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World Wide Web applications in South Africa

Editor
Dr David Raitt

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GUEST EDITORIAL

World Wide Web research investigated at annual conference in South Africa (www.zaw3.co.za)

The success of the international World Wide Web conferences prompted the invention of a similar and local series for South African researchers and web developers. Professor Pieter van Brakel consequently organised and chaired the 1st Annual Conference on World Wide Web Applications, held in 1999 in Johannesburg.

The first international WWW conference was held in 1994 at the web's birthplace at CERN, Geneva and organised by Robert Cailliau, the person who wrote the first source code for a hypertext system for physicists, of what would eventually become today's World Wide Web. Tim Berners-Lee, who is generally being seen as the father of the web and then also worked for CERN, was also speaking at the 1994 event. Later, the International WWW Conference Committee was established, with its primary aim to arrange regular international WWW conferences. Today this Committee is better known by its acronym IW3C2 (www.iw3c2.org/). Robert played a prominent part in IW3C2's earlier work, especially to lay down standards and guidelines for future international conferences in this field. A large contingent of international speakers was invited to the first South African event, for example Robert Cailliau of CERN and David Raitt (Editor of *The Electronic Library*), to name but few.

From the first event in 1999 (www.zaw3.co.za) the overall aim of the South African conferences was to provide academics, researchers and web developers with an opportunity to describe and discuss novel internet, web and intranet applications and developments, and to exchange ideas on applying the web for teaching and research purposes. The outstanding success of this first conference necessitates the arrangement of a second, a third and further events in the years to come. For the first time in South Africa, academics and those from industry were brought together from the wide spectrum of human knowledge – with web applications as the common denominator. The uniqueness of this common theme of conferencing is that researchers from different disciplines – for example pure sciences and social sciences – more than often would share the same podium or present their research results within the same track.

Soon after its existence the conference organisers received an enquiry to host the Conference in another centre than Johannesburg. This heralded the start of a bidding system to provide other areas in the country the opportunity to host a web applications conference.

Another major development in the nine years of its existence is that it was endorsed as a Regional Conference by the above-mentioned international conference committee (IW3C2). The high standard of the peer-reviewed papers submitted annually was the driving force behind this decision. A regional conference is defined as a conference whose goals and mission are similar to that of the international conference series but is

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organized for a specific geographical audience. This definition can also apply to a conference that has a more limited attendee focus (e.g. specialist conferences) than that of the international conference series. Typical tracks that appear in the annual programmes were online learning, web-enabled business, e-government, cyberlaw, new web technologies, web development, the web and society, web-based research methodologies, and more.

Since 2003 poster sessions were also introduced. More than 30 topics were covered by the posters submitted in 2003, and especially young researchers and post-graduate students used lunch and coffee breaks to test their ideas, expose research methodologies and share provisional findings with the other delegates. Awarding a price for the best poster has become an annual highlight of the Conference.

The nine years of conferencing created the opportunity for about 600 authors to present their research to an international audience. These papers are published permanently in www.zaw3.ac.za. During the last couple of years the publication of the proceedings was preceded by a peer-review process, thus ensuring the high quality of the annual proceedings.

The first week of September each year is set aside for ZA-WWW, as the conference is being labelled to distinguish it from the international counterpart. The 2007 event took place from 4-7 September in Johannesburg. Bidding is still open for next year's, the tenth.

Thus it is with pleasure that I write this short introduction to acknowledge that once again a few of the best and most interesting papers presented at the recent World Wide Web conference have been specially re-written for this mini-special issue of *The Electronic Library*. The papers selected not only show the scope and breadth of research being undertaken on the World Wide Web, but perhaps more importantly they also demonstrate the that South African ideas and activities play no small role in the development and use of the web. To this end, Butler discusses the growing phenomenon of phishing and how we should be protecting ourselves; in the same vein Etsebeth discusses malware and cyber risk, while Seymour and Naasden look at the developing world perspective on web abuse. Finally, for something different, Yates shows how the web can be used as a martial arts training resource. I hope you enjoy our South African contributions!

Pieter van Brakel
Conference Chair, Cape Town, South Africa

The current issue and full text archive of this journal is available at
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RAT online: martial arts learning resources

Steven Yates
Derivco – Computer Based Training and Online Learning, Durban, South Africa

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Abstract

Purpose – The purpose of this research is to document the development and evaluation of a multimedia resource for the principles, techniques and syllabus content for Rough and Tumble (RAT) – a South African martial art.

Design/methodology/approach – The researcher uses the Eclectic-Mixed Methods-Pragmatic Paradigm (EMMPP) as the theoretical framework. Development research provides the basis for varied research methods and instruments, which tie into the practical and complex nature of the EMMPP. The researcher uses both a quantitative and qualitative approach, but the study is mostly qualitative in nature, due to the small numbers of participants. Data and findings are triangulated with a wide variety of methods, instruments and participants. Methods include expert reviews, observation, records, and learner feedback.

Findings – Experts, learners and users report favourably on the usefulness, usability, functionality, appeal, and effectiveness of the RAT CD-ROM as a learning and reference resource. Observation (cognitive walkthrough) reveals that inexperienced users experienced problems with navigation.

Research limitations/implications – This study is limited by its small numbers of participants, making it difficult to conduct useful quantitative analysis. As the project matures the researcher is creating a version of the RAT CD-ROM on the WWW, which requires further evaluation.

Practical implications – This research is useful in the domain of online learning, as it shows that support for kinaesthetic kinds of learning can occur in computer mediated environments.

Originality/value – This study is not the only work being done on martial arts learning on the WWW, but it is unique in that the researcher has created complex learning environments that allow learners to create, contribute, and demonstrate new knowledge, skills and attitudes. The RAT CD-ROM has value for learners and teachers of RAT, as they have useful, effective learning and reference resources. Other martial artists may benefit from the RAT CD-ROM, as several other martial arts systems have been included on the RAT CD-ROM.

Keywords E-learning, Multimedia, South Africa, Research, Learning

Paper type Research paper

1. Introduction

In this paper the researcher focuses on the evaluation of the RAT CD-ROM, which is a martial arts learning resource for the South African martial art, Rough and Tumble (RAT).

The research in this study is practical in nature and has real-world outcomes. This paper forms part of a larger study known as the RAT online project in which the researcher creates, delivers and evaluates online constructivist martial arts courses. Knowledge from these online courses is added as new knowledge to the RAT CD-ROM and the RAT CD-ROM in turn will serve as an online martial arts resource for future online courses and face-to-face classes.

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1.1 Background

The RAT online project was initiated as a response to the relocation of RAT practitioners and their resulting geographic dispersion. RAT practitioners need a practical solution to give them access to RAT learning and resources without having to travel across international borders.

Face-to-face learners of RAT also required better learning resources, as they previously received only text-based learning material. It is difficult for teachers of RAT to document physical movement in the form of text and it is also difficult for learners to decode the text into movement.

Practitioners required a "learning space" where they could engage with theory and practice, converse and collaborate with other practitioners, record and store new practically orientated knowledge and media, learn and demonstrate new skills and attitudes.

The researcher began a process of dialogue with other practitioners, resulting in the development of a multimedia resource and a pilot online course. These initial developments became the two components of the RAT online study: the RAT CD-ROM; and constructivist online martial arts courses.

This paper focuses on the two rounds of evaluation of the RAT CD-ROM component. The researcher starts with a brief description of the theoretical framework, followed by a section on the methodology of the study. The researcher then provides a description of the RAT CD-ROM, which sets in place a context for the evaluation section. The researcher concludes with a summary of the findings and some insights for future research.

2. Theoretical framework

This study is complex in nature, incorporating cross-disciplinary knowledge such as martial arts theory and teaching, teaching and learning approaches, human computer interaction, and multiple research methods. In such projects, researchers cannot rely on traditional quantitative empirical methods, as there are too many variables to obtain reliable findings this way. This research calls for an approach that can allow for varied theoretical foundations and research methods, and that can inform practical decisions. There are three main theory areas in this study: EMMPP, RAT and learning.

The approach supported by Reeves and Hedberg (2003), the Eclectic-Mixed Methods-Pragmatic-Paradigm (EMMPP), forms the core theoretical foundation of this study. The EMMPP allows researchers to use theory and evaluation methods in an eclectic and mixed way depending on the practical demands of each project.

RAT is an approach to martial arts learning that is practical, eclectic, mixed and "universal". Practitioners do not think in terms of a single martial arts strategy, such as standing striking (e.g. Karate – predominantly punches, kicks and blocks). RAT practitioners aim to develop and practice a complete self-defence system incorporating all combat possibilities and ranges (e.g. strikes, throws, ground wrestling, and weapons, as well as psychological and strategic considerations). This makes the aims of RAT "universal" and possibly a resource for the greater martial arts community. Practitioners require open-minded and humble attitudes, as they may also borrow techniques and principles from other martial arts, which is what makes RAT a mixed system. Although RAT has a syllabus and a ranking structure, it is more a way of thinking rather than a martial arts system, with a fixed technical structure. Ranks at

higher levels are structured in terms of learning outcomes, but unstructured in terms of content. This means that at higher levels RAT practitioners develop new ways of combat, which makes RAT an individualized, dynamic, and practical martial art.

The RAT concept is linked analogically to two theories of linguistics: Chomsky's Universal Grammar (UG) and Prototype Theory. Analogical borrowing is common between disciplines. Linguistics has borrowed the idea of genealogical trees from biology for language family classification. Raitt (1987) showed how one can apply martial arts principles to online library searching. UG and Prototype Theory merely provide ways of thinking about RAT knowledge and learning. Chomsky postulated that all languages have rules that belong to a universal set of language rules (Chomsky, 1965; Cook, 1988; Cook and Newson, 1996), much in the way that RAT practitioners view different martial arts techniques as belonging to a universal set of techniques and principles. Prototype theory (Taylor, 1989) is a useful way to negotiate meaning in learning environments and for developing new knowledge. This is a theory of meaning, which suggests that humans may have different mental associations (prototypes) for words and that other mental representations may be more peripheral members of a category (e.g. "work shoe" for "shoe" – as a prototype, and "slipper" as a peripheral example, where each differs because of their varying attributes). Prototype theory lead to a RAT method of creating new techniques, called multiple contextual training (MCT), which encourages learners to: change the attributes of a martial arts technique in order to create new techniques and variations (e.g. change the hand position of a throw to create a new type of throw), and change the attributes of an attack using a single defence technique to maximize the cross-utilization of muscle memory for multiple uses (e.g. use a throwing technique against a single-hand front strangle attack and then change the attack to a punch and so on).

The learning part of this study is informed by social constructivism, cognitive flexibility theory (CFT), and Bloom's Taxonomy. The social constructivism influence comes mostly from Vygotsky (1978), who suggests that learning occurs in environments where learners can solve problems and construct new knowledge with the help of more knowledgeable peers. This approach is employed in RAT, especially the face-to-face and online courses, but to a lesser extent in the RAT CD-ROM. The RAT CD-ROM was initially designed as a resource, but it is expected that with time it will evolve into a resource with more of a constructivist feel. This might occur as learners contribute more of their own knowledge.

Spiro *et al.* (1991) contend that learning at early stages is structured, but in order to achieve learning at higher levels, learning environments need to be complex and ill-defined. This approach is known as cognitive flexibility theory. The RAT syllabus is more structured in the early stages of learning detailing specific techniques to be learnt, but far more ill-structured at higher levels.

RAT practitioners need to develop in three broad areas: cognitive (knowledge), affective (attitudes), and psychomotor (skills) (KAS or KSA). These three areas were initially classified by Bloom *et al.* (1956) for the education system in the USA. According to Singer (1982) sportspeople develop automatic skills that allow their minds to concentrate on thoughts other than the movements themselves, such as strategy. This ability would be useful in self-defense situations. Krathwohl *et al.* (1964) did further work on the affective domain and the work suggests that in order to develop in the cognitive and psychomotor domains the development of the affective

domain is important. There is an equivalent concept in the Asian martial arts of body (psychomotor), mind (cognitive) and soul (affective) (see Park University (n.d.)). Martial artists believe that without the presence of all three attributes one's martial arts success will be hindered. The syllabus and learning activities on the RAT CD-ROM would need to reflect all three learning areas.

3. Study methodology

The researcher uses development research in this study, as described in Van den Akker[1] and Reeves and Hedberg (2003). Development research is a useful methodology for projects of such a complex and practical nature. This study is formative meaning that after each round of evaluation, improvements to the learning environments can be made resulting in a "recipe of design principles". The researcher measures the development and delivery in terms of learning effectiveness, which includes the functionality, usability and appeal of the RAT CD-ROM.

3.1 Participants

Reeves and Hedberg (2003) say that development research involves "collaboration among practitioners, researchers, and technologists". This study involves several kinds of participants: experts (content experts, usability experts, and online teaching experts), users (learners, learners and instructors, instructors, and other), and participant observer (the researcher). Experts were chosen based on knowledge and experience. Learners from the "other" category could have been distance learners who had trained in RAT previously, or distance learners of RAT who had never trained in RAT.

The user participant group was homogenous in terms of gender (all male group), but varied according to age, status (learner vs instructor), RAT experience, and computer experience.

All participants and parents of minors signed an informed consent form to take part in the study.

3.2 RAT CD-ROM releases

Before the researcher carried out the full-scale evaluations, he developed some initial pilot releases of the CD-ROM, which some senior practitioners commented on. He then released the first major version (19 March 2004) and carried out the first round of evaluation. Based on the findings and feedback, he developed a second major release (6 March 2005) and carried out a second round of evaluation.

3.3 Data collection methods and instruments

The data collection and analysis methods are varied and were chosen according to the type of information required, as well as practical implications. Data collection methods include expert reviews (content expert evaluation form, user interface rating form, and teaching evaluation form), observation (cognitive walkthrough with users, participant observation), learner feedback (semi-structured interview, focus group discussion, post grading interview), and records (anecdotal records, development log).

3.3.1 Expert reviews. The researcher uses visual scale diagrams for each of the expert evaluations, which allows for quick analysis. The researcher extended Reeves' (1997) pedagogical dimensions tool, which is used to compare educational software

products with each other against various teaching criteria. In the RAT online project these visual rating scales are used for the teaching ratings, but also for the user interface and content evaluations. The rating diagrams also provide a useful way to compare successive rounds of evaluation and development (e.g. round 1 and round 2). Lastly, the diagrams allow the researcher to see the results of all the experts on one diagram for each evaluation, with colour codes or different line styles for each expert. This allows for quick analysis and design decisions.

The researcher used a further extension to the visual rating scale by displaying development goals and expected ratings in the first round and development goals in the second round. The development goals are marked on the diagrams with a square and expected ratings are marked with a circle. While the researcher attempted to develop according to the goals, the implementation of the RAT CD-ROM does not always prove such a simple task, resulting in expected ratings that differ from the development goals.

The content expert evaluation form helps the researcher to determine the quality of the RAT syllabus and if required characteristics are evident from the structure and layout of the RAT CD-ROM. The researcher constructed this instrument from important characteristics of RAT and other martial arts. He also used and adapted some criteria used in Reeves' (1997) pedagogical dimensions tool and the user interface rating form.

The user interface rating form is useful for decisions and comparisons of usability and functionality of learning environments (Reeves, 1997). The researcher blended and adapted criteria used by Nielsen (2005), Reeves and Hedberg (2003), and Tognazzini (n.d.).

The researcher used the teaching evaluation form to determine the teaching effectiveness of the RAT CD-ROM and the learning tasks contained in syllabus material on the CD-ROM. The dimensions in this tool are derived from Reeves and Hedberg's (2003) pedagogical dimensions tool and martial arts learning environments.

3.3.2 Observation. The two kinds of observation include a cognitive walkthrough with the users and participant observation by the researcher.

Cognitive walkthroughs allows designers to carry out early evaluations during development[2]. This activity typically involves the observer giving the participants a list of tasks to perform on the computer ranging in complexity from easy to difficult. The observer documents a step-by-step procedure for how the tasks should be completed. Once the observation is complete the researcher can analyze the results and see how closely or how far the user matched the procedures. In round one the researcher gave the participants five tasks ranging in complexity from easy (task 1), to intermediate (task 2), to most difficult (task 3), to intermediate (task 4), to easy (task 5). The tasks related to information required by practising RAT practitioners. The researcher administered the same five task walkthrough in round two, but changed the specific pages and files to be accessed. The observer recorded each step and rated the users accordingly (successful, unsuccessful, or successful with hesitation).

While all other project participants, such as learners and experts might rate the RAT CD-ROM highly or not so high, the developer/researcher's observations play an important role and may be quite different to the views expressed by others. This makes the researcher's role as participant observer a useful one.

3.3.3 Learner feedback. After each individual cognitive walkthrough the researcher administered a semi-structured interview with that participant to probe further on the walkthrough tasks. Users had the opportunity to explain their thinking and why they may have experienced difficulty. Further feedback included user opinions on functionality, usability, appeal, and effectiveness. The researcher also gathered biographical information, data on martial arts experience, computer experience, and experience using the RAT CD-ROM. He also gathered information on frequency of use and purpose for using the RAT CD-ROM.

The researcher also carried out a focus group discussion in the first round of evaluation and post grading interviews. Post grading interviews are semi-structured interviews carried out after learners take part in a formal face-to-face grading exam. The focus group was video-recorded and the researcher took manual notes. The video camera damaged the tape and thus only minimal notes were useful. No focus group was conducted during the second round of evaluation.

3.3.4 Records. The records data collection derives mostly from participant observation of the CD-ROM usage, the researchers' development log and anecdotal records. It is useful to see whether there is much of a mismatch between ratings and records.

3.3.5 Analysis. Analysis is both quantitative and qualitative, but the study is mostly qualitative in nature, due to the small numbers of participants. Quantitative analysis is confined to basic frequency statistics to highlight areas of concern. The researcher used SPSS (a statistical analysis computer software programme) to carry out the frequency counts. Qualitative analysis is carried out with QSR NVivo (a qualitative software analysis programme), as well as with the visual scale diagrams for the expert reviews.

4. The RAT CD-ROM

The researcher developed the RAT CD-ROM with the eventual aim of deploying it as a resource on the Web. This means that technologies suitable for delivery on the Web were required. However, due to Internet bandwidth limitations in South Africa, as well as no Internet connection in the face-to-face training venue, the researcher opted for delivery by CD-ROM for this media rich resource.

The researcher developed an HTML based web site that consists of four frames areas. The top frame contains the RAT logo and important links to information such as the Aims, Guiding Principles, and Rules of RAT, as well as a few others. The left frame is the main syllabus menu and contains the links to all the content and media. The middle frame is the presentation or display area, which is where the HTML pages open. The bottom frame contains copyright information, a RAT footer image, and the last date of update of the CD-ROM. The CD-ROM is self-running and the home page opens when the user inserts the CD in their CD or DVD-ROM, which is expected functionality of CD-ROM media. The researcher chose a frames-based site, as it is the only effective method of having one file for the menu in a static HTML site. The RAT CD-ROM contains an extensive navigational structure and the researcher needs to be able to make rapid changes.

The syllabus menu consists of three main areas, which are clearly marked by bold red text: Syllabus Content, Resources, and Other Martial Arts. Under each section the categories are listed with folder icons. Each category may contain links to HTML

pages, or further sub-categories. For example, the Senior Syllabus folder contains a link to a main senior RAT page, as well as other folders for each of the ranks, which in turn contain links to the relevant pages. The researcher chose a familiar Windows Explorer metaphor for the menu, as it might provide a seamless usable environment for Windows users. The site layout is shown in Figure 1.

The RAT CD-ROM contains links to hundreds of HTML pages, PDF documents, nearly 600 movie clips, instructional videos, nearly 2,000 photos, diagrams, syllabus content for junior and senior RAT, other martial arts syllabus material (North Siu Lam Kung Fu, Jiu-Jitsu, Eskrima, Hsing-I, Wing Chun Kung Fu, and Kobujutsu), mind maps, example grading exam videos and other learner output, Flash animations, some freeware software, a glossary, external web site links, and multiple pages of fitness programmes. The media is meshed together by an expansive network of links and cross-links.

The navigational structure is modelled on the needs of the RAT practitioner. There are folders, sub-folders and links to all the various media. Most of the folders are organized in a way that requires a basic understanding of the structure of RAT. For example, to find the movie clip on boxing drills, you would need to know that a boxing drill is a kind of sparring drill and not a technique (Yates, 2005). The folder and link structure on the content pages is based on a large mind map (the RAT framework), which represents the cognitive structure of RAT. While the navigation was created with ease of use in mind, it may present problems for inexperienced RAT practitioners. The researcher took the view that the structure of the folders and links may serve as an implicit learning aid for learners of RAT so that they can become familiar with the various categories, sub-categories, principles and techniques.

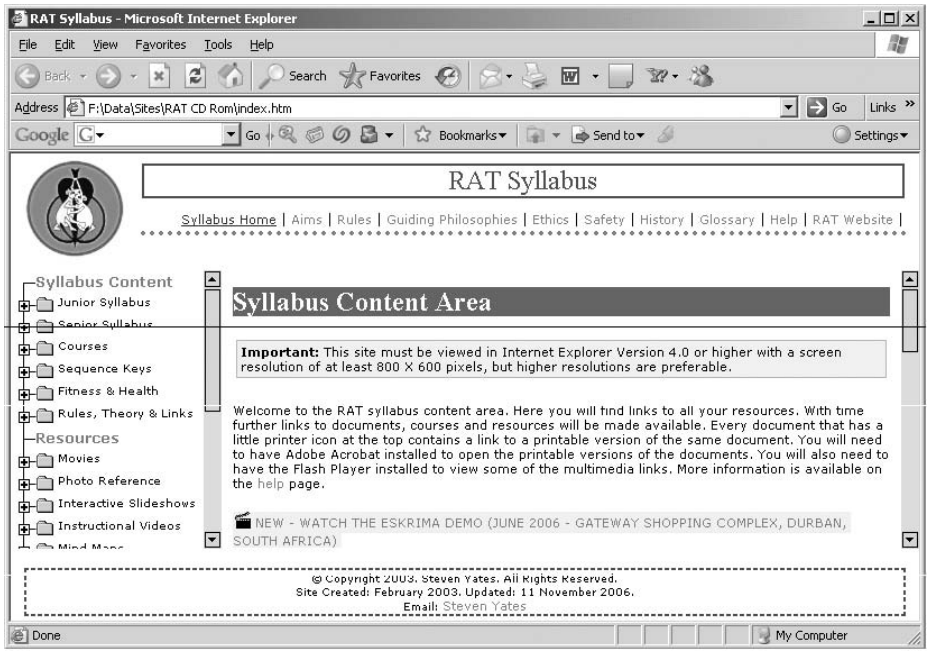

Figure 1.
RAT CD-ROM layout

In the next section we see how the evaluations were carried out and how the results have influenced further development. The evaluations are presented in the order in which they were carried out.

5. The Evaluations

5.1 Round 1

Observation – cognitive walkthrough. Sixteen participants took part in the first cognitive walkthrough. Task 3 of the five tasks seemed to cause difficulty for most of the participants, as only four participants completed the task successfully. Task 3 required the greatest number of steps to complete and was more complex than any of the other tasks. Two of the participants (junior RAT members) did not need to access the information in task 3, as this information is required only at the senior levels. This was nevertheless a useful exercise, as it added to the view that inexperienced users and inexperienced RAT practitioners may experience difficulty in task 3, as they are not familiar with how that information is structured in the RAT syllabus and in the navigation structure. Three of the four participants that completed the task have a "learner and instructor' role in the club, while one is a learner.

Task 2 and task 5 also caused difficulties. Four participants could not complete task 2 (one of them from the "learner and instructor" group) successfully and three participants were unsuccessful in task 5. Of those that could not perform task 2 and 5 successfully one rated his computer experience as fair and two had rated their WWW experience as bad, which may have contributed to their poor performance in the respective tasks. Only one learner did not complete task 4 successfully and all participants completed task 1 with success.

The walkthrough suggested that there were problems with the structure of tasks 2, 3, and 5. The researcher carried out further data collection, detailed below, to determine the extent and cause of the problems in the above-mentioned tasks. He then considered the data from the various sources and conducted further development before running a second round of evaluation. The appendix contains an example of the round one cognitive walkthrough activity.

Learner feedback – semi-structured interviews. All of the cognitive walkthrough participants (16) took part in the semi-structured interviews. Overall participants express feelings of satisfaction with the CD-ROM in the areas of usability, appeal, functionality, and effectiveness. One learner had the following to say of effectiveness:

> 1. It illustrates things better than a person, because you can go over and over something without frustrating the teacher.

Comment (1) is interesting, as the RAT CD-ROM was not initially designed as a tool to actually teach, but rather as an aid to teaching and reference. So it seems that its intended use has extended. The same learner made another comment that may support the observations made in the cognitive walkthrough about the experienced practitioners completing task 3 successfully because they understand the structure of RAT better:

> 2. The tree structure helps you understand the concepts better. It also helps you to know what you have to do. The sub-categories make life a lot easier. [The] tree structure helps individuals come up with their own programmes (e.g. kicks – Monday, punches – Tuesday).

Comment (2) also supports the idea that implicit learning can take place simply from the learners making use of the RAT CD-ROM and the tree menu.

