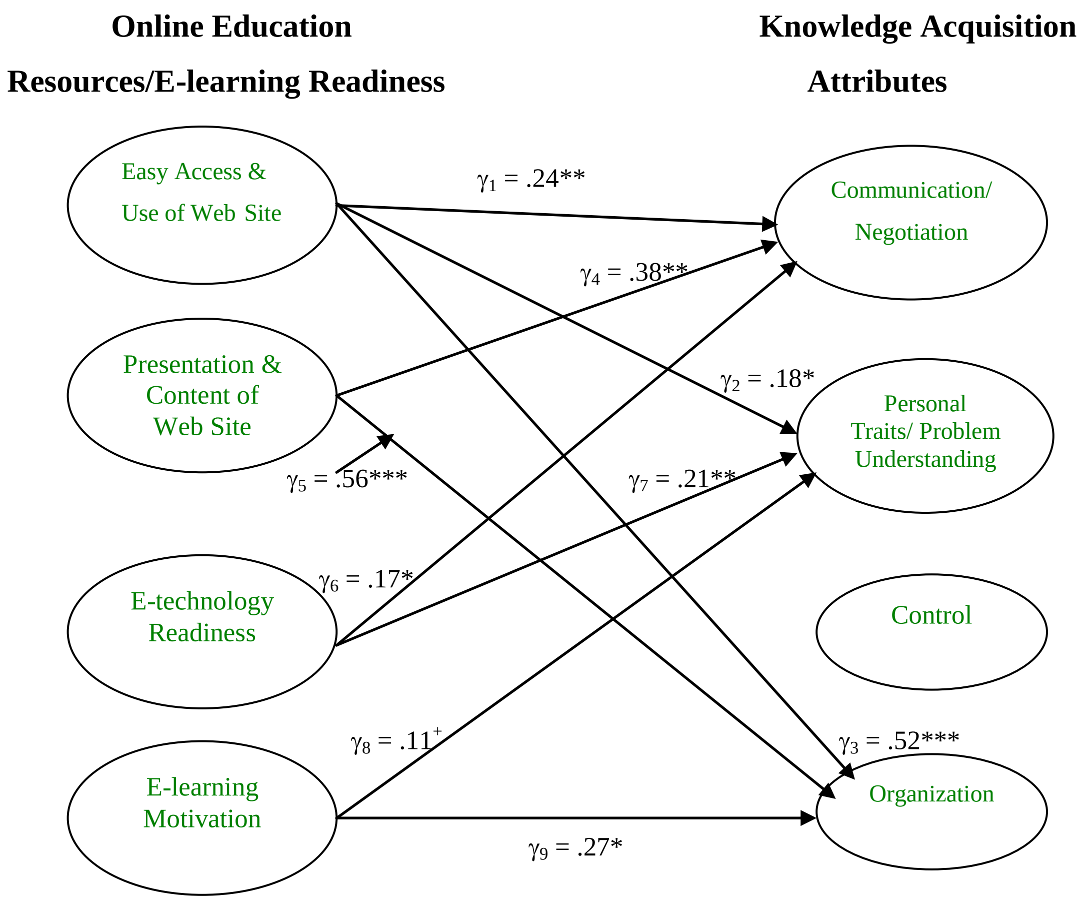
			Reliability Estimate	Regression Coefficient	Error variance
Variable	**Mean**	**SD (σ)**	**Cronbach alpha (α)**	$\lambda = \sigma * \sqrt{\alpha}$	$\theta = \sigma^2 * 1 - \alpha$
Online Education Resources/E-learning Readiness					
Easy Access and Use of Web Site	5.39	.96	.72	.81	.267
Presentation and Content of Web Site	5.62	.80	.74	.69	.166
E-technology Readiness	6.13	.70	.70	.59	.147
E-learning Motivation	5.92	.78	.70	.65	.183
Knowledge acquisition attributes					
Communication/Negotiation	5.24	.85	.83	.77	.123
Personal traits/ Problem Understanding	5.76	.71	.78	.63	.112
Control	5.51	.79	.70	.66	.187
Organisation	5.69	.67	.71	.56	.130

Note: λ has been rounded to two decimal places.

Once these parameters (regression coefficients (λ_i) which reflect the regression of each composite variable on its latent variable and the measurement error variances (θ_{ii}) associated with each composite variable) are calculated, we built this information into the path model to examine the relationships among the latent variables.

The model of Figure 3 contains four online education resources/e-learning readiness dimensions namely, easy access and use of web site, presentation and content of web site, e-technology readiness, and e-learning motivation, and four variables of knowledge acquisition (communication/negotiation, personal traits/ problem understanding, control and organisation). (Note: the dimensions of liberal arts/ non-verbal communication were not supported from the data of this study.)

Figure 3 Structural estimates of predicted model$^{\alpha}$



Note 1: $^{\alpha}$ Standardised path coefficient; N = 118.

$^{+}$ $p < 0.10$; *$p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

All correlations of exogenous variables were statistical significant @ 0.001 level.

The analysis reveals that the structural model of Figure 3 fits the data reasonably well, with χ^2 = 19.6; df = 10; (χ^2/df = 1.96); ρ = 0.04; GFI = 0.96; AGFI = 0.91; CFI = 0.93; TLI = 0.89; RMR = 0.038; and RMSEA = 0.090. Figure 3 displays results of hypotheses testing using structural equations modelling. Standardised path estimates are provided to facilitate comparison of the regression coefficients. It should be noted that only significant regression coefficients are shown. Alternative models were examined with either paths added, reversed or removed, but all led to significantly worse model fit.