During the interviews the observer discussed any level of perceived difficulty in the cognitive walkthrough tasks. The participants who had difficulty with task 3 complained that the information (a list of sequences) was too hard to find. The task required the user to navigate from the senior syllabus to the junior syllabus to view the sequences. One user commented on this structure:

3. You shouldn't have to go to the Junior-Syllabus to see the sequences.

While comment (3) is a valid comment, especially in light of the fact that the sequences resource is used quite often, there was a reason for the original structuring of the links. Senior RAT practitioners do not have sequences in their syllabus, but they need to know them by default, because of the requirement to learn the junior syllabus in their first four ranks. The thinking therefore was that if a senior learner had been following the syllabus properly, they should know this structure. It turns out that many participants had not ever read their syllabus requirements.

The participants did not report any useful reason why they had difficulty with task 2. The problems in task 5 were due to the name of the "Quick Pics" folder, which has been renamed to "Photo Reference" for the second round of evaluation.

Learner feedback – focus group discussion. Ten people took part in the focus group discussion. Most of the discussion centred on the needs for future releases of the RAT CD-ROM and the difficulty with task 3. The discussion highlighted the fact that many participants had not even read their syllabus requirements. These participants were inexperienced practitioners and were not yet accustomed to the learning methods of RAT. The discussion was further evidence that the navigation in some areas needed improvement. Participants also requested a glossary.

Expert review – content expert evaluation. Out of the five experts from whom the researcher requested an evaluation, three completed the content expert evaluation form and one provided written feedback. The expert who provided written feedback felt uncomfortable using the rating form and said that he required more time to go through the RAT CD-ROM properly before he would use the rating form. He submitted a complete rating form in the second round evaluation.

Overall the ratings show close positioning around the development goals (square) and expected ratings (circle) (Figure 2 under Headings and Figures), with the exception of "guiding principles", "ethics", "safety", "syllabus structure" and "topics".

This review indicates that the visibility of the information above needed to be improved. Possibly the "syllabus structure" dimension could be misleading, as every rank level is laid out in terms of the tasks required with clear learning outcomes, but the nature of the tasks becomes more unstructured at higher rank levels. So at a surface level the syllabus will seem highly structured, which is possibly the reason for the mostly "structured" syllabus rating.

Expert review – user interface rating. Three evaluators completed the user interface rating form. One of the evaluators omitted the "anticipation of user needs" dimension. This dimension was moved more appropriately to the content expert evaluation form in the round 2 evaluation. The ratings in Figure 3 show an irregular pattern, but overall a clustering around development goals and expected ratings.

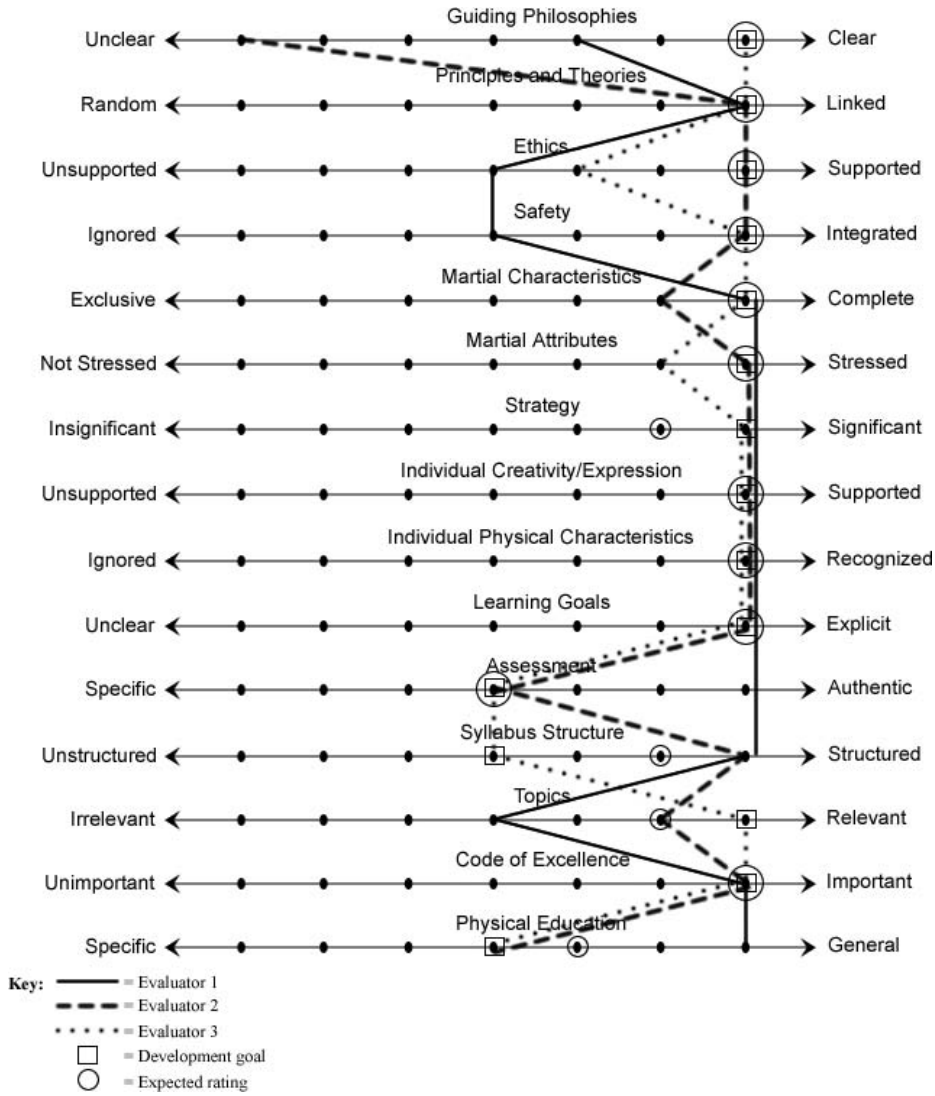

Figure 2.
Content expert evaluation round 1

Although mostly a satisfactory result, there were areas that could improve, such as "navigation", "cognitive load", "mapping", and "information presentation".

Expert review – teaching evaluation. Three online teaching experts completed the teaching evaluation form. The RAT CD-ROM was designed as a static information resource that would have releases every few months. The CD-ROM was merely to serve as the interface to learners' syllabus and tasks, which they need to go and practice in real-life by themselves or with another partner. While the researcher aimed to develop a learning environment that embraces constructivist principles, it was expected that ratings would be more instructivist in nature. The ratings show (Figure 4)

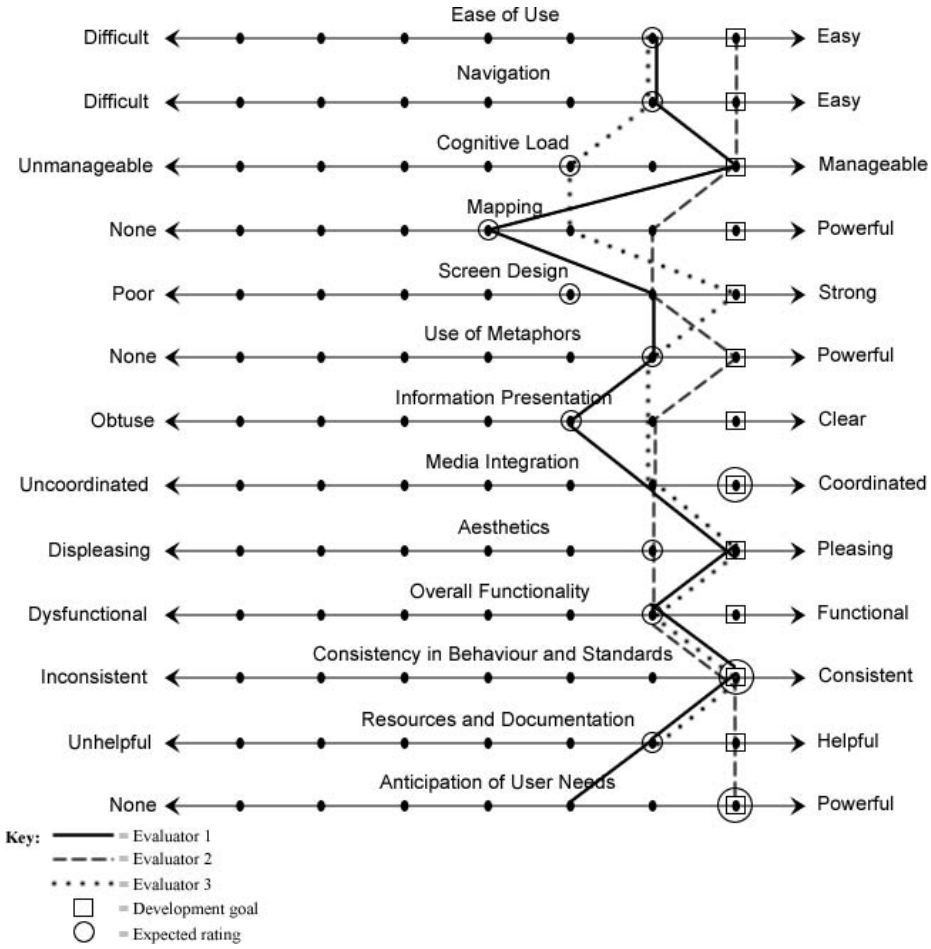

Figure 3.
User interface rating form round 1

that the first version of the RAT CD-ROM more closely matched the expected ratings and not the development goals.

Two of the evaluators reported difficulty using the rating form, as they felt that there were elements of both poles for some of the dimensions in the rating form. The researcher added a third dimension (integrated) in the middle of most of the scales for those ratings where there is a strong presence of both the poles (e.g. instruction and construction).

Observation – participant observation. The researcher observed that some participants are not as serious as others about their training and therefore failed to read their syllabus requirements. He suspects that this might have had an influence on the cognitive walkthrough results, especially task 3. Even though there were reasons why the information was structured the way that is was for task 3 and more experienced users could easily find the information, the number of mouse clicks became an issue of practicality. Changes would be required to the navigation of task 3.

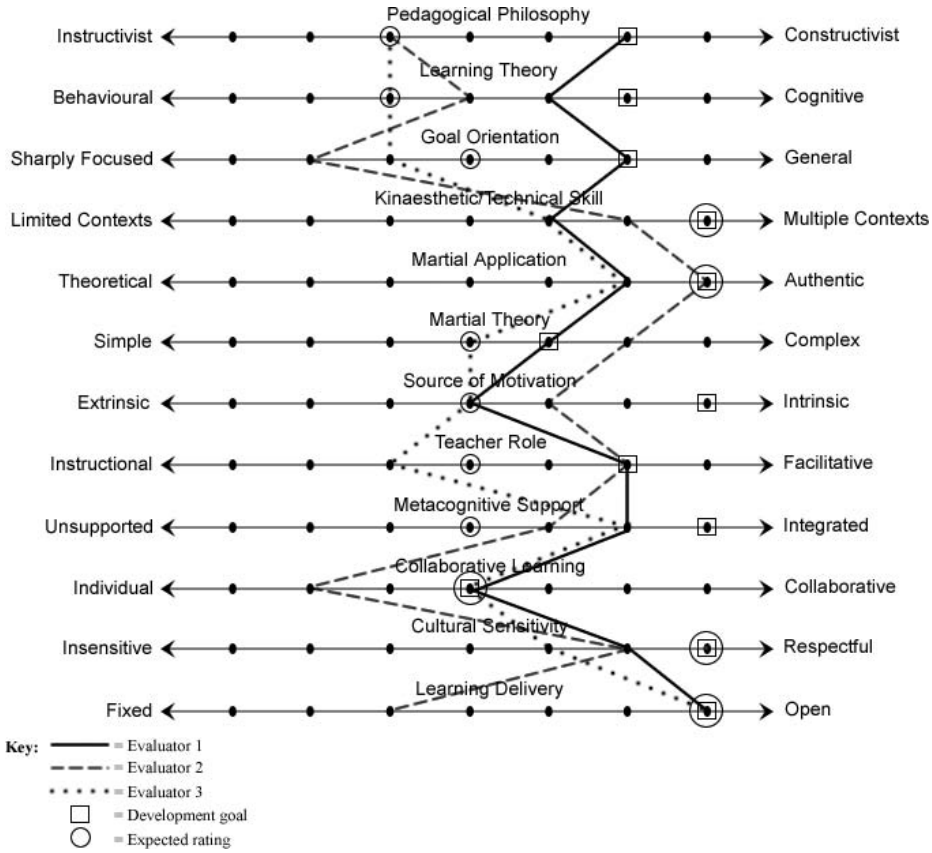

Figure 4.
Teaching evaluation form Round 1

Learner feedback – post-grading interview (focus group). Three participants took part in the post-grading interview. The discussion indicated that the RAT CD-ROM was useful to prepare for the grading, because learners could replay and pause the video clips and it helped to correct problems. They also said that they used the CD more close to the grading and that it was also useful in real life. Participants suggested a slight change in folder names for the senior ranks that would be the same as the names we use in the face-to-face classes. One participant also said that voice and varying camera angles in video clips might help learners understand some of the more critical techniques better.

Records – anecdotal records and development log. Anecdotal records and a complex and lengthy development log reflect that development is time-consuming, technically difficult and can be delayed due to dependencies on people and technology. Video recording was often delayed because of participant absenteeism and bad weather. This means that stakeholders need to weigh the benefits of a learning application versus the time and effort required to produce learning applications such as this.

Changes and additions. The researcher made changes to the RAT CD-ROM based on the findings above, which included improving navigation, adding more media

(especially video) and providing more cross-links between pages within the site to the wide variety of course topics. Further pages were added to the top menu on request of participants, some of which include "glossary", "history", "guiding principles" pages and a few others. Some of the folder names were changed and pages were divided and grouped to make manageable chunks of information. The researcher also added learner output, such as mind maps and video gradings of course participants from RAT online courses (online wheel spanner course, online belt course, and online pen course).

Some expert reviewers reported difficulty with some of the evaluation instruments. So, based on their feedback and participant observation, the researcher made minor changes to the evaluation instruments and also moved some of the evaluation dimensions from their existing forms to more appropriate forms.

The researcher then carried out round 2 of the evaluation.

5.2 Round 2

Observation – cognitive walkthrough. Seven participants took part in the second round of the cognitive walkthrough. Again with such small groups the cognitive walkthrough as the only decision-making factor is insufficient, but useful as an indicator that changes to the design are required.

Once again task 3 caused problems for the learner group, as both learners could not find the information required, as well as one "learner and instructor". The one "learner and instructor" completed the task after being abroad for a period of a year and had not used the CD or trained in RAT for that period. The same practitioner was able to complete the task successfully in the first round of evaluation. Four "learner and instructor" participants completed the task successfully, one with some hesitation. This finding may indicate that the more experienced RAT practitioners who understand the thinking behind the syllabus are able to find the information easier than the inexperienced learners because they have acquired the cognitive structure of RAT. This finding supports a similar finding in the round 1 evaluation.

All participants completed Tasks 1 and 2 successfully and only one each in tasks 4 and 5 did not complete the tasks successfully. This might indicate that development changes after the first round of evaluation were successful.

Learner feedback – semi-structured interview. In the semi-structured interview one of the "learner and instructor" participants took longer with task 3 than he did with the others. His response offers some corroboration for the perception that more experienced RAT learners find the information easier because they understand the structure of RAT:

> 4. I was thinking I would see a link to sequences, but then I had to apply my knowledge, … where would you find it?

Again it seems that some participants may not have read their grading requirements as one comment seems to indicate:

> 5. I didn't realise the sequence keys list was right here in the syllabus.

Notwithstanding that some participants may not have read their syllabus, the information does not stand out in task 3. It is however not supposed to stand out too much and occupy an overly important position in the RAT syllabus. There needs to be

some degree of effort on the part of the learners. Of course, the task instructions may also have been unclear, as one participant's comment suggests:

> 6. Because you asked for list of sequences.

This may suggest that the participant was looking for a complete list of sequences and not the short list for task 3.

In the areas of functionality, usability, appeal and effectiveness participants generally comment favourably. In the area of functionality one participant complained that some videos are too dark and another said that some links do not work. Otherwise people did not have problems with the functionality of the CD. Overall, participants comment that the new release of the RAT CD-ROM is easier to use, but they could not provide reasons why this might be the case. One participant mentioned that he struggled to find the information for task 3 because he confused "combinations" with "sequences", again suggesting that information is easier to find when participants have an understanding of the structure of RAT. Six out of the seven learners like the way that the site looks and some add that the functionality and content is what keeps them interested. However one learner has the following to say:

> 7. Yeah, because um . . . in terms of usability the set out is brilliant because for a new user it is easy to get started. No offence, but from a graphical point of view it is a bit bland, but it is functional. I would give it a 10 out of 10 for functionality, but a 6 out of 10 for looks. But it is to present data and a pretty site might confuse the user, especially a new user. The links guide the user (different colours).

The researcher agrees with this statement, as the site was built with function in mind first. Later iterations of design will incorporate a new look and feel. All of the participants think that the RAT CD-ROM is an effective resource. Some of the comments indicate that the participants have benefitted in the three domains of Bloom's Taxonomy: cognitive, affective, and psychomotor. One of the comments about the usefulness of the text on the CD intimates that the text helps learners employ higher order thinking skills:

> 8. I think they're necessary. It is like a definitive breakdown and it forces you to think about it and analyze it. To act it out. To visualize something you've never seen before and get it right helps you to remember it.

Another comment supports the relevance of the topics on the CD and supports development in the affective domain:

> 9. This appeals to me. It is very streetwise. It teaches you to defend yourself in the society we live in.

Comments (10) and (11) also suggest that the constructivist teaching approach, guiding principles and software on the CD are effective:

> 10. Yes, I learnt. What intrigued me was the fact that you could use Freemind [Freemind is a free mind mapping software programme] for other things, like school [referring to university] work. I was thinking that Rough & Tumble you could apply its principles to life and nothing will be too difficult.

> 11. The whole CD effectively illustrates your whole point to RAT and student input. When I see how many people are getting involved reinforces the whole concept behind RAT. It is

> inspirational, because when you see all that it is on [the CD] [it] keeps you involved. And if you are not able to get to a training session you at least have the knowledge at your finger tips.

Some participants say that they learnt new techniques and sequences, which indicates that they have gained new skills (psychomotor domain). Comments (12), (13) and (14) support this statement:

> 12. I have learnt new techniques from it. It's even refined old techniques.

> 13. Ja, my throws, certain sequences, the baton as well. It's helped me.

> 14. Ja. Well, in terms of exercises, fitness programmes and stuff, I looked at the pictures and it was what we were doing. I was doing some of the exercises wrong.

All participants regarded the video clips highly and were interested in the idea of more instructional videos.

Expert review – content expert evaluation. Five experts out of six returned complete evaluation forms in the second expert evaluation. One of the five experts completed the round 1 evaluation form (the wrong form), so some of the data was missing, because the researcher added new evaluation dimensions in the second round. Figure 5 shows that changes made in the areas of "ethics", "safety", "syllabus structure" and "topics" after round one improved the rating slightly, but the rating for "guiding principles" remained more or less the same as round 1.

The evaluations for "assessment" reflect differing expert opinions. Although the researcher would prefer a closer concentration around the middle of the scale, the varying ratings might reflect the varying nature of many of the assessment tasks. The RAT CD-ROM is a large resource and ratings might be dependent on where in the CD the experts look. The "kinaesthetic/technical skills", "martial application", "martial theory", and "anticipation of user needs" dimensions were previously part of the user interface and teaching evaluation forms. The ratings for these dimensions in the round 2 content evaluation were similar to those received in round 1, indicating some degree of reliability of the instrument.

One expert's comment serves to corroborate findings in other parts of the study that the RAT CD-ROM has improved in terms of usability and effectiveness:

> 15. This version of the RAT CD-ROM is much more user friendly than the previous one. The amount of information is also growing considerably and there is a vast amount of information available.

Expert review – user interface rating. The same three experts from round 1 evaluated the second release of the RAT CD-ROM for its user interface. One evaluator did not rate the "use of metaphors" dimension. Changes effected after round 1 reflect a pattern closer to the development goals, especially in the areas of "use of metaphors", "information presentation", "media integration", and "aesthetics" (Figure 6).

The evaluation also shows that more could be done to improve "navigation", "cognitive load", "mapping", and "screen design". However, one expert reported that release two of the RAT CD-ROM has improved in the areas of "navigation" and "cognitive load" compared to the first release.

Expert review – teaching evaluation. The same three online teaching experts in round 1 completed the round 2 teaching evaluation form. Figure 7 shows a much closer

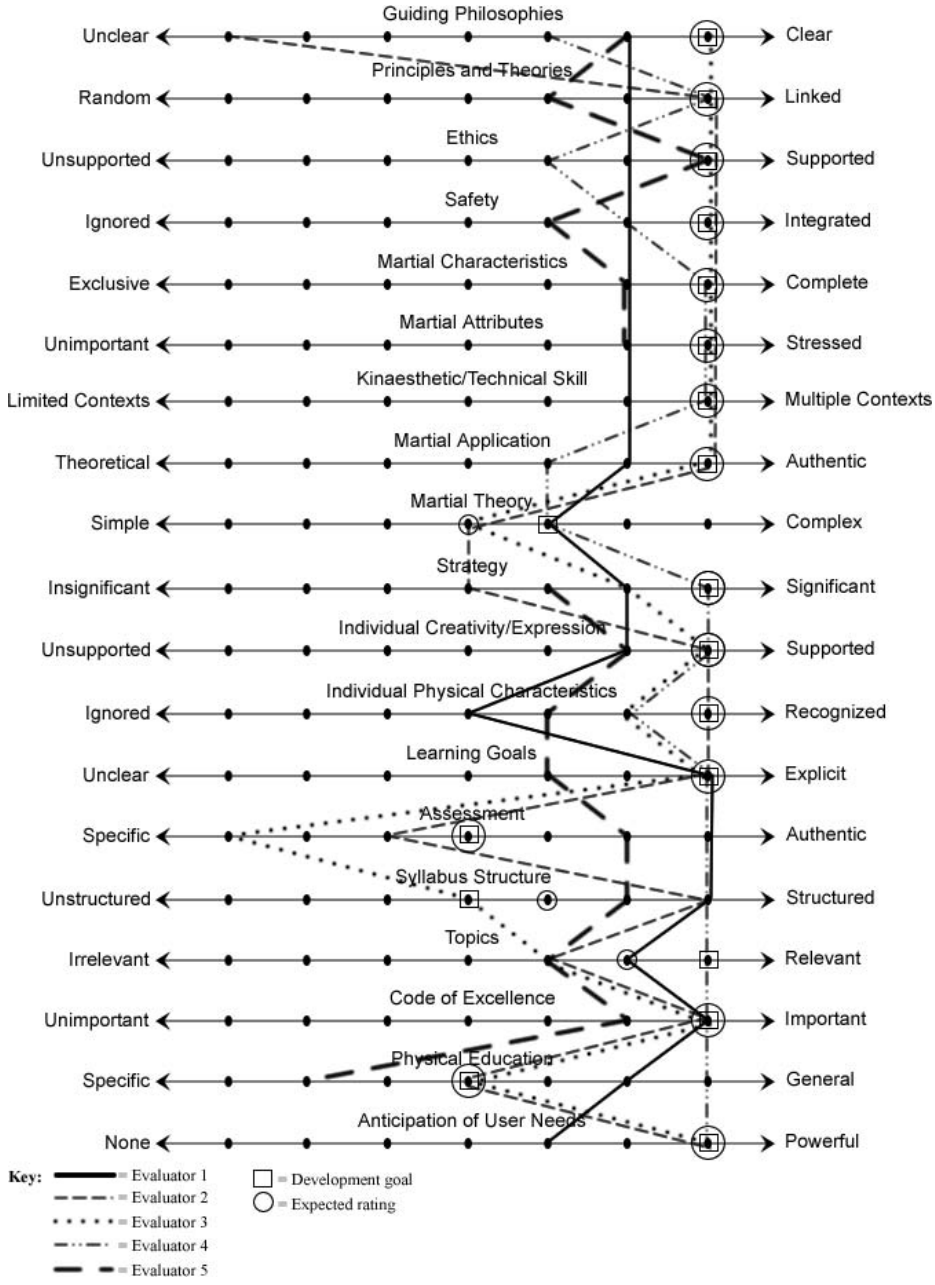

Figure 5.
Content expert evaluation round 2

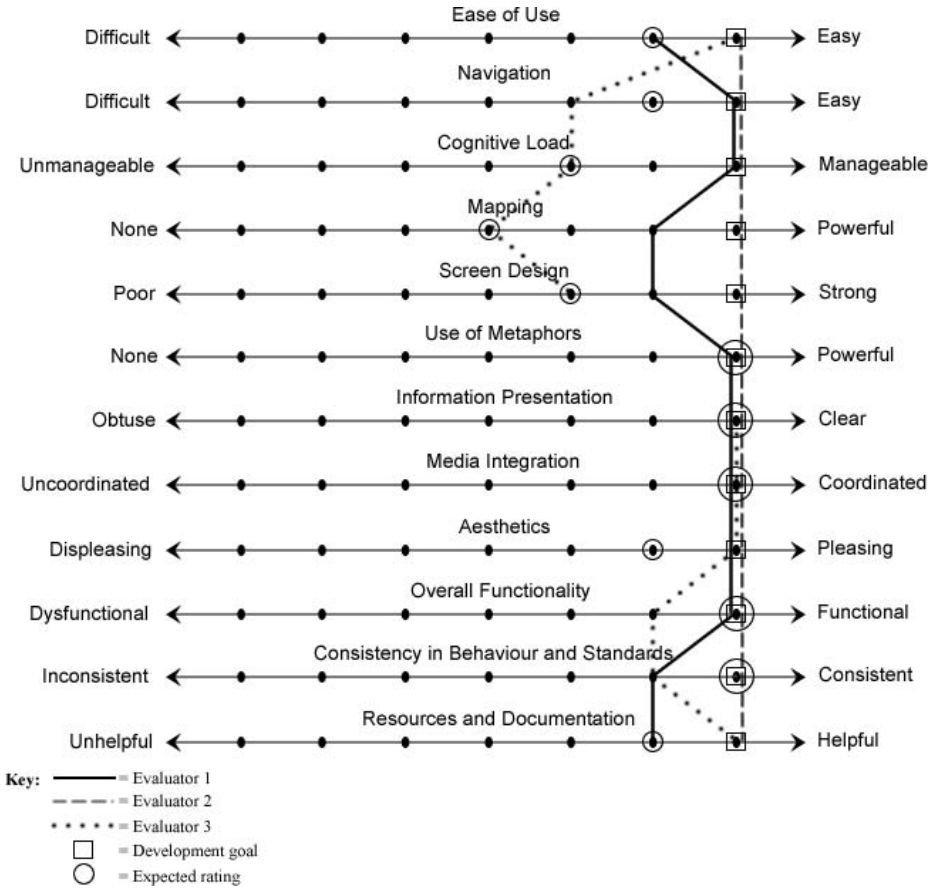

Figure 6.
User interface rating form round 2

grouping around the development goals and more of a harmonious pattern between the experts. The ratings show that many of the changes after round 1 and the addition of learner output in online courses may have improved the teaching effectiveness of the RAT CD-ROM.

The more constructivist feel of the second release of the RAT CD-ROM is supported by comments made by two of the experts:

> 16. I based my evaluation decisions on an overview of selected syllabuses and also saw how some work is applied in the evaluation videos and I see it is more facilitative/constructivist etc. than I thought after viewing it previously.

> 17. In particular, I felt the first version of the CD was more instructivist than the second, with the addition of mindmaps from the students and different degrees of scaffolding being provided at different levels of learner progression greatly contributing to the more constructivist feel of the second CD-ROM.

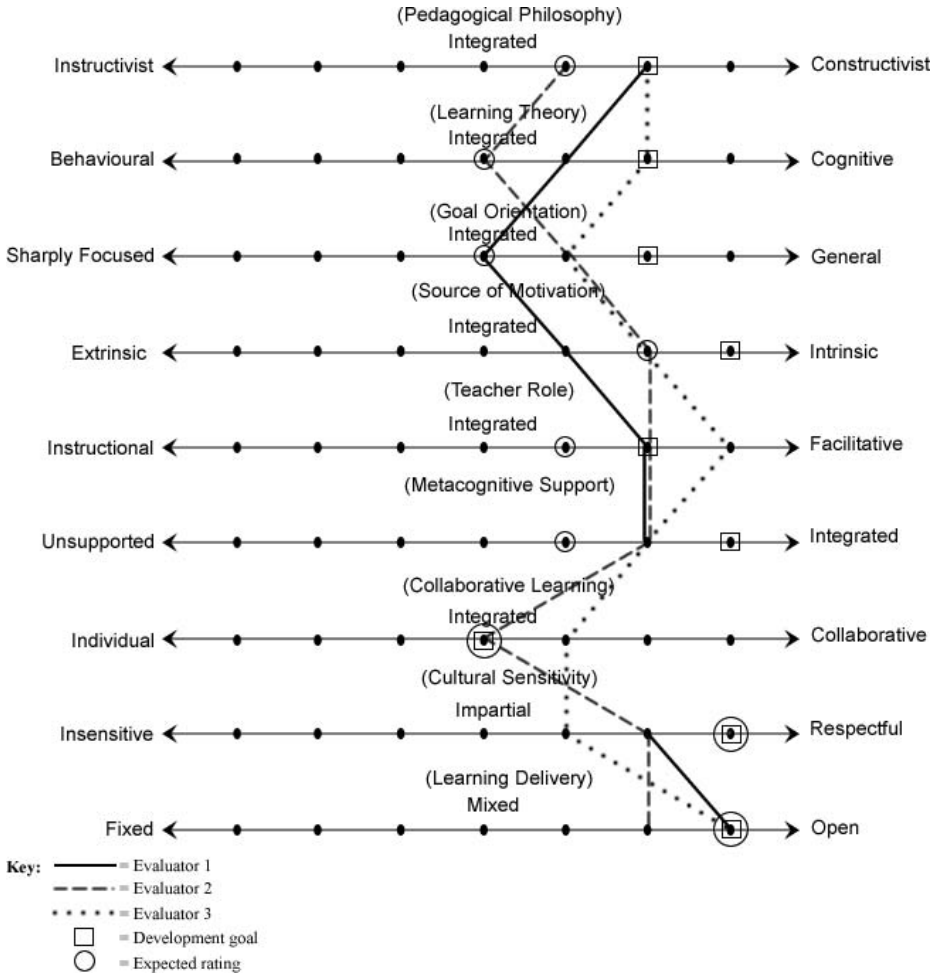

Figure 7.
Teaching evaluation form round 2

Observation – participant observation. The researcher has observed that the RAT CD-ROM is used by most of the learners and it is used by at least someone during every face-to-face class. It would appear from the regularity that it is used that users have grown accustomed to the resource and use it for reference, teaching and learning.

Learner feedback – post-grading interview. Four participants were interviewed in a post-grading interview in the second round of evaluations. Two were individual interviews and the other two were conducted as a focus group. The same questions were asked of all participants.

Compared to the post grading interviews of the first round, the second round interviews offer much richer data in terms of the usefulness, content and learning approach embraced in the RAT syllabus and CD-ROM. Learners express positive feelings towards the syllabus, demonstrate higher order thinking and knowledge construction. Once again the video clips were highly valued and participants requested

more instructional videos with voice and different camera angles. The comments below serve to support some of the claims in the above paragraph and also the expert review rating towards a more constructivist learning environment:

> 18. I need the mind map for mine. I had all the different types of punches, so I could see all the different types of blocks for those things.
>
> 19. The new syllabus makes us think a lot more about the techniques that we are doing. It makes us think. It is a lot more difficult.
>
> 20. It is a creative way of learning techniques, allowing you to think and develop techniques while training.
>
> 21. We can all add our own piece to the CD.
>
> 22. When I was working out the techniques the mind map, the RAT framework for the principles [was useful]. Because it was easier for me to know that I was not repeating the same things. For example, moving in different directions. Sometimes the techniques were similar, for example face-to-face, side to face, position of hands. It helped me do the same techniques with different configurations. It was good guidance, even though I knew what to do. It guided me to actually go about planning for the grading. The higher your grade is the more of use the CD is, because earlier on in terms of doing the earlier gradings you can just practise the techniques. The higher you go the more techniques there are so you need to create order.
>
> 23. Because it gives you the basics, the framework and it encourages productivity. Like a platform where you can get to know yourself more. Because by doing everything you get exposed to everything and then you get to develop and get a chance to explore what you like more. Also it is not a rigid martial art. It is flexible.

The above comments suggest the learners appreciate the opportunity to explore rather than only receive new knowledge. Eventually the RAT CD-ROM should become more of a learner developed resource than a founder developed one. One last participant comment points the way to the future direction of the CD-ROM development:

> 24. I think we should be (pause . . .) we are at a phase where we have gone past the complaining stages, we either do it or we don't do it. Everything is up to us now, because if someone complains I don't know what they want. If anyone wants something **we** should add it.

Records – anecdotal records and development log. Not much has changed in terms of technical difficulty and the time-consuming nature of development, but it has become marginally easier because of a well-established structure to the CD. Some of the ease results from new digital still camera technologies with video clip capabilities. These are higher in quality and easy to download onto the computer after filming.

Changes and additions. Future challenges for RAT CD-ROM development will include significant additions to the media, especially the video clips, instructional videos, and animations. Infrastructure needs to be in place to allow greater and easier collaboration on the CD-ROM for learner output, especially in respect of the development of a technique database. A Flash animated splash screen needs to be added and some improvements to the appeal of the site need to be made to engage users through a visually appealing learner experience. The researcher wishes to improve the quality of the video clips and add more self-assessment opportunities so that learners can have a greater awareness of topics such as theory, history, ethics, safety, and strategy.

6. Conclusion

Notwithstanding that it is difficult to attach a definitive and clear-cut result to evaluations of interactive learning environments; this study shows that by using appropriate theoretical and methodological approaches that are varied and based on practical considerations, researchers, developers, and teachers can make informed decisions. These decisions may result in further improvements and enhancements to a learning system and might then result in a set of design principles for that field of study that can be used by future courseware designers.

The researcher began this paper with an introduction and background to the RAT online project which highlighted some of the reasons this study was initiated. Then the theoretical framework was summarized, followed by the section on the methodology. The researcher found that the holistic and practical view taken in the methodology allowed him to gain a more complete and flexible approach to this study. The scale diagrams are of particular value in such projects, as they allow for rapid and effective design decisions. The EMMPP allowed the researcher to include all aspects of the study as part of the evaluation process, which includes the instruments used. Some of the criteria of the research instruments were modified in the second round of evaluation. So not only can evaluators develop design principles, but they can also develop evaluation principles with this pragmatic approach. Mixed methods were used for analysis, including both quantitative and qualitative, but the implementation of the evaluation dictated that mostly qualitative analysis could be used. The researcher then gave an overview of the RAT CD-ROM which showed the resource as a vast and complex system of HTML pages and numerous multimedia resources. The evaluations reveal changes that were closer to development goals occurred after the second round of evaluation, especially in the area of navigation and pedagogical philosophy. Some participants report difficulties with certain cognitive walkthrough tasks and as participant observer the researcher records that development is time-consuming and complex. There is also a perceived lack of interest by some participants. There is an apparent usefulness of the RAT CD-ROM that has extended beyond its original implementation objectives. Learners now use the resource regularly as a reference and use it to learn new techniques. Instructors use the CD-ROM for reference, as well as for teaching and carrying out grading exams. Other martial arts teachers have also used the RAT CD-ROM to prepare seminars and grading exams and have even used the video clips to evaluate the proficiency of the participants in the video clips.

There is an apparent need to increase the range of media and techniques on the CD-ROM. The researcher has included a technique database, which is a repository of all possible RAT techniques that learners will add to during syllabus tasks, as well as instructional video clips in addition to video clips.

The RAT online project is now in a new phase of development where there is a need to install an integrated online learning system and to make the RAT CD-ROM available to the geographically dispersed RAT practitioners. The sheer range of principles and possible techniques in RAT makes the task of developing the technique database an impossible one in the lifetimes of such a small learner group. The researcher has installed a Wiki on the RAT online web site, which is an online tool that allows users to collaborate and co-author content. The RAT Wiki will be a freely available resource to benefit the martial arts community at large. The various categories will be provided and contributors will have to match the quality and

technical criteria for each category. They will also be required to add media, such as images and video in the contributions. It is expected that once the RAT CD-ROM is uploaded on the Web that we can expect to see much more of a constructivist and cohesive RAT online learning environment.

Notes

1. Available at: http://projects.edte.utwente.nl/smarternet/version2/cabinet/ico_design_principles.pdf
2. Available at: www.bui.fh-hamburg.de/pers/ursula.schulz/eulerev/cogwalk1.htm

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Appendix. Cognitive walkthrough observation tasks – round 1
Tuesday 25 May 2004

Please read the instructions carefully and perform each task one at a time. Please stop after each task to allow for me to make notes. You will be asked when you are ready to proceed to the next task:

1. Go to the Junior RAT Green Belt syllabus.
2. Go to the fitness programmes list for the Senior RAT Jack-Spades rank.
3. Find the first list of sequences for the Joker-Spades rank.
4. Find and play the Movie for the Focus Pads Punching Drill.
5. Open the large photo of the Hip Throw.

End of observation.

About the author
Steven Yates is currently an e-learning consultant living in Melbourne, Australia. At the time of writing this article, he was employed by Derivco as a CBT/Online Learning Developer in Durban, South Africa. Prior to this he worked as an Educational IT Consultant at the University of Natal, which later became known as the University of KwaZulu-Natal, in Durban. He has also worked as an English teacher in China where he also taught his martial art, Rough and Tumble (RAT). Other relevant positions held include unarmed combat instructor in several specialised military units and web designer. Steven is the founder of RAT and also holds advanced ranks in several martial arts from various parts of the world. His educational qualifications include a BA: Linguistics and Spanish (University of South Africa), MA: General Linguistics (University of Stellenbosch), and MPhil: Hypermedia for Language Learning. Steven is currently busy with his PhD studies in online learning. He can be contacted at: stevenyat@gmail.com

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A framework of anti-phishing measures aimed at protecting the online consumer's identity

Rika Butler
Department of Accountancy, University of Stellenbosch, Stellenbosch, South Africa

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Abstract

Purpose – The purpose of this paper is to aim to educate the internet consumer, who may be a potential phishing victim, and to suggest a framework of anti-phishing measures, following the staggering increase in the number of recent phishing attacks. Phishing describes a method of online identity theft, in which phishers typically pose as legitimate organisations when sending deceptive e-mail messages to internet users. When they respond to such e-mails, victims are lured to malicious web sites, where they are duped into disclosing their personal details. In this way, phishers are able to commit identity theft, with possibly devastating consequences for the victim.

Design/methodology/approach – After a literature review of the available sources, the phishing threat is investigated by analysing the *modus operandi* of phishers and the basic components of a typical phishing scheme. A possible solution for the phishing problem is examined.

Findings – Phishers continually target the weakest link in the security chain, namely consumers, in their attacks. Educating the online consumer about phishing, as well as the implementation and proper application of anti-phishing measures, are critical steps in protecting the identities of online consumers against e-mail phishing attacks.

Originality/value – This article proposes measures that internet consumers can take to ward off phishing attacks, as well as remedial actions that they can take after falling victim to such an attack. By implementing these measures online, consumers can minimise the risk of becoming victims of successful phishing attacks, as well as remedy the negative effects of any past disclosure of information to phishers.

Keywords Fraud, Electronic mail, Online operations, Information control

Paper type Literature review

1. Introduction

A good name, like good will, is got by many actions and lost by one (Lord Jeffery).

One of the most popular and successful techniques employed by cyber thieves to steal a person's "good name" (identity) entails the use of deceptive e-mail phishing attacks (Emigh, 2005; Ollmann, 2004). Phishing represents an online method of identity theft employed by phishers to steal attributes (like passwords or account numbers) used by online consumers.

Identity theft and financial fraud are significant consequences of successful phishing (Abad, 2005). Gartner (2005), a reputable research organisation, reported that 10 million USA adults were victims of identity theft in 2005, causing almost $15 billion in losses. Identity theft was highlighted as one of the five increasingly prevalent security risks by Gartner (2006a) in its *Hype Cycle for Cyberthreats 2006* report. The

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Identity Theft Task Force was established by Executive Order of President George W. Bush on 10 May 2006, as a result of escalating identity theft in the USA. The purpose of this Task Force is to develop a comprehensive national strategy to combat identity theft (FTC, 2006; White House, 2006).

Research has indicated a strong correlation between people who recall providing personal information in response to what, in retrospect, was a phishing e-mail and those who suffered identity theft (Bielski, 2004; Litan, 2004). Since the earliest media citation of phishing in March 1997 (Ollmann, 2004), the number of phishing attacks has continued to increase. According to the Phishing Activity Trends Report of the Anti-Phishing Working Group (APWG), an association dedicated to eliminating identity theft and fraud resulting from the growing phishing problem, the number of attacks during recent months has reached epidemic proportions (APWG, 2006).

2. An explanation of phishing

Note. The numbers shown in parentheses next to the explanation of phishing in this section refer to the graphical presentation of a typical phishing attack (see Figure 1).

The threat known as "phishing" exploded across the internet in late 2003 and early 2004 (Microsoft, 2006). A White Paper on Phishing explains that use of the term "phishing" originates in the term "password harvesting fishing" (Honeynet Project and Research Alliance, 2005). The APWG describes phishing as a process using spoofed e-mails (1) designed to lure recipients to web sites (2) where phishers attempt to trick consumers into divulging personal financial information, such as passwords and account numbers (3) in order to commit fraud (APWG, 2006). The term "phishing" was officially added to the *Oxford Dictionary of English* in August 2005 (Independent Online, 2005).

Since then, the definition of phishing has expanded and today attributes such as user names, social security numbers, and credit card numbers, as well as other personal details, like birth dates and maternal maiden names, can serve as targets of phishing attacks (Emigh, 2005; Ollmann, 2004).

In the often anonymous world of e-commerce, key factors such as passwords and account numbers identify online consumers uniquely, enabling them to interact and

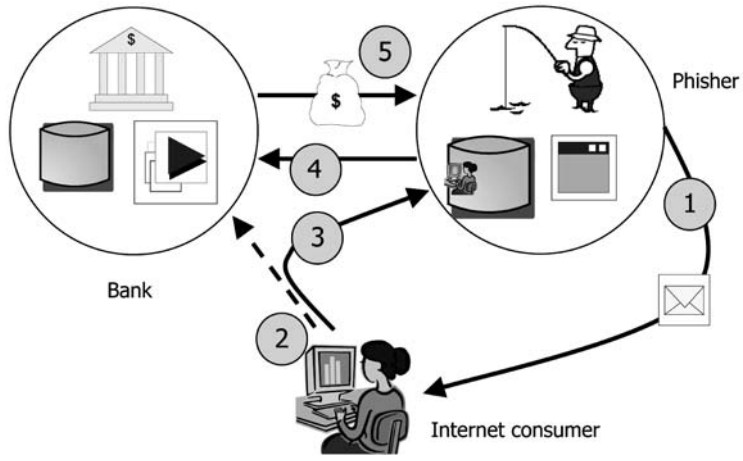

Figure 1.
Graphical presentation of a typical phishing attack

conduct transactions via the internet. Stealing an identity could enable a phisher to contact the organisation concerned (4) claim to be the victim of the phishing attack, and to transact business with the organisation illegally (5) in the name of the client concerned. An online consumer's identity is therefore priceless and identity theft holds only negative consequences for the phishing victim concerned.

3. The extent of the phishing problem

Since the first attack, the phishing problem has grown to one of the most prevalent internet threats (Pruitt, 2005). A survey by Gartner (2005) indicated that in the 12 months ending May 2005, an estimated 73 million online USA adults reported that they had probably received on average 50 or more phishing e-mails during the year. Phishers enriched themselves with approximately $929 million between May 2004 and May 2005, when 1.2 million online USA consumers reported having experienced losses directly as a result of phishing (Gartner, 2005).

The primary objective of phishing is to obtain money fraudulently (Vegter, 2005). Phishing attacks are popular, as they are relatively inexpensive to launch, while the potential returns for the phisher could be significant (Consumer Reports, 2006). As most institutions are continuously increasing their online presence, the economic value to be gained by phishers through compromising the account information of the online clients of such institutions is increasing dramatically (Emigh, 2005).

Of the participants who took part in the 2006 E-Crime Watch survey conducted by *CSO Magazine*, in co-operation with the USA Secret Service, Carnegie Mellon University Software Engineering Institute's CERT Coordination Centre (CERT) and Microsoft Corp, 31 per cent indicated that, between July 2005 and June 2006, their organisations had been the target of a phishing attack. In these attacks phishers had posed online as their company attempting to gain personal data from the clients of their organisation or its employees (CERT Coordination Centre, 2006).

The *Internet Security Threat Report* released in September 2006 by Symantec, a world leader in providing solutions for security, availability and integrity of information, claimed that during the first six months of 2006 the Symantec Probe Network had detected 157,477 phishing messages sent with the intent of gaining personal information. According to Symantec, each of these messages was unique in content and each represented a different way of trying to fool a user into providing personal information. However, a single message may be utilised numerous times in different phishing attempts, usually targeting different users (Symantec, 2006).

During August 2006, victims reported a staggering 26,150 unique phishing schemes to the APWG, the second highest number ever recorded, representing an increase of approximately 190 per cent over the monthly number reported for the same month in the preceding year. A total of 10,091 phishing sites were active in August 2006, a 192 per cent increase over that reported for August 2005. (APWG, 2006).

Visit the APWG's web site at www.antiphishing.org for the latest monthly Phishing Activity Trends Report.

4. The cause of the problem

Symantec's (2006) *Internet Security Threat Report* indicates that the home user sector accounted for 86 per cent of all targeted attacks between January and June 2006. According to Dean Turner, Executive Editor of Symantec's latest report, cyber thieves

are currently moving in a totally new direction by focusing quite heavily on the end user, primarily because the end user "is the weakest link in the security chain" (Symantec, 2006).

Researchers from the Honeynet Project and Research Alliance (Honeynet Project and Research Alliance, 2005), which collates data gathered from observing real-world incidents, have concluded that launching phishing attacks on home or small business computers seems particularly popular, because such systems are less likely to have well- established security practices in place, providing fraudsters with a suitable base from which to launch their attacks (Symantec, 2006).

Phishers succeed in their attacks as consumers are not adequately informed about the risks of disclosing their personal details. British research conducted for the 2005 Infosecurity Europe event revealed that an alarming nine out of ten individuals leave themselves vulnerable to identity theft. More than 180 of the 200 respondents questioned freely divulged personal details that fraudsters could use for committing identity theft (Clarkson, 2005).

During 2006 researchers from the Centre for Research in Computation and Society at Harvard University conducted an empirical study to determine why phishing attacks are successful. Twenty-two participants were shown 20 web sites and requested to identify any fraudulent web sites. The key findings of the study revealed that (Dhamija *et al.*, 2006):

- Effective phishing web sites fooled more than 90 per cent of the participants.
- Existing security warnings are not heeded by users; 23 per cent of the participants did not notice security indicators, while 15 participants proceeded without hesitation after having been presented with warnings.
- Failure to recognise fraudulent sites occurred approximately 40 per cent of the time.
- All participants proved vulnerable to phishing attacks, irrespective of education, age, gender, previous experience, or hours of computer use.

The researchers deduced that phishing attacks are successful due to the lack of knowledge of the computer user regarding the phishing threat; successful visual deception employed by the phishers; and the lack of attention by the user to security indicators, or the absence of such indicators (Dhamija *et al.*, 2006).

5. Education as a possible solution

According to an Identity Theft Technology Council Report, phishing is a complex phenomenon and there is "no single silver bullet" or solution to prevent phishing (Emigh, 2005; Ollmann, 2004). Although various security technologies and techniques can be used to protect the user, the server and the enterprise, protection at user level should be the "forefront of anti-phishing security" (Ollmann, 2004).

As identified by various researchers, the most important countermeasure to be employed against phishing at the user level is the education of the online consumer (Butler, 2005; Consumer Reports, 2006; Emigh, 2005; Microsoft, 2006; Milletary, 2006; Symantec, 2006). This finding is supported by the research results of the Harvard University study referred to earlier.

The significance of online consumer education is reaffirmed in the Executive Order issued by President Bush in May 2006, which declares that in its effort to protect the public against identity theft, the US Federal Government needs to improve its public

outreach aimed at educating the public about the risk of identity theft, including advising them of measures that can be undertaken to protect personal data (White House, 2006).

Online consumers need to be aware of the possible risk of identity theft through phishing and should be familiar with the telltale signs of a typical phishing attack. More importantly, consumers need to know how to protect themselves from falling victim to such attacks by the continued use of properly applied security measures. They should also know how to react appropriately and timely on discovering that they have fallen prey to a phishing attack.

Due to the growing capabilities of the phishers and the increasing sophistication and use of technical deceit employed in the attacks, all internet consumers should consciously strive to adopt and improve their security practices (Clarkson, 2005) and awareness of the dangers posed by phishers (Milletary, 2006).

6. Objective and research methodology

This article aims to educate the internet consumer, who may be a potential phishing victim, about the risks posed by phishing, since the education of online users has been identified as an effective anti-phishing measure. In light of this aim, the author has undertaken a literature review of the relevant available sources and has considered the modus operandi of phishers, as well as the possible results of successful phishing attacks. The basic components of a typical phishing scheme are also analysed.

Based on the literature review and investigation performed, the author provides a framework of anti-phishing measures that can be adopted to prevent, detect and recover from phishing attacks. By applying the precautionary and remedial actions proposed in this article, an online consumer should be able to prevent falling victim to a phishing attack and should be able to counteract the negative consequences of a phishing attack to which he or she has responded.

Even though there are various ways in which identity thieves can steal identities offline (such as by phone, theft of records or mail, or the bribing of employees), this article only addresses the method of online identity theft known as phishing. Online phishing attacks for confidential personal information can be launched in various ways, most notably by means of deceptive e-mail messages. Although various other communication channels, such as web pages, IRC and instant messaging services can be used to launch an attack, this article intends only to provide guidelines against deceptive e-mail phishing attacks. Reference is made to other forms of phishing towards the end of the article, however.

Though this article does not include a technical description of a phishing attack, the reader can visit www.honeynet.org/papers/phishing for a White Paper containing more technical information on phishing techniques and tools.