Results

Preliminary results

In Table II, we presented the means, SDs, and the patterns of relationship between online education resources/e-learning readiness variables, and the variables of knowledge acquisition. There are several important observations regarding Table II. First, it can be noted that all sub-scales display acceptable reliabilities, these being of the order above the generally accepted value of 0.70 (Hair, Anderson, Tathan, & Black, 1995). Second, the correlations between the constructs used in this study are generally lower than their reliability estimates, indicating good discriminant validity for these factors (Hair, et al. 1995). Finally, it is interesting to note that these patterns of correlations, although smaller in magnitude, parallel those obtained from the path modelling (see Figure 3).

Hypotheses testing

Figure 3 indicates the estimated path coefficients (γ values) obtained from the AMOS analysis and the associated significant levels for each path. As predicted, *P1* was largely supported by the data of this study, in that *easy access and use of web* site was positively and significantly related to *communication/negotiation* ($\gamma_1 = 0.24$, $p < 0.01$), *personal traits*/*problem understanding* ($\gamma_2 = 0.18$, $p < 0.05$), and *organisation* ($\gamma_3 = 0.52$, $p < 0.001$). Moreover, no effect of the component dimension of *easy access and use of web* on *control* was found by the data of this study.

As predicted by *P2*, there were significant positive relationships between presentation and content of web site and two component dimensions of knowledge acquisition attributes of KWs. Specifically, *presentation and content of web site* is positively and significantly related to *communication/negotiation* ($\gamma_4 = 0.38$, $p < 0.01$), and *organisation* ($\gamma_5 = 0.56$, $p < 0.001$). The expected influence, however, of *presentation and content of web site* on the other dimensions of knowledge acquisition (*personal traits*/*problem understanding* and *control*) was not supported by the data of this study.

As predicted, *P3* was largely supported by the data of this study, in that *e-technology readiness* was positively and significantly related to *communication/negotiation* ($\gamma_6 = 0.17$, $p < 0.05$), and *personal traits*/*problem understanding* ($\gamma_7 = 0.21$, $p < 0.01$). Moreover, the results did not support the relationship between *e-technology readiness* and the component dimension of *control* and *organisation.* Finally, the data of this study largely supported *P4*. Specifically, *e-learning motivation* is positively and significantly related to *personal traits*/*problem understanding* ($\gamma_8 = 0.11$, $p < 0.10$) and *organisation* ($\gamma_9 = 0.27$, $p < 0.05$). However, the results did not support the relationship between *e-learning motivation* and *communication/negotiation* and *control*. No other paths were significant.

Discussion

The findings from the current study suggest that the dimensions associated with online education resources and e-learning readiness are essential in the process of strengthening collaboration (Schrage, 1990) and serve e-learners sharing and transferring knowledge (Davis, 1998; Davenport et al. 1998). Specifically, the relationships between easy access and use of a web site and most of knowledge acquisition variables were positive and significant suggesting that difficulties in accessing and using reliable web site may be a barrier to on-line learning and knowledge acquisition. Yet, the findings suggest that balancing information overload and providing accurate content on the web play an important role in the process of knowledge acquisition. This find reinforces previous suggestions (Hahn & Suramin, 2000) in that the on-going utilisation of information technology for knowledge management and acquisition depends pretty much upon the usefulness of content and knowledge flow, viz. the balance of workload and the accuracy of content.

As far as e-learning readiness is concerned the findings suggest that e-technology (i.e. the Internet and computers) enhances knowledge acquisition by bringing together a vast wealth of learning resources making learning more stimulating, thereby motivating the learner (Hargis, 2000). E-technology can provide the necessary “change of learners’ motivational practices” (Davenport et al. 1998) improving learners motivation, increasing reflection and widening access through flexibility (Hughes, 2001), thereby enhancing knowledge acquisition. In particular, the results of the present study suggest that learners’ e-motivation, viz. enjoy trying the Internet, being self-starters and having the desire to obtain new skills, is an important attribute in making one’s workload less tedious and more interesting, thus stimulating knowledge acquisition.

The results suggest that access to a suitable technology, a good user interface, and effective navigational tools are of paramount importance if the enterprise is to take advantage of the vast wealth knowledge available in improving efficiency, effectiveness, productivity, and competitive position. In other words, e-technology allows for a more efficient and interesting way of ‘impacting’ knowledge (Laurillard, 1998), by increasing the amount and quality of learning. Finally, scales, corresponding to the dimensions of online education resources and e-learning readiness showed satisfactory reliabilities and discriminant validities.

In conclusion, the study presented data that supported the propositions that online education resources and e-learning readiness are significantly related to knowledge acquisition attributes of knowledge workers (e-learners) who are actively engaged in knowledge activities.

Limitations and future work

In closing, brief mention of some limitations of this study should be made to place the results in proper perspective. Though from analytical perspective structural equations’ modelling has a number of advantages in testing causal relationships, some caution should be noted. First, given the cross-sectional nature of the study, causality cannot be tested directly, although the predictions imply causation. So, experimental or longitudinal data are needed for more definite results. Second, a larger sample size would have allowed simultaneous estimation of measurement and structural models instead of assessing the measurement models first and then developing the structural model. Future research should estimate models that replicate these results using larger sample sizes. Third, other factors that were not measured, such as economic performance, culture and leadership (Davenport et al. 1998), trust and intelligence of KWs should be included in future research models to examine the patterns of relations between online education resources, e-learning readiness and knowledge acquisition.

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