7. Components of a phishing scheme

A phishing attack launched by e-mail typically consists of the following components: the sender; the recipient; an e-mail message; a fraudulent web site; and a "lure" to attract the recipient to the fraudulent web site.

7.1 The "supposed" sender

Phishers typically pose as figures of authority, such as banks, credit card companies and other institutions, which are in authorised possession of sensitive personal information of their clients. The thieves rely heavily on their potential victims' innate sense of truthfulness when responding to automated systems or to (apparent) authority figures (Honeynet Project and Research Alliance, 2005).

7.2 The recipient

To reach the maximum number of potential victims while exposing themselves to minimal risk, phishers have found "an ideal partner in crime in the form of spam e-mail" (Honeynet Project and Research Alliance, 2005). Spam consists of unsolicited e-mail, usually sent from hacked mail servers (Bellovin, 2004). Symantec's Brightmail AntiSpam blocked 1,3 billion phishing attempts in the first six months of 2006, whilst spam made up 54 per cent of all e-mail traffic monitored by Symantec during this period, representing a 4 per cent increase from the last six months of 2005 (Symantec, 2006).

Legitimate addresses required for the delivery of spam can be purchased on the "cyber black market" or parsed together using programs that randomly combine last names and first initials with common domain names (Bielski, 2004). Phishers are aware that the vast majority of the recipients of such messages will simply disregard them, since they have had no previous dealings with the organisation named in the e-mail. However, phishers also realise that a small percentage of the recipients might be bona fide accountholders of the targeted organisation and could potentially respond to the e-mail, making the continuation of such practice worthwhile (Sophos, 2005).

Since the potential financial gains from phishing are directly related to the number of messages that successfully reach the end users, spammers continue to find ways to bypass many of the defences that such users might put in place (Symantec, 2006).

7.3 The phishing e-mail message

The phishing e-mail messages, which appear to come from legitimate sources, are carefully designed to trick the recipients into intentionally performing a series of actions that will provide access to their sensitive personal information.

The sophistication of phishing attacks is steadily increasing, both in terms of the physical appearance of the message and the technology used (APWG, 2006). Phishers are increasingly able to mimic authentic messages more closely (Bielski, 2004) and messages often feature corporate logos and formats similar to those used by the legitimate organisations. Phishers also often include or hide certain words in the e-mail message to enable the message to bypass the standard anti-spam filters.

The victim is often lured to provide personal information by means of apparently innocent requests, such as requests for the client's assistance in solving a "problem" with his or her account, or providing details to enable institutions to manage or update customer information. Often, the urgent attention of the user is requested, ironically, in order "to protect the user's confidential data from malicious activities" (Honeynet Project and Research Alliance, 2005). The recipient may be warned that failing to respond promptly will result in some form of penalty being imposed, such as the closure of the account, or the loss of a limited-time "free" offer opportunity.

The most popular means of phishing attacks via e-mail include (Emigh, 2005):

- a message incorporating a replica of a login page in the body of the e-mail message itself, to be read by means of an HTML e-mail reader on opening the e-mail message; and
- a message luring a recipient to a malicious web site, where he or she may be duped into disclosing personal details.

Examples of phishing attacks reported to the APWG can be found at www.antiphishing.org/phishing_archive.html

7.4 The fraudulent web site

The fraudulent phishing web site usually mimics the graphics and formatting of a legitimate web site as closely as possible, in order to mislead the computer user. Research has found that successful phishers create a high-credibility web presence that is so impressive that it causes the victim to ignore standard security measures (Dhamija *et al.*, 2006).

Well-known online brands are often targeted in this way. *The Phishing Activity Trends Report* indicated that 148 brands were hijacked by phishing schemes in August 2006 – a 176 per cent increase from August 2005 – and that 92.6 per cent of the brands hijacked in August 2006 originated in the financial services industry (APWG, 2006).

7.5 Lure to the fraudulent web site

As stated earlier, phishing e-mail messages may contain a lure to a fraudulent web site, where phishers attempt to convince a potential victim to provide personal information. The secret to many successful phishing attacks is to hide the fraudulent web site's name in an embedded hyperlink, thereby disguising the address of the actual web site to which the user will be taken when clicking on the hyperlink.

The most common deceptions include the following (Ollmann, 2004):

- Disguising the URL (Uniform Resource Locator) in the address bar by, among others, the purposeful registration and use of bad domain names to hide the real destination host, the use of ostensibly friendly login URLs, the inclusion of an extension of the web site name after the @ symbol (cloaked links) and the use of third-party shortened URLs. The APWG reported that 48 per cent of the August 2006 attacks contained some form of the target name in the URL employed in the attack (APWG, 2006).

  In cousin domain attacks, the domain name of the phishing site is disguised by making it deceptively similar to a legitimate domain name. Similar-looking characters in the URL might be substituted or slightly altered by intentionally adding, omitting or transposing letters, or by adding hyphens or dots. At first glance, the URL might appear to be the name of the legitimate organisation. One of the first phishing incidents reported disguised Paypal.com as paypa1.com (Bellovin, 2004). Similarly, the web site address www.microsoft.com could appear as www.micosoft.com, www.microsift.com or www.verify-microsoft.com (Microsoft, 2005).
- Providing a numeric IP address as part of the URL in the link instead of the illegitimate host name. The APWG reported that 36 per cent of the attacks launched in August 2006 contained only the IP address in the URL and not the host name itself (APWG, 2006).

8. Results of phishing as a method of identity theft

The latest *Internet Security Threat Report* states that the motivation for phishing attacks has shifted from its original concern with status based on technical prowess, to one of financial gain (Symantec, 2006). According to Amrit Williams, research director at Gartner, cyber attacks are no longer merely carried out as a pastime or as a form of cyber vandalism, but are now undertaken by professionals with a targeted aim (Gartner, 2006b). Attackers aim to gather value-laden information, either in order to commit either identity theft or other forms of fraud (Symantec, 2006).

Thieves can also re-sell the illicitly obtained personal information on a secondary market, such as an online brokering forum, chat channels and even identity theft rings, thereby often only indirectly being the cause of economic damage to the victim concerned (Emigh, 2005; Hubbard, 2005).

A study by Gartner indicated that internet-related data theft attacks have risen sharply to approximately $2.7 billion during 2005. Consumer information stolen from the internet has resulted in the following types of financial fraud and losses for USA online consumers (all figures reported below relate to the period 1 May 2004 to 30 April 2005) (Litan, 2006):

- the most common type of fraud is making illegal purchases using stolen account information, which has resulted in more than $2.39 billion of direct losses;
- cheque forgery amounted to a nearly $292.5 million annual losses and unauthorised transfers on accounts amounted to an approximate $822.12 million annual losses;
- new-account fraud, committed by identity thieves opening new accounts or obtaining credit in the victim's name, or using stolen data to create new fictitious identities with which to commit fraud, resulted in damages amounting to $397,31 million.

Other consequences for phishing victims include:

- Possible refusal of loans, education, housing and cars, due to bad credit reports.
- Having to spend time and money in "cleaning up the mess that the identity thieves leave behind" (FTC, 2006). Victims sometimes have to spend several months, or even years, and vast amounts of money in recovering their good names and credit records, after damage perpetrated by identity thieves (Emigh, 2005; FTC, 2005). The FTC estimated that approximately 297 million hours were spent in 2005 by consumers in their attempts to resolve identity theft-related problems (FTC, 2006).
- On a psychological level, victims experience negative emotions, ranging from feelings of violation, stress and humiliation, to those of anger and frustration (FTC, 2005, 2006).
- As phishing undermines the basic element of trust essential for successful ongoing e-commerce (ActivCard, 2004), such attacks can cause consumers to lose confidence in the e-commerce industry (Litan, 2004; Milletary, 2006; Pandit, 2006). Brad Nightengale, the vice-president of VISA, states that consumers perceive the online environment as "exceedingly risky" and that this perception "could curb online spending" (Radcliff, 2005b).

- These concerns have been investigated in a variety of studies. According to Cyota, a fraud prevention service provider, more than 50 per cent of internet consumers are afraid to conduct online commerce, due to phishing concerns. A Symantec study shows that nearly one-third of the respondents refrain from online banking, due to fears of phishing. Of the Cyota survey participants, 70 per cent remarked that they were less likely to respond to an e-mail purporting to come from a bank, because of fears relating to phishing (Radcliff, 2005b).
- A study into online shopping behaviour indicated that attacks are taking a toll on consumer confidence, resulting in online consumers changing their usage patterns (Gartner, 2005). The study indicated that consumers are more fearful about entering personal data online, or tend to buy fewer items online. internet analysts fear that the phishing threat will slow down, and possibly even totally erode, online commerce (ActivCard, 2004).
- Additional costs for the consumer include customer service expenses, account replacement costs, and higher expenses due to the decreased use of online services (Emigh, 2005).

9. Anti-phishing measures

As indicated in this article, educating the consumer about the phishing threat, as well as properly applied relevant technology can significantly reduce the risk of identity theft and play an integral part in any long-term solution to the phishing problem (Emigh, 2005).

Based on the information provided on phishing in this article and the literature review conducted, the following aspects and precautionary measures should significantly reduce the risk of any online consumer falling victim to a phishing attack.

9.1 Be cautious with e-mails and confidential information

Online consumers should familiarise themselves with the way in which legitimate organisations normally communicate with their clients:

- E-mail is a relatively insecure means of transmitting personal information. Legitimate companies usually refrain from asking clients to supply sensitive personal details via e-mail.
- Personal e-mails from legitimate companies should be addressed to the consumer concerned directly. A message addressed to "Dear valued customer" indicates that the message was sent out in bulk, rendering it more susceptible to phishing. Never provide personal details in response to such requests.
- If suspicious about an e-mail message, contact the institution that supposedly sent the message and verify the origin of the message.
- Grammatically incorrect or misspelt messages may indicate irregularities as official communications are usually checked for language proficiency.
- Check that e-mail messages requesting personal details are signed by an official of the company concerned.

9.2 Examine the URL of the web site

As the actual destination of a link can be disguised in various ways as explained earlier (Emigh, 2005), the URL displayed in the address or status bar should be examined carefully:

- Only a certain number of characters of the URL can be displayed. The longer the URL, the easier it is to conceal the true destination indicated by the link. Phishers can place the "active" part of the URL at the end of a long string, obscuring it from view (Sophos, 2005).
- Beware of cloaked links hiding the actual destination of a link. Most browsers ignore characters preceding the @ symbol in a URL. Clicking on www.legitimatecompany.com@phishingscam.com, for example, will take you to the web site of Phishingscam.com, and not to the web site of Legitimate Company.
- Look for the substitution of similar-looking characters in the URL; the intentional addition, omission or transposition of letters; or the addition of certain hyphens or dots marking possible cousin domain attacks.
- Do not cut and paste a link provided in e-mail messages. Rather retype the URL directly into the browser, which will take the user directly to the relevant web site. (Alternatively, add the institution's address to the list of favourite web sites, and use this link whenever logging into the relevant web site.)

9.3 Be aware of signs that browsers and web sites are secure and legitimate

- The web site address should be prefixed with "https" (the "s" is for secure), rather than "http". A picture of a padlock (locked symbol) should appear in the status bar, as the presence of such an icon indicates that the web site accessed is secure.
- The closed lock must be present on all web pages containing requests for personal information. However, the presence of a lock icon does not necessarily mean that the web site is secure as phishers can even forge security icons. In order to verify whether the web site is, indeed, secure, double-click on the lock icon to display the security certificate of the site concerned. The name following "Issued to" on the certificate should match the name of the legitimate destination.
- Search for a company web site's privacy policy, which describes how any personal information collected will be used and protected. If the privacy policy is not displayed, or not understandable, consider doing business elsewhere.

9.4 Use specific anti-phishing browser toolbars

Dedicated toolbars are specifically designed to determine whether a site is safe, by using a variety of technologies, including a database of known phishing sites, analysis of the URL and the imagery and text on a site, and various heuristics. Heed any messages and warnings displayed.

9.5 Be extra careful when donating funds online

When donating funds online, only use the web sites of designated fund-collecting organisations, like that of the Red Cross, as such sites are government-registered and usually offer secure online payment facilities.

Phishers may launch attacks in which they play on people's emotions. Various instances where phishers took advantage of the outpouring of goodwill, and the subsequent call for donations, in the aftermath of disasters, have been recorded. In such instances, the phishers set up false web sites on which they claimed to be raising funds for disaster relief and even offer to locate missing people. Such scams were, for example, discovered after the tsunami disaster in the Pacific in December 2004 (Vecchiatto, 2005), after the London terrorist bombings in July 2005 (Technology News Daily, 2005) and after Hurricane Katrina hit the south-eastern coast of the USA in August 2005 (American Red Cross, 2005). An estimated 5 and 10 per cent of funds raised annually for charity or disaster relief efforts are skimmed by scam artists (Vecchiatto, 2005).

9.6 If an offer appears too good to be true, it probably is

Treat with suspicion supposed "bargains" (which could be examples of "google phishing", as described later) advertised on web sites. Only buy from trusted sites, as described above.

A recent phishing scheme targeted 2006 FIFA World Cup Fans (SurfControl, n.d.) by offering cheaper online ticket. Instances where identity thieves posed as the Internal Revenue Service (IRS) have also been recorded, in which the perpetrators of such crime tried to dupe taxpayers into providing bank account information in response to an e-mail promising a tax refund (Dalrymple, 2006; Lank, 2006). The IRS has already traced and shut down 105 such phishing schemes, operated from 27 different countries (Lank, 2006).

Requests for users of online banking sites to complete an online banking survey at a monetary reward, is another recently evolved scam, in which the phishers aim to steal the banking details of the account into which the reward is to be paid (Milletary, 2006).

9.7 Employ available security measures

- Apply sound password control on all accounts and computers. When prompted for a password while conducting online business, first provide an incorrect password. A phishing site will accept the incorrect password, whilst a legitimate web site will inform the user that an incorrect password has been provided and not accept it.
- Regularly check the activity on accounts. Review credit card and bank statements for unauthorised charges. If statements are not received timely, call the bank to confirm the billing address and account balances, as identity thieves often change billing addresses to delay detection of fraudulent transactions.
- Be suspicious of e-mails arriving from unknown sources. Delete all suspicious e-mails immediately.
- Use attachment blocking. Never view, open or execute any e-mail attachment unless the purpose and source of the attachment is known.
- Install software protection, such as firewalls and anti-virus software, against viruses and use up-to-date spam filters to reduce the number of fraudulent and malicious e-mails and other threats exposed to. Install straight away software patches that providers distribute, in order to close any holes that hackers or phishers might otherwise exploit.

- Delete all personal information on discarded computers.
- When using internet banking, activate and use the appropriate SMS security features and random verification numbers in order to detect any unauthorised activity on your account.
- Stay up to date regarding the latest information on fraudulent internet activity.
- Immediately report suspicious activity or e-mails received directly to the faked or "spoofed" organisation concerned, to the relevant authorities, as well as to the APWG (www.antiphishing.org).

10. After falling victim to a phishing attack

Research indicates that between 3 and 5 per cent of targets unwittingly provide personal details to phishers (Dhamija *et al.*, 2006; Gartner, 2005; Goldsborough, 2004; Ollmann, 2004; Tsai, 2005). According to Gartner, a respondent to a phishing e-mail message is three times more likely to experience negative consequences associated with identity theft (Bielski, 2004; Litan, 2004).

10.1 Actions to take after personal information has been provided

If personal information was provided to a phisher, acting in accordance with the following guidelines will minimise the potential loss or negative effects of having done so:

- As soon as possible, change the passwords used for all online accounts.
- Frequently review credit card and bank statements, as well as credit information and personal credit reports, for any possible unauthorised or unusual activity.
- Immediately, in writing, close any accounts known or suspected to have been tampered with or which were fraudulently opened.
- Report the incident to the credit card company concerned; the company that has been fraudulently misrepresented; the relevant consumer reporting companies and the APWG.
- Request local credit bureaus to place fraud alerts on credit files or reports, notifying creditors to contact the consumer before opening any new accounts in their name or making any changes to existing accounts.
- File a report concerning the incident at the local police station. Secure a copy of the report, or at least the case number concerned, in order to deal with creditors who may need proof of the crime in future.
- Invest in an anti-spam filter and anti-virus software to filter all future messages received.

10.2 Reporting phishing attacks

Phishing incidents reported are investigated by the relevant authorities, resulting in the alleged phishers being questioned, in the closure of any phishing web sites discovered and in the perpetrators involved being arrested, charged and sentenced (APWG, 2006; Lowman, 2005;). The *Phishing Activity Trends Report* reports that the average time online for a phishing site during August 2006 was 4.5 days, the longest time being 31 days (APWG, 2006), before being shut down.

The FBI opened 662 identity-theft-related cases in 2005 and 272 such cases from January to June 2006. In the 2005 fiscal year, the US Department of Justice charged 266 defendants with aggravated identity theft, while 432 defendants were charged during the first six months of 2006 (Department of Justice, 2006).

11. Emerging phishing mutations

Unfortunately, innovations and advancements in the "art of phishing", results in the continued development of new phishing techniques (Honeynet Project and Research Alliance, 2005). According to the APWG, the sophistication of attacks is increasing dramatically as phishers continuously discover new methods to conceal their attacks (APWG, 2006). As a result, this article might not cover all the possible phishing methods and techniques currently employed.

However, some of the interesting phishing mutations that exist include "pharming", "spear fishing", "google phishing" and "wi-phishing":

- *Pharming (DNS poisoning or redirecting of URLs)* involves redirecting users to counterfeit sites that closely resemble the legitimate site, when a legitimate domain's name is entered. Pharmers inject malicious code onto a PC, or even onto DNS servers on the internet. When logging on to the counterfeit site, the personal information used for logging on is harvested and transmitted to the pharmers (APWG, 2006; Fox, 2005; Hubbard, 2005; Pandit, 2006; Radcliff, 2005b).
- *Spear fishing (keylogging)* attacks target-specific individuals, groups or employees of a company, rather then distributing countless e-mails to large numbers of unsuspecting users (Microsoft, 2006). Fraudsters load programs, known as keystroke-loggers, onto the user's directory, tracking the keystrokes of the users of infected machines. The keystroke-loggers activate when certain keywords (like login names and passwords) are typed into browsers, when specific predetermined sites (like e-banking sites) are visited, when phoney e-mail attachments are opened, or when programs are downloaded (Der Hovanesian, 2005; Pandit, 2006; Radcliff, 2005a, 2005b).
- In *google phishing*, phishers use search engines to drive traffic to illegitimate sites created by them, where they claim to be selling a product or service, usually at unbelievably low prices. As the phishers have no intention of making any legitimate sales, they can claim to be selling virtually anything at any price likely to attract victims. In this form of attack, phishers do not initiate contact with their potential victims, but the online consumers themselves search out the phishing site by entering certain key terms in a search engine, such as when searching for the cheapest online airline tickets. Internet consumers, having appeared to have "found" the site by themselves, thereby gain a false impression of it being a secure and legitimate site (Radcliff, 2005b).
- Users buying from these sites have to provide personal details, including credit card information, online. On submission of the information, an error message is displayed, informing the consumer that a "problem" has occurred and that the transaction was not completed successfully. Meanwhile, the phisher will already have gained access to the information provided by the victim concerned (Corrons, 2005; Radcliff, 2005b).

- *Wi-phishing* entails phishing from consumers by way of wireless technology and Bluetooth facilities. Phishers set up wi-fi networks in public places, which users of wireless broadband connections tend to frequent. While using what they might assume are legitimate networks at designated hotspots, personal information of users might be tapped into by wi-phishers, who harvest personal information through their own networks (Der Hovanesian, 2005; Radcliff, 2005b).

Two innovative and potentially very dangerous phishing mutations discovered recently include:

(1) *Vishing* attacks use phishing e-mail messages in conjunction with a Voice over IP (VoIP) phone systems. Vishing, which targets banking clients, was first reported in April 2006. In these attacks e-mail messages are sent out in bulk, but instead of directing the would-be victims to a spoofed URL, the message involved warns the user about a security risk and requests the potential victim to phone the bank's call centre. On calling the bank, which is an automated system set up by the cyber thieves, the customer is asked to verify his or her security details, such as account numbers and PINs (Patterson, 2006; Sausner, 2006).

(2) *SMiShing* attacks consist of a combination of phishing and a cellular operator's short message service (SMS) and were first detected in September 2006. Those who are subject to such attacks are notified via SMS that they are signed up for some kind of service at a specific charge per day, and that, unless they cancel the service by visiting a web site referred to in the SMS, they will have to pay the stipulated charges. On arriving at the web site, the victim is prompted to download a program that is actually a Trojan horse, which turns the computer into a zombie that can be controlled by the hackers concerned (Hickey, 2006).

12. Conclusion

When transacting over the internet, the online consumer's identity encompasses personal details, such as account numbers and passwords. Phishers aiming to commit identity theft continue to launch deceptive e-mail phishing attacks on online consumers. Victims are duped into disclosing personal details to phishers, resulting in considerable losses being suffered.

Research indicates that the education of online consumers, as well as the implementation and proper application of anti-phishing measures, can reduce the risk of consumers falling victim to phishing attacks. It could also minimise the negative effects that might be suffered as a result of phishing.

This article has aimed to educate the online consumer about the threat of phishing and set out to analyse the components of a typical phishing scheme. It suggested countermeasures that the consumer can apply in order to prevent and detect deceptive e-mail phishing attacks, as well as measures that can be applied when consumers have responded to phishing messages.

Al DiGuido, CEO of Bigfoot Interactive, remarks, in an article titled "Study: fraud is consumers' no. 1 concern", "[p]hishing will only be diminished when people are completely educated" (Oser, 2005).

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About the author

Rika Butler obtained a BCom (Hons) (Acc) degree, as well as her Certificate in the Theory of Accounting, at the University of Pretoria, South Africa in 1992. After completing her trainee contract at PriceWaterhouseCoopers, she qualified as a chartered accountant (CA (SA)). She was appointed as Senior Lecturer in Auditing at the University of Pretoria in 1996, where she lectured until 2000, when her family moved to Stellenbosch. She started lecturing at the University of Stellenbosch, South Africa in 2001 and obtained her Masters degree in Computer Auditing from the University of Stellenbosch in 2003. She is currently an Associate Professor in Auditing in the Department of Accountancy at the University of Stellenbosch, where she lectures in Auditing at both undergraduate and postgraduate levels. Her fields of interest includes internal control and auditing in a computerised environment. She can be contacted at: rbutler@sun.ac.za

Malware: the new legal risk

Verine Etsebeth
Faculty of Law, University of Johannesburg, Johannesburg, South Africa

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Abstract

Purpose – The purpose of this research is to show that companies world-wide are being placed under increasing pressure by an onslaught of cyber risks and malware is one of the most common sources of security failures at present. The position in South Africa is no exception and malware presents a very real danger to corporate South Africa's information assets, resources and systems, as it has the capacity to undermine firewalls, hijack Virtual Private Networks (VPN's) and defeat digital signatures. The threats associated with malware have several salient legal issues embedded in it and these are elaborated in the paper. Unfortunately, corporate South Africa is still largely ignorant of the range of tools available to the "Darkside" and the potential legal consequences which may ensue if this cyber risk materialises. The article helps in the understanding of the problem.

Design/methodology/approach – This paper examines malware, and more specifically legal liability for malware from a South African perspective. The account contained in this contribution deals with the question whether or not a company who falls victim to a malware attack or unwillingly facilitates such an attack, may be held legally liable. This is done by giving a brief overview of the nature of the cyber risk malware, before moving on to observe the consequences which may ensue if a malware attack occurs. Corporations who fall victim to malware attacks or unwittingly facilitates such an attack may suffer: direct damage; indirect damage; and physiological damage.

Findings – It will be pointed out that malware attacks may result in legal liability in civil law for the "victim" company because of its failure to take reasonable steps to secure the information assets, resources and systems of the company.

Research limitations/implications – It will furthermore be observed that companies who unwillingly facilitate malware attacks, where for instance the company's own employee uses company resources to launch a virus attack, may be faced with legal liability in the form of vicarious liability.

Practical implications – Suggestions are made on how to avoid legal liability for failed information security.

Originality/value – No such a study has yet been undertaken in South Africa as most view the law and technology as strange and perhaps dangerous bedfellows. The study will also be of use, value and interest to the library and information community outside South Africa since it raises an issue of real significance.

Keywords Information control, Legal process, Data security, Due diligence

Paper type Research paper

Introduction

Although companies world-wide are being placed under increased pressure by an onslaught of cyber risks, including unauthorised access, denial of service attacks, insider theft of information and unauthorised or unlawful network based activity, malware is one of the most common sources of security failures at present. The position in South Africa is no exception. Malware in the form of viruses, worms, Trojan Horses and logic bombs, present a very real danger to corporate South Africa's information assets, resources and systems, as it has the capacity to undermine firewalls, hijack Virtual Private Networks (VPN's) and defeat digital signatures. The threats associated with malware as a result of the use of commercially available hardware and software and connection to the internet does however have several salient legal issues embedded in it. Unfortunately, corporate South Africa is still

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ignorant of the range of tools available to the "Darkside" and the potential legal consequences which may ensue if this cyber risk materialises.

To follow correct form in evaluating a company's civil liability in relation to information security breaches or incidents, the discussion must properly begin with a detailed analysis of the cyber risks facing companies, identify those specific acts which may lead to civil liability. Unfortunately, such an approach is made difficult by the lack of sufficiently independent reliable data upon which to base such an analysis. This is in part due to companies' reluctance to report cyber crimes and attacks for fear of damage to their reputation or worse still, legal action being instituted against them by stakeholder, because of inadequate information security within the company. Companies believe that it is in their best interest to keep attacks quiet, and will go to great lengths to keep such an attack out of the courtroom and more importantly out of the press. Consequently, most cases are settled outside the courtroom with the legal system being blissfully unaware of the types of cyber risks corporate South Africa is exposed to.

Notwithstanding this, corporate information assets, resources and systems are primarily at risk from one or more of the following categories of cyber risks (Stahl, 2004):

(1) Information acquired by unauthorised means and without the collaboration of one rightfully in possession thereof (unauthorised access).

(2) Information obtained by someone rightfully in possession thereof but exceeding his/her authority (inappropriate use).

(3) Threats associated with malware attacks on corporate systems as a result of the use of commercially available hardware and software and connection to the internet.

(4) A hostile intruder or the malicious insider who purloins information, make duplicates of the original, or perhaps corrupt or destroy information on the corporate system or network (information theft).

(5) Information acquired by influencing a person(s) into either revealing information or acting in a manner that would result in unauthorised access, unauthorised use, or unauthorised disclosure, to an information system, network (social engineering).

(6) Information obtained by acquiring another's mobile wireless device. Mobile devices, despite their small size and limitations, have a significant impact on information security, mainly because sensitive corporate information are stored on these devices, and these devices are able to directly connect to the database of a company (mobile working and wireless security).

This paper provides an assessment of the threats associated with malware attacks against corporate information assets, resources and systems as a result of the use of commercially available hardware and software and connection to the internet.

2. Malware defined

Grimes (2001) defines malware as "any software program designed to move from computer to computer and network to network to intentionally modify computer systems without the consent of the owner or operator". This term may include viruses, Trojan horses, worms, script attacks and rogue internet code. In the past a more restricted meaning was ascribed to the term "malicious mobile code" to include only viruses, Trojan horses and worms. Today however, because of technological advances

and the increase in complexity of modern malicious mobile code the scope and application of this term has been broadened to include "all harmful programs created by scripting language and powered by internet technologies" (Grimes, 2001).

As mentioned earlier malware presents a very real danger to corporate information assets, resources and systems, as it has the capacity to undermine firewalls, hijack Virtual Private Networks (VPNs) and defeat digital signatures (Tipton and Krause, 2000). At present malware is the most common source of security failures, and may result in corporations incurring and suffering the following types of damages and loss:

- direct damage;
- indirect damage; and/or
- psychological damage.

Direct damage suffered by the company as a result of malware

All threats/incidents have as their first and foremost objective to launch an attack against the confidentiality, integrity and availability (CIA) of the company's information assets, resources and systems. Consequently, the impact of the threat/incident on the company may be measured and evaluated giving regard to the direct effect it will have on these three core components of information security (Harley *et al.*, 2001).

(1) Attacks against confidentiality may result in:
   - capturing and forwarding passwords;
   - forwarding of personal and confidential files to newsgroups and elsewhere;
   - capturing of credit card numbers and sending them to a third party;
   - capturing of keystrokes and passwords;
   - uploading and downloading files; or
   - observing whatever is on the server's screen.

(2) Attacks against integrity may result in:
   - the modification of objects such as an infected file, boot sector, as well as data;
   - corruption of system files and system areas by random of non-random disk writers, including displacement of system areas;
   - data diddling whereby targeted data files are modified such as garbling of spreadsheet formulas;
   - corruption of application files an data files by unauthorised file writers;
   - subtle modification of encryption programs;
   - changing configurations;
   - overwriting data;
   - scrambling of system information; (ix) depositing fake certificate into computers thereby deceiving users into trusting someone; or
   - modifying the company's home page and overwrite the settings found in the browser.

(3) Attacks against availability may result in:
   - deletion of files and subdirectories;
   - renaming of files;

- encryption of files, disks or system areas;
- unauthorised calls to system software;
- rebooting the computer;
- disabling of security systems;
- corruption of software or killing program processes;
- theft of confidential and financial information; or
- denial of service attacks.

Indirect/incidental damage suffered by the company as a result of malware

Incidental damage may be viewed as damage "that may not be obvious or severe but is nevertheless inherent in the fact of infection". It may be argued that approximately all viruses result in damage in this category, since their presence will inevitably involve loss of performance due to theft of memory, disk space, clock cycle, system modification, or a combination of two or more of these (Harley *et al.*, 2001).

Other forms of indirect damage include:

- loss of customers;
- loss of suppliers;
- loss of reputation;
- loss of competitive advantage;
- loss of staff morale;
- public embarrassment;
- loss of competitive advantage;
- loss of tangible assets; and
- decrease in cash flow.

Another form of indirect damage that may cause extensive damage is the computer user who does not know how to react when faced with the possibility of being infected/invested with a malicious mobile code. Damage caused by misunderstanding and inappropriate response to problems may manifest itself in various forms ranging from unnecessary reformatting to inappropriate use of disk recovery utilities. It may be argued that inappropriate response to malware attacks may even cause more damage than the attack itself (Harley *et al.*, 2001).

Psychological and social damage suffered as a result of malware

Malware attacks may furthermore cause psychological damage, in the form of damage to morale through insecurity and scapegoating. Serious damage by peer companies may also be experienced because the "victim" company may now be perceived by business partners as a virus carrier (Harley *et al.*, 2001).

It should therefore be evident that a company may suffer serious damage and incur substantial losses as a result of a successful malware attack. A key conceptual question that needs to be addresses however is whether a company whose information assets, resources and systems were used or accessed in a malware attack may be held liable by a third party because of the company's failure to take reasonable steps to secure these assets, resources and systems prior to the attack. Put differently, may a third party who has suffered damages or sustained losses, hold a company liable where the

damages/loss suffered was as a result of the company's failed or inadequate information security?

Present state of the law

The internet is characterised by transactions, communications and business taking place in a faceless, borderless environment. These attributes of the internet may be considered by some as its biggest advantage, yet from a legal perspective it might be seen as its biggest downfall:

- *Anonymity offered by the internet.* The internet enables people to communicate, transact and even do business, while remaining anonymous. While anonymity affords people with a sense of security and privacy, be it a false sense of security, it may also provide another with less noble intentions with the fortitude to perform illegal or unethical activities. People connected to the internet have the misguided belief that their actions can not be associated with them, and they therefore resort to actions they would never have considered in the physical world. Within the context of the law the problem with anonymity is two-fold: it is very difficult to detect an information security incident or breach, and secondly even if a breach or incident is detected it will be very difficult to identify the perpetrator(s) (Mandia *et al.*, 2003).
- *National boundaries are unimportant.* Jurisdiction is one of the key problems when wanting to prosecute a perpetrator. The internet transcends all borders, consequently normal rules of jurisdiction and even extradition will be difficult to apply. Consider this scenario: a person could be sitting in country A, writing a virus which infects computers in country B, C and D. Under which country's laws should this person be prosecuted?
- *Motive and age of the offenders.* A criminal case usually consist of three crucial elements, namely motive, opportunity and means. The internet provides anyone with malicious intent with a means and opportunity, as a multitude of web sites exists that provides anyone from script kiddies to black hats with hacking tools. Often no or a limited amount of skill is required. A problem however arises when wanting to ascertain the motive behind an attack, as numerous attacks are the result of the quest for adventure, challenge or result out of sheer boredom. The motive of the offender will usually be a good indication of his age. Some of the most serious cyber attacks were as a result of juveniles being bored or curious.
- *Inadequate precedent.* Because of the fact that cyber crime is a relatively new evil to the South African legal system, very few cases have been tried on this subject-matter. The *stare decise* regulate modern day court rulings, requiring of judges to base their decision on past precedence as set in old cases. The problem lies therein that since there is no precedence establishing rulings on cyber-related cases current cases will become precedent for future cases. This should be alarming especially when considering the fact that our courts are filled with technology-inept legal personnel, who do not have the required know-how of computers and related technologies.

When considering the difficulties experienced when pursuing the wrongdoer in criminal law, and obtaining compensation for damages suffered or losses incurred it is clear why injured parties are increasingly considering the option of pursuing civil

lawsuits against the company itself. By focusing their wrath on the company, plaintiffs are able to circumvent most of the aforementioned problems.

Theories of civil liability

Civil liability enables an injured party to recover damages and losses from a third party if such party was negligent or acted intentionally and such negligent or intentional conduct resulted in the subsequent loss or damage suffered by the injured party. As is evident from the discussion above, it is highly unlikely that, in the current electronic environment, an injured party will be successful in collecting compensation in criminal law, as the identity and whereabouts of the wrongdoer will more than likely be unknown. Consequently, the injured party's only source of recovery may be found in civil liability.

Potential sources of civil liability for a malware attacks, include contract law, law of delict, statutory or regulatory obligation and professional liability.

(1) *Contract law.* Contractual liability for failed information security will generally ensue as a result of a breach of:

- a contractual obligation to protect the information; or
- express or implied agreement to secure customer, client or a third party's information.

It should, however, be kept in mind that the law of contract will only provide adequate protection and recourse to contracting parties (Gamertsfelder *et al.*, 2002). Therefore, third parties who do not have a contractual relationship with the company will not be afforded any protection or redress under contract law (Raul *et al.*, 2001).

(2) *Law of delict.* Various commentators (Raul *et al.*, 2001) have recommended that liability for failed or inadequate information security should be evaluated against the backdrop of the legal theories of delict/tort law. The ratiocination behind this argument is based on two principles, firstly that companies which possess over confidential and sensitive information assets, resources and systems are in the best position to secure these assets, resources and systems, and secondly, when considering the fact that the cost to a company for the development and implementation of information security measures is relatively low when compared to the cost for society if an information security breach or incident occurs, it should follow that companies are placed under a legal duty to take reasonable steps to secure confidential and sensitive corporate information assets, resources and systems.

A key conceptual question in delict is therefore whether or not the law should allow an injured party who has suffered damage or incurred losses with a right of recourse where a company does not implement reasonable measures to secure its information assets and systems, such that an internal or external threat agent is able to launch an attack against the company, or use the company's own information system to facilitate an attack against another (Personick and Patterson, 2004).

Under the law of delict/tort law, an entity that has fallen victim to an information security breach or incident will be able to claim damages if the plaintiff can prove the following (Van Gerven *et al.*, 1998):

- the existence of a reasonable duty of care necessary to prevent security breaches;
- a breach of that duty (failure to conform one's conduct to the required standard of care such as reasonable care);
- a proximate relationship between breach of the duty (causation); and
- the injury actual loss or damage sustained as a result of the breach.

(3) *Statutory and regulatory obligations.* Various pieces of legislation have been enacted world-wide to criminalise unauthorised access to, and inappropriate use of information assets, resources and systems. Most of these laws are however directed against the wrongdoer, imposing criminal sanction on him/her. The existing legal position pertaining to a company's obligation to avoid third party liability in civil law for failed or inadequate information security is however uncertain. Although legislation and regulations have been passed to impose this obligation on certain institutions such as banks, health care providers and entities that possess over highly sensitive information, much uncertainty remains for companies that do not operate in these sectors. Small to medium size companies that form the backbone of a country's economy have been left in the dark. Internationally the question of corporate civil liability to third parties for failed or inadequate information security comprises of a patchwork of legislation and regulations. Consequently, the question of what a company's statutory and regulatory obligation to provide information security is still shaded in controversy and uncertainty.

(4) *Professional liability.* The common law places the primary role players (board of directors and members of top management), under a fiduciary duty of care and skill. This duty is the most prevalent within the information security domain, as this would be the ground on which a stakeholder will be able to hold a director personally liable should information security fail. Within the information security domain this duty will require of the board of directors to take reasonable steps to secure the information assets of the company.

Therefore, if a successful malware attack takes place a third party will, depending on the circumstances, be able to hold a company liable in civil law on one or more of the above mentioned grounds.

Escaping legal liability

Two of the main areas of potential corporate liability resulting from malware attacks are:

(1) liability in negligence for failure to take reasonable steps to secure the information assets, resources and systems of the company prior to the attack occurring; and

(2) vicarious liability for the acts of the company's own employees.

In the former situation the company itself may fall victim to a malware attack or its information assets, resources or systems may be used to facilitate an attack. In the latter situation an employee of the company will be responsible for the attack, and the company will incur liability based on the principle of vicarious liability which states that an employer is liable for the actions of his/her employee, where these actions fall within the scope of his/her employment. The only possible way for a company to

escape legal liability would be to indicate that it took reasonable steps to secure the corporate information assets, resources and systems against malware attacks.

When wanting to determine if a company has taken reasonable steps an investigation must be launched into:

(1) The existence, scope and execution of:
   - the risk management program to determine the radius of risk to information security in the company;
   - information security policies, standards, procedures and guidelines of the company; and
   - the company's information security awareness and training program.

(2) How the company's information security practices compare to that of internationally accepted best practices for information security.

(3) To what extent the company benchmark itself against industry leaders and companies in similar fields.

(4) To what extent all three components of information security (physical; technical and procedural security) have been implemented, and the question whether or not they all enjoy the same level of attention and degree of importance.

(5) To what extent the board and top management have educated themselves on what the discipline information security entails.

(6) To what extent the information security practices of the company are maintained and reviewed on a continuous basis.

If a company can show that the above-mentioned six areas have been adequately addressed, it would have gone a long way in proving to a court that it had taken reasonable steps to secure its information assets, resources and systems.

Conclusion

As should be evident from the discussion above, companies world-wide are under attack. Unauthorised access, social engineering, corporate and industrial espionage, unauthorised or unlawful network-based activity and malware attacks are merely some the cyber risks responsible for this onslaught. Unfortunately, corporate South Africa is still ignorant of the range of tools available to the "Darkside" and the potential legal consequences which may ensue if the cyber risk materialises. All of these cyber risks inevitably come down to two pivotal questions – responsibility and liability. Who is responsible if a cyber risks materializes; and who may be held liable for the risk materialising?

From the above discussion it may be concluded that a malware attack may result in:

- the company itself falling victim to the attack; or
- the company's information assets, resources or systems being used by a malicious third party to facilitate an attack against another innocent party.

Moreover, when considering the fact that the company and members of top management may be held liable for:

- the actions of their own employees (vicarious liability), where, for instance an employee uses the information system of a company to launch an attack against another (internal threat); as well as for

- the actions of a malicious third party who launches an attack against the company or uses the company's resources to facilitate an attack against another (external threat) it becomes why the question of legal liability for malware attacks has come to the fore as a topic of great interest and immediate concern for board members world-wide.

If a company fails to adequately secure its corporate information assets, resources and systems against known vulnerabilities and threats such as malware attacks, the company, and those people responsible for the governance of the company (directors and top management), will find themselves ending up in court sooner rather than later, defending not only their company's reputation but also their own positions. Companies will do well to adopt the mantra "only the paranoid will survive", as this holds true in business and in law.

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About the author

Verine Etsebeth is a Senior Lecturer in the Faculty of Law at the University of Johannesburg lecturing in tax law and commercial law and specializing in information security. Her qualifications include: LLB, Higher Diploma Corporate Law (*cum laude*), Higher Diploma Labour Law (*cum laude*) and LLM-Information Security Governance (*cum laude*). She is currently completing LLD-Legal Liability for Information Security. She can be contacted at: vetsebeth@uj.ac.za or space_law@yahoo.com

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Web access for IT staff: a developing world perspective on web abuse

L. Seymour and K. Nadasen
Information Systems Department, University of Cape Town, Cape Town, South Africa

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Abstract

Purpose – The purpose of this research is to address increasing levels of web misuse, high internet costs and decisions regarding restricting web access, this research set out to identify factors that contribute to positive web use or reduce web misuse in the work environment.

Design/methodology/approach – The theory of planned behaviour has been used in previous research to investigate factors that contribute to web abuse in the workplace. These factors, potential demographic factors that could impact web abuse as well as factors that make the advantages of the web possible were surveyed amongst information technology (IT) professionals in the Western Cape IT sector in 2004. The 94 responses were then analysed quantitatively.

Findings – Results showed that higher levels of web access increased perceptions of information literacy and information access. None of the subjective norm or attitudinal antecedents showed significant support for reducing web abuse. Interestingly, close managerial supervision displayed significance by increasing web abuse. Demographic factors of firm size, number of years internet use, age and profession showed significance in predicting web abuse.

Research limitations/implications – Attitudinal factors such as playfulness, self-efficacy and internet addiction were not included in this study and could be useful in future research. Many factors followed the expected trends but failed to show significance, a larger and more diverse sample size could have improved the results.

Originality/value – The research findings are of interest to practitioners trying to manage web abuse and are also relevant in the context of high cost internet access and low bandwidth prevalent in many developing countries.

Keywords Worldwide web, Developing countries, Employee behaviour

Paper type Research paper

Introduction

The internet has become indispensable in conducting day-to-day business of all types (Greenfield and Davis, 2002). Although the web has been known to enhance personal productivity, communication and education (Anandarajan, 2002), it also presents employees with non-work alternatives and has often been described as a "double-edged sword" (Lim *et al.*, 2002). Organisations are faced with the dilemma of either offering employees unlimited web access or not offering employees access at all to avoid misuse. Obstacles to adopting and using ICT, that developing country organisations also face, is slow, unreliable, insufficient, and expensive telecommunications services (World Bank, 2006). The practice of organisations not giving staff web access could seriously hamper internet initiatives in developing countries. A recent survey of 56 developed and developing countries found a significant link between internet access and trade growth (World Bank, 2006). For this reason, this research aimed to identify the perceived advantages of web use and factors that reduce web misuse in the work environment.

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Prior available research on this problem has been conducted in first world countries, primarily the USA. The cost associated with giving employees web access in the USA is less of a factor than in developing countries. For example, the price basket for internet access in 2004 was US$15 in the USA, versus US$33 in South Africa and US$55 in sub-Saharan Africa (World Bank, 2006). This price differential is more significant if one considers the relative 2004 gross national income per capita of US$41.400 in the USA, versus US$3.630 in South Africa and US$600 in sub-Saharan Africa (World Bank, 2006). Research by the South Africa Foundation shows that South African fixed line fees are up to 400 per cent higher than the cost of similar services in 13 comparable countries (IST Africa, 2006). The Cape IT Initiative (CITI) has a goal of promoting the Western Cape as a global IT hub and gateway into Africa, thus facilitating the creation of jobs and prosperity through IT (CITI, n.d.). This sector, being IT professionals in the Western Cape IT sector, was chosen as the sample for the study.

By identifying potential factors, from previous research, and testing them for application in a developing country context, a better understanding and hence management of web usage and web initiatives in developing countries can be achieved.

The advantages of web access at work

The web is integrating the world's information economy and in so doing has brought many advantages to organizations such as increased productivity, greater flexibility, and new applications for work (Greenfield and Davis, 2002). A review of the literature has revealed that there are two prominent factors that make these advantages possible: information access and information literacy. Therefore increased web access should increase information access and information literacy and it is employees' increased information literacy and information access that results in benefits such as increased productivity.

In terms of information access, the web is an information system on the internet. This source of information can be turned into valuable knowledge for individuals and organizations (Paliouras *et al.*, 2004) and can be useful in helping employees perform their job better (Hubbartt, 1999). Stanton (2002) researching a sample of professional engineers concluded that employees that accessed the web more frequently than their counterparts, contributed highly to the organisation because they had access to information to perform their jobs better.

Rockman (2004, p. 7) defines information literacy as encompassing information authoring, finding, organisation, research, analysis, assessment and evaluation. Technology has contributed to an expanded understanding of literacy and technology skills for communicating, investigating, accessing and using information (Holum and Gahala, 2001). However, computer ownership does not guarantee information literacy, information technology can be used to manipulate data and create documents without demonstrating information literacy skills (Rockman, 2004). While web access has been proposed to positively impact information literacy because it enables quicker research and communication, studies concluding the existence of a strong relationship between web access and information literacy could not be found.

Web abuse at work

Personal use of the web during work hours, more commonly termed "web abuse" is defined as voluntary online web behaviours during working hours using any of the

organisations' resources for activities outside current customary job/work requirements. Web abuse is rising (Greenfield and Davis, 2002) and individual web abuse can range from over-use to compulsive levels of abuse. Many categories of web abuse exist, for example accessing non-work related sites, shopping online, using external ISPs, downloading non-work related information and even illegal uses such as hacking, reproducing copyrighted materials and accessing pornographic sites (Siau *et al.*, 2002; Lim *et al.*, 2002; Greenfield and Davis, 2002). This research aimed to identify factors that are effective in controlling web abuse within the business environment in the Western Cape.

Antecedents of web abuse

The theory of planned behaviour (TPB) has been widely used for understanding and predicting unethical human behaviour (Woon and Pee, 2004). Using TPB, Galletta and Polak (2003) grouped potential antecedents of web abuse into attitudinal, perceived behavioural control and subjective norm categories and added some demographic factors as exploratory variables. These factors are listed as hypotheses in Table I with additional variables (depicted in italics) that were identified from the literature. These factors will now be reviewed.

Job satisfaction

Previous research has found that lower job satisfaction leads to heavier web abuse (Stanton, 2002; Galletta and Polak, 2003). Galletta and Polak (2003) stated that this could be due to users' detachment with aspects of their job and a desire to disengage by substituting other activities. Although this attitudinal variable showed significance in

H1 and *H2* Factors being promoted by increased web access at work
H1. *Increased web access at work will promote perceived access to information*
H2. *Increased web access at work will promote perceived information literacy*

H3 Attitudinal factors promoting web abuse at work
H3a. Lower job satisfaction will promote web abuse at work
H3b. Inadequate rewards will promote web abuse at work
H3c. *Limited internet access outside work will promote web abuse at work*
H3d. *Longer working hours will promote web abuse at work*

H4 Subjective norm factors promoting web abuse at work
H4a. Supportive peer culture promotes web abuse
H4b. Supportive supervisor culture promotes web abuse

H5 Perceived behavioural control factors reducing web abuse at work
H5a. A restrictive AUP is perceived to reduce web abuse
H5b. Monitoring of traffic is perceived to reduce web abuse
H5c. *Less managerial supervision is perceived to reduce web abuse*

H6 Demographic variables impacting web abuse at work
H6a. Male employees are more likely to abuse the web at work than female employees
H6b. The age of employees will have no impact on web abuse at work
H6c. *Profession/title will have no impact on web abuse at work*
H6d. A smaller firm size will increase web abuse at work
H6e. The number of years' internet experience will have no impact on web abuse at work
H6f. A higher level of education will increase web abuse at work
H6g. *Having fewer staff in report will increase web abuse at work*

Table I.
Hypotheses proposed

the Galletta and Polak (2003) study, the authors concluded that this factor required further research.

Self-justification

Findings by Lim *et al.* (2002) suggest that employees are not averse to personal use of the web during work hours when they perceive their companies are overworking them and providing inadequate compensation. This can be classified as self-justification. The study conducted by Stanton (2002) provided minimal evidence about the casual links between these variables. Galletta and Polak (2003) added an exploratory item to address self-justification with expectations that feelings of inadequate rewards would lead to heavier web abuse instead the inverse was found. These conflicting results require further research.

Limited web access outside of work

A study conducted by Websense Inc. (1999) suggests that the limitations of internet access at home (slow, 56K dialups or expensive cable modem services), is a possible reason for employees using the web at work for personal use. In 2005 in South Africa, the dial-up market experienced no growth while corporate usage experienced solid growth, this limited growth in home users with internet access could increase web abuse further.

Longer working hours

As workdays get longer, workers are finding it necessary to accomplish personal tasks online at the office, such as online shopping or banking (Websense Inc., 1999). According to Websense Inc. (2000), employees expect flexibility in accessing the web for personal use if they are expected to work longer hours.

Supportive peer and supervisor culture

Galletta and Polak (2003) listed both supervisor culture and peer culture as subjective norms and stated that subjective norms have been powerful determinants of worker behaviour. Webster (1991) also determined in a previous marketing study that consumers' expectations are influenced more by peers than any other factors. Galletta and Polak (2003) found that if the peers and supervisors of the employee don't react negatively to personal web use during work hours and hence are seen as supportive of web abuse, then employees tend to abuse the web more.

Acceptable Use Policy (AUP)

Siau *et al.* (2002) state that companies that give employees web access should develop an AUP to provide general usage guidelines of the web at work. The AUP should clearly define which sites and types of activity are forbidden, when staff can use the internet for personal reasons and what the consequences of violating the policy is (Wynn and Trudeau, 2001). A Websense Inc. (2000) US study found that, out of a sample of 244 companies, 82.6 per cent had policies in place outlining appropriate and inappropriate use of the web (Greenfield and Davis, 2002). However, Galletta and Polak (2003) found that policies and other restrictive practices fail to restrict internet abuse and in agreement Anandarajan (2002) states that AUPs are largely ineffective. A possible answer to this could be found in research conducted by Siau *et al.* (2002) who

found that from those organisations that do have AUPs in place, they are not formally worded or legally sound and do not cover the all the primary abuses of web access. Galletta and Polak (2003) suggest that trying to foster a culture that does not support the practice might be more effective. This research aims to identify the extent to which AUPs have been implemented amongst our sample organizations and whether they are perceived to reduce web abuse.

Web monitoring and filtering software

Web content filtering and reporting tools enable enterprises to enforce policies to prevent employees from visiting certain categories of web sites and they can record all web "surfing" activities (Gassman, 2003). According to a survey conducted by the AMA in 2001, almost 63 per cent of USA businesses monitor their employees' internet connections and about 40 per cent of companies block connections to unauthorized or inappropriate sites (Wynn and Trudeau, 2001). The argument for monitoring or restricting web use is that these restrictions make workers more productive, conserve network resources and limit legal liability by discouraging workers from downloading objectionable materials to company computers. Kanagarethnam and Nainar (2002) found that it is possible to control web activity and hence reduce the level of abuse in an organisation. Stanton (2002) concluded that monitoring might be warranted for workers with no strong stake in the organisation (temporary workers) and 92 per cent of USA employees surveyed by Websense Inc. (2006) said that they believe their company has the right to install web filtering technology. In contrast, such monitoring is likely to be irrelevant and possible counterproductive for workers who identify closely with the organisation's values (Stanton, 2002). Against these conflicting views, this research aimed to identify the extent to which web monitoring and filtering has been implemented amongst our sample organisations and whether they are perceived to reduce web abuse.

Managerial oversight

A method of controlling web abuse, is close managerial supervision also termed "managerial oversight" which involves supervision of employee web usage through either walking around or physical monitoring (Greenfield and Davis, 2002). Greenfield and Davis (2002) found that managerial oversight seems negative to employees, as they experience this as more intrusive than monitoring software.

Effect of demographic variables on web abuse

Stanton (2002) states that although data shows the prevalence of web abuse it sheds little light on the users. Various demographic variables were identified, from the literature, to have an affect on web abuse. The variables that are likely to have an affect on web abuse are identified and expanded upon below:

Gender

It has often been assumed as well as validated empirically that women and men differ in their attitudes toward, comfort with, and anxiety regarding computer technology (Shaw and Gant, 2002). Stanton (2002) could not find a difference in gender with regards to web abuse, but later studies by Galletta and Polak (2003) and Websense Inc. (2006) have revealed that males are more likely to abuse the web than females. Galletta

and Polak (2003) listed gender as an antecedent in predicting web abuse by employees. Although most researchers are quick to point out that the evidence for specific gender differences in computer cognition and usage is conflicting and inconclusive, there is still a widespread belief that computers, and now the internet, are male-biased technologies (Shaw and Gant, 2002).

Profession/title

Inconclusive results and different sample populations were used on previous studies that looked at the relation between web abuse and job title. While Stanton's (2002) study used a society of professional engineers, Galleta and Polak (2003) surveyed a group of Usenet users. This study looks at a subset of IT workers termed IT professionals, comprising mainly of computer scientists and engineers, systems analysts, and computer programmers. Because these IT professionals comprise of a wide range of roles it would be interesting to find out the affect profession will have, if any, on web abuse.

Age and years' internet experience

Internet experience and age were added as exploratory demographic categories in a study done by Galletta and Polak (2003) and was not found to show any significance as an antecedent of web abuse. A study by Stanton (2002) also did not find any significant difference in age groups of those that use the web frequently and those that did not. These findings would need to be confirmed in this study. It is also possible, given the different characteristics of the sample population that will be used in this study, that these variables could yield significant results if applied to IT professionals within the Western Cape. According to the World Wide Worx's annual study, only one in 12 South Africans had access to the internet in 2005, making this still a luxury to many (World Wide Worx, 2005). Therefore the number of years internet experience for IT professionals within the Western Cape is presumed to differ from those in first world countries where studies of this nature have been conducted.

Level of education

Using a sample of 188 working adults in Singapore with access to the internet at work, Lim *et al.* (2002) found that 85 per cent of respondents had at least a high school diploma or a bachelor's degree. Armstrong *et al.* (2000) also found that individuals abusing the web at work were mostly highly educated. It is expected that a person that is well educated will have more knowledge of how to use the web, which in turn will increase web abuse practices.

Number of staff in direct report and firm size

Studies conducted by Greenfield and Davis (2002) show that managers differ from employees on their perceptions of web abuse. It is assumed that the more people an individual has reporting to them the more responsibility they feel towards the organisation and hence the less they will abuse the web. The study conducted by Galletta and Polak (2003) also found that firm size plays a role in predicting web abuse, where employees in larger firms are less likely to abuse the web.

Methodology

The nature of the research conducted in this paper is explanatory and deductive although selected open-ended questions were used to add more value to the results. A positivist approach was taken; data was quantified and used to statistically test the hypotheses. A cross-sectional survey-based approach was used to collect and analyse data. The research design is descriptive given that the problem setting is reasonably well defined and will be examined in a particular domain. Based on the review of the literature the hypotheses listed in Table I were proposed.

Questionnaire design and sampling

For *H1* and *H2*, original scales were created. Web access at work was defined on a scale from 1 to 4, represented by full access with no monitoring; full access with monitoring; limited access with no monitoring and limited access with monitoring. For the remaining hypotheses, the amount of web abuse was measured by the average number of hours per week spent on using the web for personal use. The Spector job satisfaction survey scale (Spector, 1999) was used to address job satisfaction (*H3a*). This includes fringe benefits, communications, operating procedures, co-workers, pay, promotion, contingent rewards, supervision and nature of the work itself. To address the issue of self-justification (*H3b*) users were asked if they believe that their rewards adequately match their efforts at work. A numerical response-type question was used to address the number of working hours (*H3d*) while a four-item scale was used to address the level of access outside work (*H3c*). A seven-point Likert scale was used to collect data for subjective norm and perceived behavioural control factors. Questions required to address the demographic variables were adapted from Galleta and Polak (2003) and a questionnaire by Nie and Erbring (2000).

The target population identified to carry out the research was defined as all IT professionals within the IT sector in the Western Cape. A convenience sampling technique was used to select the participating companies, with six companies within the greater Cape Town displaying willingness to participate. Phase one of the data collection involved a few pilot sessions with 10 respondents to refine the questionnaire. Questionnaires were administered personally to 135 employees fitting the target profile within the companies. An 80 per cent response rate was obtained, with 108 completed questionnaires being returned. Questionnaires were rejected during pre-capturing checks resulting in a total of 94 questionnaires to perform data analysis from.

Data analysis

Reliability and item analysis was used to confirm the reliability of the questionnaire constructs, with Cronbach's alpha of 0.7 and above indicating reliability (Nunnally, 1978). Factor analysis was used to test if the questionnaire was adequately measuring the intended constructs. Factor loadings above 0.4 were considered when using a varimax-normalised rotation. After removal of one item from the Job satisfaction construct, all constructs were found to be reliable (Table II) and no two factors loaded in the same columns in factor analysis (Table III). All other hypotheses were tested using single item questions and could therefore not be tested for reliability or validity.

To test *H1* and *H2*, ANOVA tests were performed and these were supplemented by *t*-tests to compare all possible pairs of means. To test *H3* to *H6* a multiple linear regression analysis was first used to see how all the independent variables relate to

web abuse. Thereafter stepwise regression was used to find out if any if the independent variables were inter-correlated. Web abuse was measured as number of work hours spent using the web for personal use. The affect of demographic variables was analysed using ANOVA, *t*-tests as well as correlation analysis.

Results

Sample demographics

The sample population had on average been accessing the web for seven years. In terms of age, the majority (52 per cent) of the sample population fell between the ages of 25-35 years, whilst 26 per cent were below 25 years of age. Less than 13 per cent were between 45-55 years and 5 per cent were older than 55 years. There was a male dominance (68 per cent) in the sample population. This is comparable with IT professionals in South Africa as surveyed by IT Web (2006), where 53 per cent of respondents were 26 and 35 years and 82 per cent were male. The questionnaire consisted of 8 profession categories, which were reduced to 5. The distribution was as follows: Software Developers and Programmers (67 per cent); Systems and Business

Table II.
Item analysis results

Hypothesis	Construct	Cronbach's alpha
H1	Access to information (AI)	0.893
H2	Information literacy (IL)	0.726
H3a	Job satisfaction (JS)	0.848

Table III.
Factor analysis results

$N = 94$	After removing items		
Variable	Factor 1	Factor 2	Factor 3
AI1	0.755711	−0.109732	−0.032623
AI2	0.854075	0.138174	0.064646
AI3	0.854652	0.009272	0.172784
AI4	0.817982	−0.051868	0.033217
AI5	0.813185	−0.108492	0.089571
AI6	0.717558	0.030835	0.054062
AI7	0.620398	0.117794	0.332147
IL1	0.081295	0.124314	0.743114
IL2	0.122762	0.292544	0.759115
IL3	0.121738	−0.034994	0.819004
JS1	0.035666	0.817041	0.152520
JS2	0.035618	0.746039	0.242933
JS3	−0.067609	0.730715	−0.018136
JS4	−0.223377	0.477320	−0.308104
JS6	0.082136	0.536664	0.198823
JS7	0.232538	0.765101	−0.050246
JS8	−0.094132	0.703553	−0.043693
JS9	−0.047689	0.648733	0.066063
JS10	−0.128864	0.611619	0.043785
JS11	0.095785	0.433273	0.178784
Expl. variable	4.452366	4.499707	2.188768
Prp. total	0.222618	0.224985	0.109438

Analysts (13 per cent); Project Managers (12 per cent); Systems Architects (5 per cent) and Administrators, Support and QA staff (3 per cent).

Advantages of web access

Higher web access levels were found to increase perceptions of access to information and information literacy. There was sufficient evidence to reject the null hypothesis in favour of both *H1* (F value of 2.91, p value of 0.03) and 2 (F value of 2.173 and a p value of 0.02). In terms of the correlation with access to information, t-tests revealed that the difference was primarily between full access with monitoring and limited access with no monitoring as well as full access with monitoring and limited access with monitoring. For perceptions of information literacy, t-tests revealed that the means of full access with monitoring and limited access with monitoring were significantly different.

Levels of web use and abuse

On average respondents spent a total of 44 hours a week at work and of this 14 per cent was spent accessing the web. On average employees claimed that 33 per cent of all web activity (two hours a day) was for personal use. The abuse activities are listed in Table IV. From the abuse activities that were listed, 45 per cent of people said that they frequently used the web for banking, 46 per cent frequently used the web for reading news and articles and 20 per cent said that they accessed the web for hobbies. A total of 99 per cent said that it was unlikely that they would use the web at work to view adult sites.

Web abuse antecedents

Multiple linear regression was used to test the hypotheses for web abuse. Table V shows the results of the analysis. The co-efficient of determination, R^2, was 0.38. This translates to 38 per cent of the dependant variable, web abuse, being explained by the independent variables. The stepwise regression results were similar to the multiple regression results and did not result in the removal of any factors. Three of the four attitudinal factors were found to influence web abuse – self-justification (*H3b*), level of web access outside work (*H3c*) and working hours (*H3d*). However none of these showed significance of below 0.05. In the subjective norms category neither supportive peers (*H4a*) nor supervisors (*H4b*) showed significance in predicting web abuse. In the

	Abuse activities		
	Unlikely use %	Average %	Frequent use %
Shopping	82	13	5
Banking	39	16	45
News	31	23	46
Jobs	87	11	2
Hobbies	65	15	20
Travel	71	22	6
Adult	99	1	0
Entertain	72	17	11
Invest	87	9	4
Auction	99	0	1
Downloads	62	28	11

Table IV. Abuse activities

Hypothesis	Beta	*p*-value	Supported
H3. Attitudinal variables promoting web abuse at work			
Low job satisfaction	0.078	0.493	No
Inadequate rewards	0.118	0.331	No
Limited internet access outside work	0.112	0.276	No
Longer working hours	0.123	0.214	No
H4. Subjective norm variables promoting web abuse at work			
Supportive peer culture	0.007	0.966	No
Supportive supervisor culture	0.025	0.878	No
H5. Perceived behavioural controls reducing web abuse at work			
A restrictive AUP	0.068	0.525	No
Monitoring of traffic	0.110	0.277	No
Less managerial supervision	0.203	0.035	Yes
H6. Demographic variables showing increased web abuse at work			
Male employees	0.013	0.896	No
Higher levels of education	0.088	0.414	No
Fewer staff in report	0.129	0.184	No
Smaller firm size	0.258^{*}	0.026	Yes
Increased internet experience	0.273^{**}	0.019	Yes
Profession/title	0.271^{**}	0.011	Yes
Younger IT professionals	0.440^{***}	0.0001	Yes

Notes: $^{***}\ p < 0.001$; $^{**}\ p < 0.01$; $^{*}\ p < 0.05$

Table V.
Multiple regression results showing some support for hypotheses

perceived behavioural control category, the results for acceptable use policy (*H5a*) were insignificant. Web monitoring (*H5b*) showed some support but it was not significance. Results for managerial supervision (*H5c*) were significant.

Respondents who indicated that they were in managerial positions were asked whether their organisation had an AUP in place, to which 13 per cent of managers indicated that they did not know if there was an AUP in place or not. The 87 per cent of managers that did know of an AUP being in place were asked nine questions about the company's AUP (Table VI). It was interesting to note that 70 per cent of managers said that abuse activities such as online shopping and banking were not covered in the AUP.

Question		Percentage answering No
1.	All employees that are granted web access are asked to read and sign the AUP	7
2.	Unauthorised access and usage is covered in our AUP	38
3.	Copyright infringement/plagiarism are covered in our AUP	7
4.	Transmission of confidential data is covered in our AUP	38
5.	Hacking is covered in our AUP	1
6.	Viewing of sexually explicit data is covered in our AUP	7
8.	Abuses such as online shopping, banking, making travel arrangements are covered in our AUP	70
9.	Leisure use of the web is covered in our AUP	23

Table VI.
AUP questions to managers

Further analysis was performed on the demographic variables to analyse trends (Table V). Of the seven demographic factors tested, four showed significance in determining web abuse. Web abuse was shown to increase as age decreased (*H6b*), as the number of years' internet experience increased (*H6e*), and as the size of the firm decreased (*H6d*). *T*-tests confirmed that web abuse was much higher in small firms in relation to large firms and in medium sized firms in relation to large firms. Professions showed significance in determining web abuse (*H6c*), with *t*-tests confirming these differences. Project managers were shown to commit the least amount of web abuse. The number of staff reporting (*H6g*) showed to have an effect on web abuse, as more staff were in direct report, the less the self reported web abuse, however, this result was not significant. Gender (*H6a*) and Education (*H6f*) had no effect on levels of web abuse.

Discussion

Advantages of web access

These results showed that as levels of web access increased, employees indicated they had more access to information and improved information literacy. The relationship between web access and information access was shown by Stanton (2002) for a sample of professional engineers and it is pleasing that it holds for this sample. Previous support for the relationship between web access and improved information literacy could not be found and this result is pleasing. These results should encourage employees to give IT professionals greater levels of web access.

Attitudinal and subjective norm factors affecting web abuse

While it was pleasing that these results showed the expected trends for all four attitudinal hypotheses, none of these relations was shown to be significant. Previous research on these factors has mostly been inconclusive except for a relationship between job satisfaction and web abuse shown by Galletta and Polak (2003). It is inconclusive whether these results can be attributed to the different conditions in the Western Cape IT sector. Both items in the subjective norms category failed. It was anticipated that both supportive peer cultures and supportive supervisor cultures would promote web abuse as in the study by Galletta and Polak (2003).

Perceived behaviour control factors affecting web abuse

Previous research on the impact of perceived behaviour controls on web abuse has been largely inconclusive. While, these results showed that as web monitoring increased, web abuse decreased, the affect was not significant. In agreement with previous research by Siau *et al.* (2002) and Galletta and Polak (2003), the presence of an AUP appeared to have no influence on levels of web abuse. Siau *et al.* (2002) found that most policies reviewed were not formally worded or legally sound and did not cover all the abuse activities. While this research was limited to six companies it certainly indicated that the AUPs that were in place were not comprehensive and major abuse activities were omitted. While Greenfield and Davis (2002) found that managerial oversight was perceived negatively by employees, previous research was unable to show a relation between managerial supervision and web abuse. This research showed that as managerial supervision increased web abuse increased. A single open-ended question was added to the questionnaire to find out employees views on managerial

supervision. Most employees (greater that 80 per cent of the sample) stated that they were strongly opposed to managerial supervision.

Demographic factors affecting web abuse

The absence of a relation between gender and web abuse indicated in this study is in agreement with the research performed by Stanton (2002). Galletta and Polak (2003) however, did find higher levels of web abuse amongst male employees than by females. Lack of support for this hypothesis could be attributed to the male dominance of the sample population.

In contrast to the research by Lim *et al.* (2002) and Armstrong *et al.* (2000), levels of education were not shown to influence web abuse for this sample. This could be attributed to the homogeneity of the sample, it being restricted to IT professionals.

Well-formed expectations on the effect of profession on web abuse are not held since this variable had not been examined closely. This research showed a correlation, with project managers being the least likely to abuse the web. The research also found that an increase in number of staff in reporting relations resulted in a decrease in web abuse, but this result was not significant.

In contrast to previous results, age and number of years of internet experience were both shown to be an antecedent of web abuse. The reason for this is not clear. A possible explanation is the South African context where the internet is still establishing itself and hence greater variation is inherent in the sample. Younger IT professionals could be more experienced with the web due to having access at tertiary institutes prior to work; and hence the level of abuse could be higher simply because of the level of experience. Alternatively, the difference could be attributed to the different sample populations with regards to age and average number of years' internet experience.

This study found that smaller firm size correlated to an increase in web abuse. This result is in agreement to the Galletta and Polak (2003) study, where the explanation was put down to less formalities and wider latitude of behaviour in smaller firms. A further ANOVA test was performed between firm size and monitoring and a correlation was found, with smaller firms showing lower levels of monitoring ($p = 0.25$). However this cannot be the only reason as this study failed to find a correlation between web monitoring and web abuse.

Research limitations

Although TPB has been widely used for understanding and predicting unethical human behaviour, the variables used in this research were poor at predicting web abuse. Other important attitudinal factors such as playfulness, self-efficacy and internet addiction were not included in this study and could have shown correlation with web abuse. Many factors were found to follow the expected trends but they failed to show significance in the regression results. Some of these results could be explained by the relative homogeneity of the sample and a larger sample size could have improved the results.

Conclusion

This research aimed to identify the factors that benefit from web use and reduce web misuse in the work environment. The research drew from the theory of planned behaviour used in previous research to investigate the antecedents of web misuse in the workplace.

Potential antecedents of web abuse, web advantages and demographic factors were surveyed amongst a sample of IT professionals in the Western Cape IT sector.

It was gratifying to see that quantitative analysis indicated that higher levels of web access increased perceptions of information literacy and information access. However, only 38 per cent of the variation in web abuse could be explained by the variables that were proposed. Only one of the variables from the TPB showed significance in influencing web abuse, showing that the framework is a rather poor predictor and cautions practitioners to merely assume that a theory can explain or common practice in this area can reduce web abuse. Neither a restrictive AUP, monitoring of traffic, high job satisfaction, adequate rewards, shorter working hours, unsupportive peer or supervisor culture nor internet access outside of work were shown to reduce web abuse. The only variable that was shown to be significant, was managerial oversight (in the perceived behaviour control category), where higher levels of managerial oversight, in fact, caused increased levels of web misuse.

Demographic factors were more useful in predicting web abuse. Firm size, number of years' internet use, age and profession showed significance in predicting web misuse. Web misuse was shown to increase as age decreased, as the number of years' internet experience increased and as the size of the firm decreased. Different IT professions also showed significance in determining web misuse.

It appears that the phenomenon of web abuse requires more research. Case study research in organisations that have low levels of web abuse could be valuable. While reducing web misuse is a global problem, these research findings are of particular interest in the context of high cost internet access and low bandwidth as prevalent in developing countries.

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About the authors

L. Seymour is a senior lecturer in the University of Cape Town's Information Systems Department and has taught on the foundation IS, databases and IT Applications courses. Prior to academia, she worked on the co-ordination and project management of the University's administrative IT implementations. Her research interests include use of technology in educational and enterprise systems. She is the corresponding author and can be contacted at: lisa.seymour@uct.ac.za

K. Nadasen is currently a project manager and business process analyst at Beyond Petroeum. She received her Honours in Information Systems at the University of Cape Town in 2004 and has since worked as a business analyst for Shoprite Checkers in South Africa and BP Castrol and Microsoft EMEA in the United Kingdom.

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Using journal use study feedback to improve accessibility

A.N. Zainab
Faculty of Computer Science and Information Technology, University of Malaya, Kuala Lumpur, Malaysia
A.R. Huzaimah
Library, University Malaysia Sarawak, Kota Samarahan, Malaysia, and
T.F. Ang
Faculty of Computer Science and Information Technology, University of Malaya, Kuala Lumpur, Malaysia

Abstract

Purpose – The purpose of this research is to examine users preference and use of electronic journals in general, especially those published in a hosting system, *Electronic Journal of the University of Malaya* (*EJUM*)

Design/methodology/approach – The study utilized the survey method and employed an online questionnaire as the data collection instrument. A list of 330 users who registered with *EJUM* was selected and an e-mail was sent to each with an invitation to complete the survey form linked to their mail. A total of 140 responses were returned, out of which 102 responses were usable.

Findings – The electronic journals are used for searching new information, reading full-text articles, reading abstracts, and browsing the table of contents. Users are led to *EJUM* by chance while browsing the internet (41.8 per cent) when searching using Google, through citations obtained from conference papers, from articles or citations in databases. About 50 per cent of respondents rated the journals as "good" and 20.6 per cent rated "fair". Respondents prefer keywords (28.9 per cent) and title (24.3 per cent) searches. The majority of respondents (70 per cent) prefer articles in PDF. The majority of respondents read the abstracts first to determine relevance before downloading the articles. Respondents believe that electronic journals will either co-exist with print journals (46.2 per cent) or replace the print journals (25.5 per cent) or supplement (25.5 per cent) them. Users indicate the functions and features preferred in electronic journals.

Practical implications/limitations – A HTML indexing page is created to automatically harvest the meta labels from the contents pages of journal issues, which is captured by Googlebot of Google Scholar. This strategy improves accessibility as Google Scholar provides citation and publication counts for articles and authors. A quality matrix for an electronic journal system is presented

Originality/value – The study shows the extent to which e-journals are used in Malaysia and provides a matrix of usability features which potential electronic journal publishers could consider.

Keywords Electronic journals, User studies, Malaysia

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Introduction

Even though electronic journals or scholarly skywriting (Harnad, 1990) constitute a small part of the plethora of contributions on the web, which may cause irritations to print journal publishers, it is an important and essential part of the web ecology

bringing benefits to the world of scholarship. It is estimated that there are over 20,000 peer reviewed journals published world-wide and over 7,000 are electronic journals (ACRL, 2000). There was an increase in the number of toll free or open access electronic journals from 67 titles as reported by Harter and Kim (1996) to 213 as reported by Fosmire and Yu (2000). The *DOAJ: Directory of Open Access Journals* (2005-2006) currently reveals a total of 1,000 open access electronic journals. In Malaysia, a recent count revealed 17 electronic journals providing access through subscription, designated portals or hosts and none is on open access. This number is extremely small compared to other Asian country such as Taiwan, which reported 892 electronic journal titles listed in *PerioGuide* (the *Chinese Periodical Directory*) (Lo, 2001).

The use of electronic journals was low in the early years (Tenner and Yang, 1999; Tommey and Burton, 1998; Weingart and Anderson, 2000; Akasawa and Ueda, 1998) but has gradually increased in acceptance especially amongst faculty members in more recent years. Meadows (1997) had recognized the easy access offered by electronic journals but noted on the problems of user unfriendly interfaces, poor speed of access, network problems, of archiving electronic journals and of reading on the screen. Woodward *et al.* (1997) listed out 15 myths concerning widely-held views about electronic journals at that time, most of which have proven to be increasingly a reality in the years approaching the 21st century. Rogers (2001b) found that at the Ohio State University, the number of electronic journals available correspond to an increase in faculty's daily, weekly and monthly use of electronic journals from 36.2 per cent in 1998 to 53.9 per cent in 2000. At the University of Maryland Dillon and Hahn (2002) found that 51 per cent of the faculty reported using electronic journals at least once a month. At the Colorado State University, 75 per cent of faculty indicated using electronic journals at least once a month in 2001 (Cochenour and Moothart, 2003). The increase in use of electronic journals was also reported by a study of academic staff of seven universities in Israel (Bar-Ilan *et al.*, 2003). The journal use study in the UK (Bonthron *et al.*, 2003) indicated high use among faculty members as well graduate students and the highest users are the engineers, clinical medicine practitioners (>70 per cent), followed by the chemists (>60 per cent), pure and applied sciences and social sciences and the mathematicians. A recent study of electronic journals collections in Argentinian private academic libraries by Gonzalez Bonorini and Molteni (2007) indicated an increase in the use of electronic journals (40.7 per cent, 11 out of 27 libraries). This increase was attributed to user trainings, guidelines, manuals and tutorials prepared and delivered to users.

There is therefore a definite cultural shift in the usage of electronic journals in academia as indicated by Brady *et al.* (2006) who compared the rate of use between print and electronic journals in chemistry, engineering and physics in Owen Science and Engineering Library, at Washington State University. There was an increase in electronic journal use in all three disciplines, especially in physics and they attributed this increase to the familiarity of users with online journals, the ease in using them with improved and consistent interfaces, enhanced quality of printouts and the increased conversion to electronic only versions of previously print journals. This high use of electronic journals among physicist was also reported by Vaughan (2003). A Dutch study conducted in 2003 through 2004, indicated that 75 percent of about 305 scientists and social scientists at 9 universities rated themselves as moderate or experienced electronic journal users and more than 50 per cent reported using more electronic journals than printed journals.

Availability and accessibility are among the characteristics that make electronic journals preferred by users in the academic community of students, researchers and academic staffs. Studies have indicated respondents' appreciation for being able to download full-text articles (Bancroft *et al.*, 1998; Liew *et al.*, 2000; Salisbury and Noguera, 2003; Voorbij and Ongering, 2006) and for having access to current articles (Rusch-Feja and Siebeky, 1999). Electronic journals are increasingly designed to be user oriented and are becoming easier to use (Rogers, 2001a). These features serve faculty members who use the electronic journals to keep current or use them for their writing and research needs (Monopoli *et al.*, 2002). Hence, in academia electronic journals are becoming indispensable especially among faculty members in the life sciences, medicine and agriculture (Bar-Ilan *et al.*, 2003).

The increase of electronic only journals was one of the reasons faculty and graduate students reported using the electronic journals at the University of Maryland in a survey conducted in 2001 (Dillon and Hahn, 2002). However, for core journals considered important in respondent's fields, 70 per cent preferred to have access to both electronic and print copies. Other reasons given for using included, timeliness, access to wider range of abstracts, the ability to share downloads with members of research groups and being able to incorporate its use in teaching such as assigning readings from electronic journals for graduate level reading (Brennan *et al.* 2002). The use or slow use of electronic journals is also discipline related. Kling and Covi (1997), Kling and McKim (2000), Talja and Maula (2003) established that degree of use is grounded on the communication practices in the various disciplines.

The largest journal use study was conducted by the Stanford e-journal initiative, which constituted three surveys (e-Just, 2000, 2001, 2002; Savori and Jeffrey, 2002). The results of the 2001 survey indicated a definite preference for electronic journals amongst respondents (75 per cent). The 2002 survey indicated the kinds of problems faced by respondents especially the lack of back issues. Respondents preferred hypertext links to related articles as 75 per cent of them reported using and finding this feature useful. The finding also indicated that 50 per cent of respondents read full text articles on screen rather than printing them out and most begun their search by using multi-journal portals such as PubMed, Ovid and Science Direct. The 2002 survey indicated that among the avid electronic journal users, most kept copies of articles on their computer and printed copies later to read. An interesting study by Brennan *et al.* (2002) found that electronic journal users made fewer visits to the library and most claimed that they were reading more articles than in the print only years and believed that they were exposed to a broader range of titles. This was also reported by the e-Just surveys, where respondents believed that have scanned more journals because of online access and they have more time to browse. They also reported being able to obtain new information about new practices quicker.

A study of the patterns of journal use by faculty at three universities in the USA (King *et al.*, 2003) confirmed that making electronic journals available to faculties have increased average annual reading, and this was especially true for faculties in the science and technology fields. The Dutch study by Voorbij and Ongering (2006) also indicated that faculty members in all disciplines were using a larger variety of journals when they were available in electronic form and they believed that besides making searching quicker electronic journals have stimulated interdisciplinary research.

The use of electronic journals is expected to increase in future. Studies have already begun to show that authors and faculty members tended to ignore bibliographic databases, which did not provide full-text links (Ashcroft and McIvor, 2001). Users tend to employ the "least effort" approach preferring immediate and easy access full-text publishers rather than the referral databases. Current use studies have also begun to use log-in records to study user behaviour. Log files record events and are used to study retrieval behaviour. Eason *et al.* (2000) categorized users of electronic journals into five categories by studying log file transactions. These are the enthusiastic users who would view many journals and articles (mainly social scientists and postgraduate students), the focused regular users who would use few journal titles frequently (mostly research scientists in the hard sciences and postgraduate students), the specialized occasional users who used a few specific journal titles infrequently (mixture of scientists and social scientists), restricted users who accessed a few specialized journals occasionally (biological scientists) and the lost, exploratory, tourists who use electronic journals only once and do not return for a second view (cross all disciplines especially those who were busy to spend time using). However, there were some contentions that log files did not really measure use as it cannot differentiate between purposeful and non-purposeful use.

Electronic Journal of the University of Malaya

Usage and usability study helps electronic journal publishers to gauge the amount of use and the ease of use of their journal system. This study examines the users and their use of electronic journals published in a hosting system called *EJUM (Electronic Journal of the University of Malaya*), their perceived satisfaction with the electronic journals, the preferred features in electronic journals in general and problems they face when using the electronic journals (Zainab *et al.*, 2005).

EJUM is an experimental hosting system purposely developed to host Malaysian scholarly journals developed and published by the Faculty of Computer Science and Information Technology (FCSIT), University of Malaya. Electronic journal publishing is fairly new in Malaysia and currently hosts only three scholarly journals; *Malaysian Journal of Computer Science* (*MJCS*) (1996-2006-), *Malaysian Journal of Library & Information Science* (*MJLIS*) (1996-2006-) and *Journal of Problem Based Learning* (*JPBL*) (2002, 2003). The host's main objectives are: to provide an avenue for Malaysian scholarly journal publishers to venture into electronic publishing, which would ultimately results in a digital library of scholarly local research content made available over the internet; to provide the facility to archive older issues electronically; to automate the editorial and refereeing process common in scholarly journals; to provide users with a common search facility in a single journal or across all journals parked in the host; and to provide Malaysian journal publishers with reports about total registered users who accessed the journals over a period of time. The aim is to help build a corpus of e-content of refereed science and technology journals in Malaysia.

The first version of *EJUM* was developed in 1998 and was improved in 2002. Two of the journals, *MJCS* and *MJLIS* are hybrids, that is published electronically together with a small print runs each for distribution to subscribers locally and abroad, while *JPBL* is an electronic only journal. All the journals are currently available gratis electronically and accessible at http://ejum.fsktm.um.edu.my Since 1998, no attempt has been made to study the users of the journals or the usability of the hosting system.

This paper attempts to describe the findings from the user and usability study undertaken in 2005. Part of the objective of the study is to ascertain whether the results would reveal areas which needs immediate action for improvements and the accessibility of the e-journals published within this hosting system.

EJUM usability study methodology

The study utilized a survey method and employed an online questionnaire as the data collection instrument. The questionnaire used was a mixture of fixed response-type questions as well as those requiring open ended answers and was distributed to respondents via a link through their e-mails. An online survey management system managed the collected data by channeling responses into an Excel spreadsheet. The questionnaire collected demographic information as well as solicit information about how users were led to the electronic journals, their opinion on the functionalities and features of *EJUM*; the problems faced when using the journals and their use and perception towards electronic journals in general.

As the journals in *EJUM* are accessible to all internet users through its designated URL, FCSIT is mainly concerned with finding out the opinions of those who have used the host and are registered as users. Users in this context are anyone who has access to the internet. This information is obtained from the user registration log as all users are required to register themselves before freely accessing the full-text. A list of 355 users registered with *EJUM* bearing demographic details such as name, email addresses, home/office address, location, gender, and occupation, was obtained from the log file on 12 January 2005 for users who registered between January-December 2004. Out of a total of 836 users registered with the system, 330 users were selected based on the completeness of the information obtained in their registration form. An e-mail was sent to each of these users with an invitation to participate in the online survey and linking the mail directly to the online survey form. A total of 140 responses were returned and out of this only 102 responses were used for analysis based on the completeness of responses.

Male respondents predominated (63, 62 per cent) over female respondents (39, 38 per cent). The majority of those registering with the host were between the ages of 31 and 40 years (42, 41 per cent) followed by those between 21 and 30 (36, 35 per cent) and 41 to 50 years of age (24, 24 per cent). Over 50 per cent of those registering were in the field of computer science and information technology (CS and IT) (51, 50 per cent) and about 15 per cent (15 respectively) were in the fields of education, as well as library and information science (LIS). The rest of the respondents spread over diverse fields ranging from business, science, engineering and health. This information revealed that *EJUM* was getting its targeted users as the journals it currently hosts are in the fields of computer science, library and information science and education. The respondents were faculty members (56.7 per cent) comprising lecturers, associate professors and professors and the rest were tutors, students and researchers. The majority of the users were Malaysians (66, 65 per cent).

Results: use of the e-journals in *EJUM*

Reasons for accessing the electronic journals

Users seem to use the electronic journals to mainly support their research and teaching needs. About a third of respondents (30, 27.3 per cent) wanted to search for new

information. Other reasons given for accessing include wanting to access the full-text articles (26, 23.6 per cent), wanting to read the abstracts before deciding to read the full-text (20, 18.2 per cent), wanting to just browse the table of contents (12, 10.9 per cent), and to check out bibliographic citations obtained from other sources (8. 7.3 per cent).

How respondents are led to the electronic journals

The majority of respondents found out about the journals "by chance" when they were browsing the internet (41, 35.3 per cent). They were also referred to journals in *EJUM* from other citations, such as "from a conference paper" (15,13.0 per cent), "saw information about it in an article" (12, 103 per cent) and "found reference in other database" (10, 8.6 per cent). Colleagues and friends were an important referral source (20, 17.2 per cent). This implied that Malaysian academics in the field of CS and IT as well as LIS were not aware of existence of *MJCS*, *MJLIS* or *JPBL* as they did not purposefully search for the journals but came across them unintentionally. This also implied the need for a marketing strategy possibly making use of the internet facilities to extract meta information from contents pages, which could be harvested by popular search engines such as Yahoo and Google scholar to increase article level accessibility. The study by King *et al.* (2003) obtained similar answers from their respondents as the majority of faculty indicated discovering electronic articles through browsing (48.7 per cent), online searching (23.7 per cent) cited in other publications (11.5 per cent) and referred to by another person (13.0 per cent).

Rating on usefulness

About 50 per cent of respondents rated the journals as "good", 20.6 per cent rated "fair" and 17.6 per cent rated "could be improved". Only 0.8 per cent rated the journals as "Excellent" and 2.9 per cent had no comments. This result indicate the need to provide improvements that takes into account users perception of what they like or dislike about the features provided by the host or their perceived "want" list in an electronic journals.

Level of satisfaction with the functions available in EJUM

Respondents rated on 26 statements listed under four sections indicating their levels of satisfaction to the functions available in *EJUM*, comprising registration, search, browsing, viewing functions; subscription information; general and editorial information; navigation and design functions. The mean ratings indicated that users were satisfied with *EJUM*'s design features especially the registration, viewing of articles by broad subject categories and the ability to change personal information at anytime. The rest of the searching and viewing features were considered fair. Users indicated being satisfied with five out of six of *EJUM*'s features and design, all of which received mean scores of 3.0 and above. The subscription information as well as the general and editorial information received only "fair" mean scores. The results imply that that there is room for improvements to include features such as new article alerts and dynamic links in references to actual full-text resources or citations and full-text of resources that sits outside the host. These features are viewed as value adding to what is being provided currently (see Table I).

When the mean scores were applied to a rating scale of 1-1.9 Poor; 2.0-2.9 Fair; 3.0-3.9 as Satisfactory; and 4.0 as Good, only 31 per cent (8) of *EJUM*'s functions achieved "satisfactory" scores and the rest (69 per cent, 18) were rated "fair". None of the functions was rated "good" or "poor".

Statements	Mean (1-4)
Registration, search, browsing, viewing functions	
As a user I could register easily	3.3
View articles according to broad subject categories	3.1
Change my personal information anytime	3.1
Search by author's name	2.9
Search by keyword/subjects	2.8
Browse article via author index	2.8
View recently published articles on the main page	2.8
Browse article by author's affiliation	2.6
Focus my search using Boolean operators	2.6
Search archived back issues	2.6
Limit search by year	2.6
View links to references	2.5
Review new article alert from the publisher	2.1
Subscription information	
Let subscriber renew account online	2.8
Able to view subscription information	2.7
Able to pay subscription online	2.6
General/editorial information	
Able to view general information about journal	2.9
Able t view about instructions to authors	2.7
Able to know submission datelines for each issue	2.7
Able to view information about editors, reviewers	2.6
Features and design	
Text font (size, colour, type)	3.2
Navigation between screen	3.1
Background colour/image	3.0
Quality of contents	3.0
Easy to learn its functions	3.0
Help screens	2.9

Table I.

Preferred search options

Keywords search (31 times, 29.0 per cent) and searching under title (26 times, 24.3 per cent) was chosen by a third of respondents respectively. The rest of the respondents preferred basic search options (17 times, 15.9 per cent) and lesser still preferred browsing the title pages (15, 14.0 per cent) and author index (11, 10.3 per cent). Very few (6.5 per cent, 7 times) indicated using the advance search features, which allow users to query the full-text of the articles in PDF. This behaviour in searching correspond with other studies which shows that because of the increase level of searching competency users are searching the online journals more and less are browsing (Tenopir *et al.*, 2003; Stanford E-journal user study, 2002a, b).

Preferred format for reading retrieved articles

The majority of respondents (70 per cent, 69) indicated preferring to articles in PDF followed by HTML (6 per cent, 6). None of the respondents have chosen "Read on screen" but rather "print and read off screen" (18, 18 per cent) or "save and print out to read later" (6, 6 per cent). This is contradictory to the findings in the E-Just study

(Savori and Jeffrey, 2002), where the majority of respondents would read two to five screens of pages online and a smaller percentage would read articles on ten screens or more. The E-Just survey had indicated 42 per cent respondents preferring PDF files and 45 per cent would print rather than read on screen.

Problems faced by respondents when using EJUM

Respondents indicated "downloading articles" problematic (48, 38 per cent), followed by "searching and browsing for articles" (42, 33.3 per cent), "viewing articles" (21, 16.7 per cent) and "printing articles to read later" (9, 7.1 per cent). The problem in downloading may be because users may not have the Adobe Acrobat Reader installed on their PCs and a link is therefore needed for users to download the Reader, which is available gratis on the WWW.

Results: use of e-journals in general

How respondents were led to electronic journals in general

About 41.8 per cent (69) of respondents accessed the electronic journals while making general searches using popular search engines such as Google and Yahoo. The next most selected option was "from specific journal hosting system" (36, 21.8 per cent). This is followed by "from my library web portal" (27, 16.4 per cent), "from citation links found in another resource" (15, 9.1 per cent), and from journal hosts or databases (15, 9.1 per cent). Very few gained access through e-print portals (3, 1.8 per cent). This indicates that academic users still opt for the easiest option when searching, that is using popular search engines rather through online databases from their library web portals. This is expected as EJUM is not designed to be on open access and article-level information could not be harvested by popular search engines and are therefore less accessible. This is an important feature that needs to be corrected as the majority of respondents use search engines to begin their information search.

Location from where electronic journals are accessed

More than a third (51, 39.5 per cent) of respondents accessed the electronic journals on campus using personal computers. Another third (42, 32.6 per cent) accessed from their homes and the rest access on campus using shared personal computers, which would most probably be located in laboratories and the library.

Frequency of retrieving, reading, downloading articles from e-journals

The 90 respondents who answered the question on frequency of use were heavy users of electronic journals, with the majority accessing weekly (39, 43 per cent), followed by those accessing daily (15, 17 per cent) and monthly (12, 13 per cent). The rest used electronic journals few times a year and three did not reply. There was a significant relationship (Pearson Chi-square = 12.655, df 5, $p < 0.027$) between the frequency of use among faculty members (lecturers, associate professors and professors) and non-faculty (tutors, researchers, students). Faculty tended to use the electronic journals more frequently.

What users do with retrieved articles

A total of 140 answers were collected from this question of use since respondents were allowed to tick more than one type of use. Most respondents scanned the abstracts,

read a few sentences to check relevance and then downloaded the articles (42, 30 per cent). The rest exhibited varied types of behaviour, such as saving the article to a file and printing it out later (30, 21.4 per cent), quickly reading the article (22, 15.7 per cent), keeping both the print-out and the soft copy of the article (20, 14.3 per cent), printing and reading later (14, 10 per cent) and reading slowly straight away (12, 8.6 per cent). Users' behaviours indicate that full-text access is essential in electronic journals since most respondents indicate reading articles straight away or later.

Types of e-mail alert found most useful

Respondents preferred e-mail alert that is linked directly to the articles (42, 29.8 per cent) and the rest preferred links from table of contents (39, 27.7 per cent), article citation (24, 17 per cent), and keyword alert (24, 17 per cent). Twelve respondents did not give an answer.

Opinion about the future of electronic journals

The majority of respondents believed that electronic journals would co-exist with print journals (49, 46.2 per cent). The rest believed that electronic journals would replace the print journals (27, 25.5 per cent) or would supplement (27, 25.5 per cent) them. Three respondents did not give any opinion to this question.

Relationship between demographic variables with journal use

Only the significant relationships are reported.

Gender and ratings on features. Female respondents significantly gave higher ratings than their male counterparts to "easy to search within journals" ($x^2 = 15.89091$, df 2, $p < 0.001$), "reasonable subscription cost" ($x^2 = 13.535$, df 2, $p < 0.001$), "indexed by indexing databases" ($x^2 = 14.215$, df 2, $p < 0.003$), and "hyperlinked to other subject-related articles" ($x^2 = 14.882$, df 2, $p < 0.001$).

Age and preferred characteristics in electronic journals. The younger users rated significantly higher (very important) on certain characteristics such as "easy to use" ($x^2 = 24.843$, df 4, $p < 0.001$), "easy to browse within journal issues" ($x^2 = 23.874$, df 6, $p < 0.001$), "easy to browse through contents" ($x^2 = 22.227$, df 4, $p < 0.001$), "user friendly interface" ($x^2 = 29.981$, df 2, $p < 0.001$), and "reasonable subscription costs" ($x^2 = 13.574$, df 4, $p < 0.001$).

Faculty members and non-faculties for preferred characteristics in electronic journals. A significantly higher number of non-faculty members viewed these characteristics as very important compared to faculty members, "easy to use" ($x^2 = 11.679$, df 2, $p < 0.003$), "easy to browse through contents" ($x^2 = 13.323$, df 2, $p < 0.001$), and "easy to download full-text articles" ($x^2 = 7.320$, df 1, $p < 0.007$).

Outcome and discussion

Users of the three electronic journals parked in *EJUM* have indicated that they came across the journals "by chance" when browsing the internet. This indicated that even though the electronic journals were available without a fee to all users since 1998, its presence was still not easily detected. This implied that going electronic was not enough to ensure accessibility. Due to security features programmed for EJUM, popular search engine crawlers could not access down to the article-level, which is embedded in tables of contents. The publishers have undertaken two

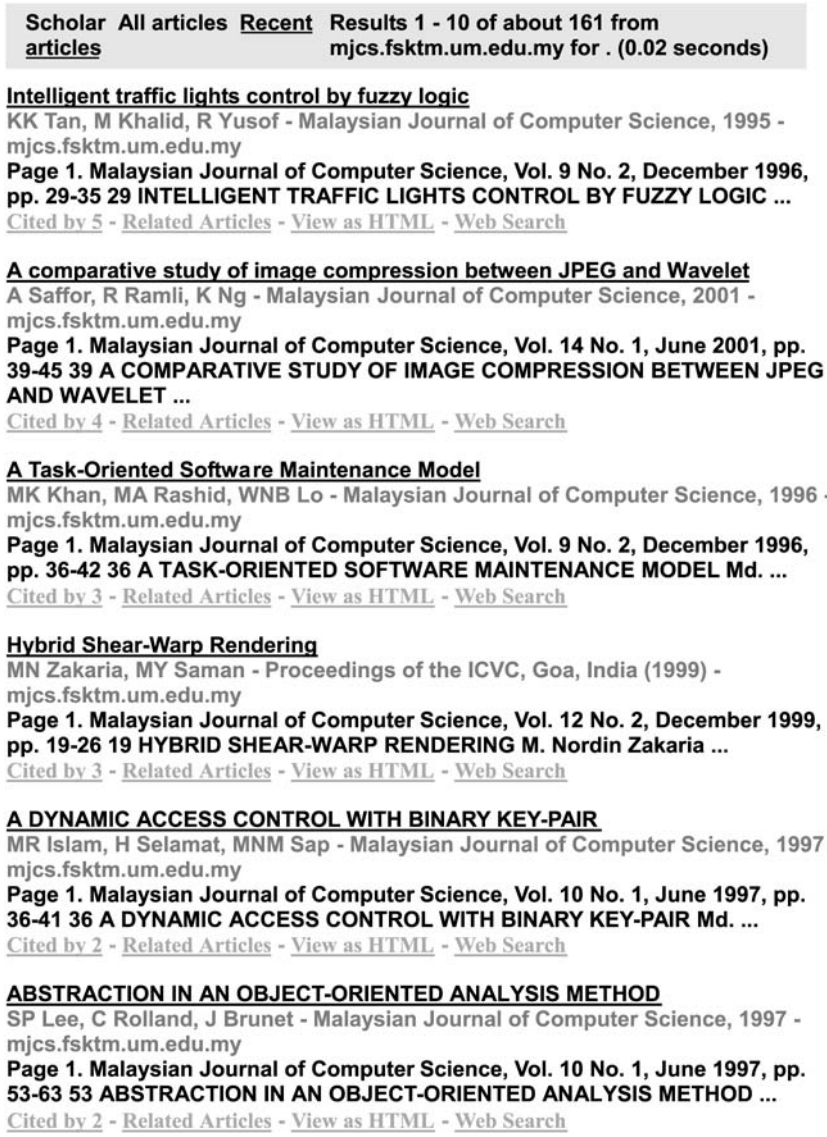
courses of action. The first addressed the accessibility problem. In order to expose the hidden article information in the contents pages, an indexing page was written in HTML, which includes the volume listing of all journals. The volume listing is hyperlinked to article listings and subsequently to each article detail pages bearing information such as titles, authors, name of journal, volume, year, keywords and abstracts. It is these article detail pages and their hyperlinks that are harvested by Google Scholar's Googlebot. This strategy allows Googlebot, to harvest article contents of both *MJCS* and *MJLIS*.

It is expected that there would be an increase of citations to articles published in both journals in future. The evidence of citation and accessibility can already be seen. It is now possible to establish the citations received by articles published in the electronic journals in *EJUM* (Figure 1). This strategy of utilizing Google Scholar to increase accessibility is a workable option for journal publishers in a developing country like Malaysia whose journals have not existed long enough to accumulate citations and impact. The viability of utilizing Google Scholar is indicated in a recent study by Bauer and Bakkalbasi (2005), who indicated that this search engine seemed to be very efficient in tracking and providing citation information. Bauer and Bakkalbasi compared the performance between Google Scholar, Scopus and Web of Science in extracting citation counts for 105 and 41 articles published in the years 2000 and 1985 respectively. In April 2005 they extracted the citation counts for each article from the three search services. The results show that the number of times an article was cited in Web of Science for the year 2000 ranged from 0-52, with an average of 7.6. Google Scholar however, detects an average of 4.5 more citations (12.0) than the Web of Science or Scopus. However, for the older sets of articles published in 1985, a higher average citation count is achieved by the Web of Science because they have been in existence longer. This meant that opening article contents to search engines such as Google Scholar help increase article and author accessibility.

The second strategy would involve redesigning the electronic journals to be on open access and open archive initiative compliant. Features such as hyper linking of articles with subject related citations would be included in future. The usage and usability study have therefore helped *EJUM*'s publishers to develop short and long term plans to improve its functions and accessibility. The importance of accessibility was also stressed by Lo (2001) who found that only 417 out of 892 Taiwanese journals listed in a published directory were accessible and provided full text to both current and back issues. Out of this, 205 titles provided access without any charges. Also, out of the 892 titles, 533 were not indexed by any major international indexing or abstracting services and only 40 per cent were indexed by the Taiwanese periodical index. This lack of access pointers may be the cause for the low usage rate.

Quality matrix for electronic journal system

The outcome obtained from the study is a matrix of features which will help to make electronic journals within the Malaysian context more useful. The list below indicates the features which users rated as important placed in order of preference. This is based on the respondents' ratings on "important" and "very important" features respondents felt that electronic journals should possess. It also identifies the features that needed to be improved upon by the EJUM host.


Scholar All articles Recent articles Results 1 - 10 of about 161 from mjcs.fsktm.um.edu.my for . (0.02 seconds)

Intelligent traffic lights control by fuzzy logic
KK Tan, M Khalid, R Yusof - Malaysian Journal of Computer Science, 1995 - mjcs.fsktm.um.edu.my
Page 1. Malaysian Journal of Computer Science, Vol. 9 No. 2, December 1996, pp. 29-35 29 INTELLIGENT TRAFFIC LIGHTS CONTROL BY FUZZY LOGIC ...
Cited by 5 - Related Articles - View as HTML - Web Search

A comparative study of image compression between JPEG and Wavelet
A Saffor, R Ramli, K Ng - Malaysian Journal of Computer Science, 2001 - mjcs.fsktm.um.edu.my
Page 1. Malaysian Journal of Computer Science, Vol. 14 No. 1, June 2001, pp. 39-45 39 A COMPARATIVE STUDY OF IMAGE COMPRESSION BETWEEN JPEG AND WAVELET ...
Cited by 4 - Related Articles - View as HTML - Web Search

A Task-Oriented Software Maintenance Model
MK Khan, MA Rashid, WNB Lo - Malaysian Journal of Computer Science, 1996 - mjcs.fsktm.um.edu.my
Page 1. Malaysian Journal of Computer Science, Vol. 9 No. 2, December 1996, pp. 36-42 36 A TASK-ORIENTED SOFTWARE MAINTENANCE MODEL Md. ...
Cited by 3 - Related Articles - View as HTML - Web Search

Hybrid Shear-Warp Rendering
MN Zakaria, MY Saman - Proceedings of the ICVC, Goa, India (1999) - mjcs.fsktm.um.edu.my
Page 1. Malaysian Journal of Computer Science, Vol. 12 No. 2, December 1999, pp. 19-26 19 HYBRID SHEAR-WARP RENDERING M. Nordin Zakaria ...
Cited by 3 - Related Articles - View as HTML - Web Search

A DYNAMIC ACCESS CONTROL WITH BINARY KEY-PAIR
MR Islam, H Selamat, MNM Sap - Malaysian Journal of Computer Science, 1997 - mjcs.fsktm.um.edu.my
Page 1. Malaysian Journal of Computer Science, Vol. 10 No. 1, June 1997, pp. 36-41 36 A DYNAMIC ACCESS CONTROL WITH BINARY KEY-PAIR Md. ...
Cited by 2 - Related Articles - View as HTML - Web Search

ABSTRACTION IN AN OBJECT-ORIENTED ANALYSIS METHOD
SP Lee, C Rolland, J Brunet - Malaysian Journal of Computer Science, 1997 - mjcs.fsktm.um.edu.my
Page 1. Malaysian Journal of Computer Science, Vol. 10 No. 1, June 1997, pp. 53-63 53 ABSTRACTION IN AN OBJECT-ORIENTED ANALYSIS METHOD ...
Cited by 2 - Related Articles - View as HTML - Web Search

Figure 1.
Retrieved citation information on articles published in *Malaysian Journal of Computer Science*. Searched on 21 September 2006 on Scholar Google using the search site: http://mjcs.fsktm.um.edu.my

Features rated as "important" and "very important" are as follows:

(1) *Back issues are available online (97 per cent).* This feature is important for scholarly journals as it serves those engaged in research and writing looking for articles. However, this feature is discipline dependent. This feature is rated by 99 respondents. Perhaps in disciplines such as Computer Science and Information Technology there is lesser need for older back issues (more than ten

years) as development in these disciplines move so fast. In other disciplines this situation might not be the case. Savori and Jeffrey's study (2002) indicated that lack of back issues as the feature that E-just S & T users want. Rudner *et al.* (2002) also suggested that the provision of archived articles helped increase use among their educational journal users.

(2) *User friendly interface (97 per cent).* Users seem comfortable to use electronic journals that have a familiar look and feel similar to most e-journal systems. Users tend to prefer familiar command buttons, located in familiar places on the screen. Younger users significantly view this as a very important characteristic in an electronic journal. This feature is rated by 99 respondents.

(3) *Good image quality (97 per cent).* The journal system should support TIF, JPG, GIF, PNG image types. This feature was rated by 99 respondents.

(4) *Refereed (94 per cent).* This is an important criteria for scholarly journal users and this feature was rated by 96 respondents.

(5) *Convenient to use (94 per cent).* Online journals should allow access regardless of time and place. This feature is rated by 96 respondents.

(6) *Easy to browse through contents (94 per cent).* Users are allowed to browse abstracts, full-text through author, title, keyword, and subjects. Non academic users regard this feature highly and 96 respondents rated this feature. The browsing function must not be limited to just browsing abstracts but extended to browsing citations to linked items. Log information from the Superjournal project indicate that basic browsing and printing functions are the most utilized functions inferring their importance to users (Eason *et al.*, 2000a).

(7) *Easy to print (94 per cent).* Printing functions should be effortlessly located on the page or screen. PDF is preferred as the look and feel of documents is preserved when documents are printed out. This function was rated by 96 respondents. An alert to download Adobe Acrobat reader is essential to remind users to download it from the web. Savori and Jeffrey (2002) also found that 42 per cent of their respondents prefer handling PDF articles. Brennen *et al.* (2202) interviewed 19 medical researchers at the University of Illinois, who, even though they were avid users of electronic journals, were less willing to read full articles on their computer screens, with the majority preferring PDF versions of articles for printing. Tenopir (2002) found that medical faculty read more in print because "it is easier to pick up during breaks".

(8) *Reasonable subscription (94 per cent).* This feature is less important if the electronic journal is on open access. It is important for hybrid journals where subscription cost is priced lower for the electronic version of the journal and attractively priced for individual subscribers. Reasonable subscription was regarded highly by female and younger users of *EJUM*. This feature received 96 ratings.

(9) *Easy to download full-text (91 per cent).* Several forms of identification and prompts before the process of downloading an article will tire the user and should be avoided. Downloads must be encouraged and counted, as Davies (2004) has indicated that total downloads is a good predictor of the number of

users using the journal and any cumbersome features must be avoided. This function was rated by 93 respondents.

(10) *Easy to use (91 per cent).* Users prefer a system with functions that is easy to learn and use. Younger and non-academic users were more concerned with the system's level of simplicity compared to the mature academic users. Ease of use was also attributed to be an important feature in the Max Plank Institute study by Rusch-Feja and Siebeky (1999). This feature was rated by 93 respondents.

(11) *Easy to search within journal issues (91 per cent).* Users prefer the search feature that is effortless to use and takes minimal amount of time for users. Users from IT related fields might not value this function as much as they are more adept at using e-based systems. It is valued by female and younger users and rated by 93 respondents. The need to provide advance search functions need to be considered carefully as studies have indicated that users basically opt for the very basic search functions and would rarely utilize advance search features. Eason *et al.* (2000b) found discrepancies between Super journal users ratings and actual use. Even though their users ranked search as an important feature of electronic journals, actual use indicated only 26 per cent of users utilized the search function.

(12) *Hyperlinks to other related articles (88 per cent).* This function is preferred by users because it saves time and is an excellent way of bringing related articles on any subject together. Female users regard this feature very highly. This feature was rated by 90 respondents. Savori and Jeffrey (2002) also found their respondents value hyperlinks to other related citations. Brennan *et al.* (2003) and Voorbij and Ongering (2006) also confirm that their respondents appreciate the provision of hyperlinks from bibliographic description to full-text of articles. Linking is expected to increase the chances of finding articles in electronic journals or in getting potential readers (Ng *et al.*, 2001).

(13) *Remote access (85 per cent).* This is important as library visits may not be convenient to all users. Hence, accessibility from own desktop, office or home is a valued feature. This feature was rated by 87 respondents.

(14) *Indexed by indexing databases (85 per cent).* Users seem to rate this lower because the availability of electronic journals directly on the internet negates the need to use an indexing service, which most often provide only referral citation information. This feature was rated by 87 respondents. Studies by Ashcroft and McIvor (2001) have shown that authors and faculty members tended to ignore bibliographic databases, especially those which did not provide full-text links. For electronic journals in education, Rudner *et al.* (2002) suggested that among other things publishers of electronic journals should get the journals indexed by *Education Index* and *Current Index to Journals in Education*.

(15) *Activating and monitoring log files.* Many studies have indicated useful information can be derived from log files (Eason *et al.*, 2000a; Yu and Apps, 2000; Davis, 2002; Nicholas *et al.*, 2003; Davis, 2004a; Davis, 2004b).

(16) *Other value added features.* This include e-mail alerts to currently published articles, personalized web pages.

Conclusion

Electronic journals have only been in existence in Malaysia for ten years. The first electronic journal in Malaysia was published in 1996 (Ling *et al.*, 1996) and the number has only increased to 17 in 2006. It is therefore important for a new academic electronic journal publisher to find answers to the following questions; are the target academic group using it? how are users led to the journals? and what are users' perceptions of the journal system's features offered?. Such information would help the publisher gauge to what extent the electronic journals are fulfilling their prime objectives of serving the Malaysian scholarly communication community. It would also help to identify factors which need to be considered by publishers of electronic journals to improve services and contents to best serve both users and authors. The *EJUM* study reported herein shows the extent to which e-journals are used and provides a matrix of usability features which potential electronic journal publishers could consider.

There is also a need to move towards an electronic only platform in the future. Both *MJCS* and *MJLIS* as well as *JPBL* can be considered as "marginal" journals serving a small section of Asian and Southeast Asian educational community. As such, the continuance of a hybrid model in publishing will not be economically viable and will not help attain maximum accessibility for the journals. Keller (2001)'s 45 experts from Europe and Africa had predicted that there will be a growth of more specialized journals described as "marginal" journals and these journals will be among the first to move to an entirely digital environment in 2008. The Malaysian move to publish electronic only journals which are on open access is a way of surviving and preventing the journals from being marginalized by major journal publishers.

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About the authors

A.N. Zainab is a Professor at the Department of Information Science, Faculty of Computer Science and Information Technology, University of Malaya, Kuala Lumpur, Malaysia. She received her BA (Hons) and MA degrees from the University of Wales, Cardiff and was also awarded the MSc (Information Studies) degree with excellence and PhD from Loughborough University, United Kingdom. She was awarded the J.D. White Memorial Prize for her dissertation from Loughborough University in 1991. Her areas of research include electronic communication and libraries, computer aided instruction in the field of library and information science, organization of information, collection development, user information needs, information literacy, Malaysian scholarly communication and dissemination behaviour. She has published articles in local and international journals and has compiled as well as edited a number of bibliographies. She is the editor in chief of *Malaysian Journal of Library and Information Science* and the coordinator of the Faculty's e-journal hosting system, *EJUM* (*Electronic Journal of the University of Malaya*, at www://ejum.fsktm.um.edu.my). She is the corresponding author and can be contacted at: zainab@um.edu.my

A.R. Huzaimah has a Bachelor Degree in Information Technology (Information Science Major) and a Master of Library and Information Science from the University of Malaya. She is a Reference Librarian at University Sarawak Malaysia since January 2006 and was previously an Assistant Librarian at Monash University Malaysia Library, Kuala Lumpur. Her research interests include electronic journals, online databases and information literacy.

T.F. Ang is a lecturer at the Department of Computer Systems and Networks, Faculty of Computer Science and Information Technology, University of Malaya, Malaysia. He obtained a Bachelors degree of Information Technology in 2000 and a Master of Computer Science in 2001 from the University of Malaya. He is responsible for overseeing the development of the electronic journal system and teaches computer programming and networking courses. His research interests are in the area of web services, VoIP, grid computing architecture and web development.

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A study on the model to link the Korean University Library OPAC with search portals

Jane Cho
Korea Education and Research Information Service, Seoul, South Korea

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Abstract

Purpose – The purpose of this paper is to show that the dependency on search portals as a gateway for internet navigation is increasing. This phenomenon is also occurring in the academic information resource market of Korea. As a result, it is necessary to positively review linking library services with search portals. In particular, a plan to link the services of university libraries (which are recognized as private facilities of universities) is needed, utilizing them actively as public facilities connected with the local community. In this context, this study discusses a model to link the Korean University Library OPAC with search portals.

Design/methodology/approach – Analyzes the present status of cases in foreign countries – already vigorously active – and raise several points. In consideration of analysis, sets basic directions about linking library OPAC to search portals. Proposes a detailed model to link search portals with University Library Union Catalogs and manifestation of Deeplink to local University Library OPAC in consideration of technical situation of Korean Library OPACs.

Findings – A major problem from established cases is that portal search engines cover all areas so retrieval results are generally vast. Users cannot easily find a path accessing library resources through search portals without special equipment.

Originality/value – This paper proposes models to link library catalogs through special sub domains or book services of portal sites using University Library Union Catalogs as a gateway. It also proposes three alternatives of Deeplink implementation to local OPACs.

Keywords Portals, South Korea, University libraries, Online catalogues

Paper type Technical paper

Introduction

The key issue of the Korean internet industry in 2005 was the concentration of users into select high-ranking sites. It was predicted that the internet market in 2006 would be further concentrated into high-positioned portal sites (Yang, 2006). This phenomenon is occurring not only in general entertainment, games and e-Commerce, but also in the academic information resource market. Search portals and information service organizations are quickly responding to this change in the information market. Recently, search portals like Google have been establishing open cooperative relationships with the major publishers and libraries of many countries. They are also providing global academic information resource gateway services. Libraries, publishers and information service organizations thus avoid a competitive structure in their point of contact with the public and are actively seeking a plan that can be developed mutually.

The Korean internet environment has the unique feature of significantly shorter documents compared to foreign countries due to the Korean-language text, thus

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competition to secure public knowledge among search portals is fierce. Search portals are providing services linked to a variety of knowledge through direct partnerships with public institutions. The Integrated Retrieval System of the National Knowledge Database (www.knowledge.com)[1] from the Ministry of Information and Communication, in which the full text information of 200 million items has been established, is being serviced through a link to a consortium of three private search portals (Paran, Empas and Nate). To provide the general public with public academic resources, cooperative cases with private search portals are continuously being pursued.

On the other hand, the project to link search portals with Korean university libraries – where learning resources are most concentrated in the local community – is not progressing smoothly. This is because the university libraries of Korea do not provide public services for the local community, as they are still being recognized as private facilities of individual universities. In Korea, not only the libraries of national and public universities but those of private universities – accounting for some 80 percent of the total universities – have received a significant amount of the national treasury. In that aspect, it is necessary to recognize university libraries as a part of the national infrastructure and thus develop them as a public facility in conjunction with the local community. As part of this, it would be meaningful to develop a plan to make public the information held by university libraries through large-scale search portals, most easily accessible to the general public. Based upon the above necessity, this study proposes a plan to link Korean university library catalogs with search portals. We comprehensively analyze the present status of such cases in foreign countries – already vigorously active – and current Korean search portal services to propose plans to link university library catalogs with search portals suitable to the situation in Korea.

Case studies of linking search portals with library catalogs

Google and Yahoo, who are Number 1 and Number 2 in the USA search portal market, provide library catalog linking services with a gateway to the global union catalog database of OCLC (Online Computer Library Center). Google Scholar, an academic resource-dedicated search engine, is also increasing accessibility to library resources by providing the service of linking the catalogs of major libraries around the world. On the other hand, libraries are providing OpenURL services or establishing corresponding open environments so their own catalogs can be accessed through a variety of channels like search portals and online bookstores. OpenURL is a kind of framework to link electronic information using metadata.

In this section the cases of Google and Yahoo are analyzed, looking at how they are providing library catalog linking services through the OCLC WorldCat (2006) as a gateway. Google Scholar[2] will also be analyzed, as it is carrying out a wide-scale library resource linking project for major libraries all over the world.

OpenWorldCat program with Google and Yahoo

The procedure Google and Yahoo created to provide services to link library catalogs with Worldcat as a gateway is briefly explained as follows:

- the robot engines of Google and Yahoo establish self-indexes by harvesting the bibliographic information of the WorldCat database periodically;
- along with that, they collect the URL information of the OCLC interfaces;

- the collected URLs are linked to the OCLC "Find a Library" interface, where is provided bibliographic information and holding list; and
- if a user enters the zip code of the location where he resides, the nearest library information pops up, and when the library information is clicked, he is deeplinked to the detailed bibliographic screen of the local library's OPAC (Online Public Access Catalog) (Wang, 2006).

Deeplink refers to a method of linking a page from an external site to each detailed bibliographic screen of the OPAC. To manifest a deeplink, service-providing organizations should provide OpenURL services or establish a corresponding open environment. At present, 83 percent of libraries are deeplinked through the "Find a Library" interface (OCLC WorldCat, 2006).

After a user accesses the "Find a Library" interface of the OCLC, he can browse the holding library conveniently, and then can be deeplinked to the OPAC of the library he wants to access. In search portals, however, vast indexes of comprehensive areas are constructed. Accordingly, it is not easy to find a result linked to "Find a Library" interface without special equipment, although there could be some differences depending upon the keyword entered. Because of this problem, Google recommends users use the auto link function after patching a dedicated toolbar to their browser. Likewise, Yahoo also recommends that users utilize the WorldCat limited search function by installing a separate dedicated toolbar.

Google Scholar

Google Scholar provides a service accessing various academic resources by entering into wide-scale data sharing agreements with a number of institutions, such as publishers, universities, academic institutes and libraries. The [Library Search] function of Google Scholar links library catalogs. The procedure to link library catalogs through Google Scholar is briefly explained as follows:

- libraries extract some bibliographic elements from a bibliographic database and then convert them into XML files by a given rule;
- the converted XML bibliographic data files are installed in a specific server and opened so robot engines can harvest them;
- Google and catalog service-providing organizations agree to update the XML data files at a certain interval;
- Along with that, URL pattern and the values of parameters that can access the OPAC system are provided; and
- Google Scholar extracts indexes from the XML bibliographic data files robot engines have harvested and then establishes its own DB.

Points raised from case studies

As search portals intend to provide academic resource gateway services, they are continuously entering into partnerships with content-holding organizations. Aimed at the global library resource linking service, they are planning to enter Korean and other Asian markets. Several important findings in the analysis of the cases of linking libraries with Google, Yahoo and Google Scholar are described as follows.

First, in order for search portals to provide the linking service of library catalogs effectively, they are utilizing union databases as a gateway. Second, as most local libraries are establishing the OpenURL service or its corresponding open environment, it is possible to deeplink to each detailed bibliographic screen of the OPAC from external sites, including search portals. Third, in the case of portal search engines covering all areas, special equipment like auto links or limited search functions must be installed in a portal-dedicated toolbar. Portal search engines covering all areas so retrieval results are generally vast. Users cannot easily find a path accessing library resources without special equipment. In the case of portal search engines covering all areas, recommend users to download and install special equipment like auto links or portal-dedicated toolbar. But it still will be a cumbersome procedure from the aspect of users. It may be problem be solved

Present status of the academic information resource service of Korean search portals

The Korean search portal market is roughly shared by Naver (69.31 percent), Daum (14.58 percent), Yahoo Korea (6.06 percent), Empas (4.38 percent), Nate (3.59 percent), and Paran (1.25 percent). As competition among private search portal sites intensifies, strengthening specialized knowledge search functions has been attempted and as a result, portal companies are continuously contacting Korean content-holding organizations.

Linking the integrated search system with portals

The Integrated Search System of the National Knowledge Database is a resultant product that the Ministry of Information and Communication has put into the Information Promoting Fund over the last few years, digitalizing the nation's knowledge and information resources produced by ministries and public institutions. To raise the public's accessibility to knowledge database, it is providing value-added services like single logins, a mailing service, PDA, and mobile search services.

But, as has continuously been pointed out, the utilization is low due to lack of public awareness and delays in search time. Therefore, a plan for expanding utilization to the general public has become necessary. To that end, the project to link the National Knowledge Database with private portals has been implemented (Song and Kim, 2006). The Korea Agency for Digital Opportunity & Promotion, the leading organization of the project, selected a consortium consisting of three portals (Paran, Empas and Nate) through open bidding.

Naver knowledge reference

Naver, accounting for the highest market share in Korea, is not participating in the consortium to link private portals with the Integrated Search System of National Knowledge Database. It is, however, signing exclusive contracts with large academic journal publishers and providing services to link numerous academic resources by contacting knowledge-producing organizations. At present, over 250 organizations including major institutes, governmental institutions, libraries and information centers have entered into agreements with Naver and are providing information through the Knowledge Reference Service.

Science Empas

Empas is operating "Science Empas" based upon science and technology knowledge database held by KISTI (Korean Institute of Science and Technology Information). KISTI is an integrated information center in the national science and technology field, containing academic journals, research reports, proceedings, patent materials and other information in that field. "Science Empas" is a method that involves Empas downloading data from the FTP server when the metadata of KISTI is exported in file format and loaded in a specific server. Because full-text URL information is included in the metadata, users can download full texts from KISTI sites by utilizing the URL link method (Lee and Park, 2005).

As in the cases above, Korean search portals are competing to execute partnerships with content-holding institutions and seeking strategic linking plans in order to strengthen knowledge content. In parallel with that, they are preparing for a business to link library information resources. These search portals intend to provide users with channels that enable them to grasp the location of wanted materials and thus get the materials through linking holding libraries.

Linking search portals with the Korean University Library OPAC

In this section, to start with, we will propose basic directions in linking search portals with library catalogs and then suggest detailed linking plans.

Basic directions

For linking search portal sites with library catalogs, it would be desirable to set the following several points as basic directions. First, develop a service model using a union catalog database as a gateway. Utilizing a union catalog in which bibliographic data is already integrated as a gateway is recommended. Second, make library resources accessible through a sub-domain or book service that enables only limited academic resources be searched. As seen in the overseas cases, through the integrated search of these portals, users cannot easily find a path accessing library resources. Even if a toolbar that can search library resources exclusively is developed, or an autolink-enable patch program is developed, it still will be a cumbersome procedure from the aspect of users. Third, induce the open environment arrangement of library services so it is deeplinked to the OPAC service of an individual university. To provide a service where users can link the holding library catalogs through search portals, the URL details of an individual university library OPAC should be opened. From a long-term standpoint, it would be desirable to induce library OPAC information to be accessible from various channels by installing OpenURL and its corresponding open environment.

On the other hand, it is recommended that private search portal sites to link with university library catalogs should meet the following requirements: Firstly, they should be able to control the quality of bibliographic information and operate stable services. Secondly, they should hold a large amount of specialized information and academic resource content and aim to provide wide-range specialized knowledge services. Thirdly, they should intend to provide public services of academic resources but should not use linking resources for commercial purposes.

Detailed linking plans

Models to link search portals with university library union catalogs. As proposed in Figure 1, two kinds of models can be summarized. The first model is a method in which a portal site provides only the function of searching library resources but transfers the traffic so detailed bibliographic screens can be browsed in the union catalog service OPAC. This model is illustrated in Model A in the Figure. Users can access library catalogs by the following procedures:

- search the holding resources of a library through the search function of a portal;
- the union catalog service OPAC is linked when clicking a searched library resource;
- browse detailed bibliographic information and the holding university library list through the union catalog service OPAC; and
- the detailed bibliographic screen of an individual university library OPAC is deeplinked when clicking the holding university library information.

The second model is a method that provides both the detailed bibliographic information and holding university library information of union catalogs within a search portal site. This is illustrated in Model B of Figure 1. Users can access library catalogs by the following procedure:

- search the holding resources of a library through the search function of a portal;
- browse the detailed bibliographic information and holding university library list of the searched result; and
- the detailed bibliographic screen of an individual university library OPAC is deeplinked when clicking the holding university library information.

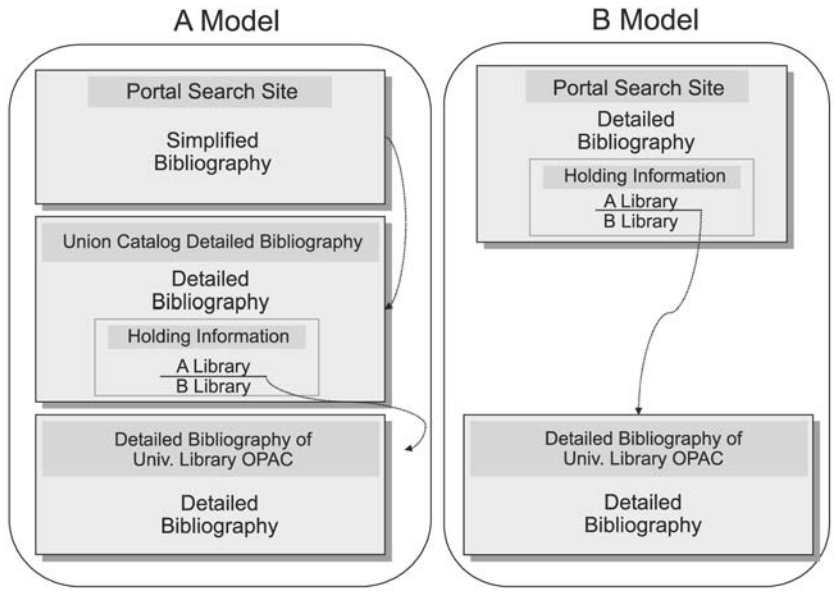

Figure 1.
Models to link search portals with library catalogs

In Model A, a search portal performs only the function of transferring the traffic to the OPAC of the union catalog service, while in Model B a search portal provides all basic information. Model B is a more user-oriented model in that it can minimize the number of unnecessary clicks and develop an independent interface according to the service model of the portal site. Naver has established an integrated database by collecting MARC (Machine Readable Catalog) data from the nation's ten major online bookstores. Users can check purchasing places of wanted materials at the same time and also purchase them from the cheapest online bookstore through price comparison. In the case of manifesting Model B with union catalog data being provided, it is possible to provide services by integrating online bookstore data. As a result, users can apply for an interlibrary loan or read in person at a library by confirming holding libraries before buying materials.

Plans to manifest the deeplink of local university library OPAC. In the long run, portals aim to provide services to the extent that the lending status and shelving location of materials can be checked by linking with the holding library OPAC. University libraries in Korea have established the OPAC system on holding materials of libraries and are operating it with most sites searching and querying the materials without authentication. In addition, as the OPAC provides the status information of books, users can check whether or not a book can be loaned, or identify the shelving location of the book within the library. In this section, we will review a few schemes that can deeplink users from the union catalog OPAC or search portal interface to a local university library OPAC. Furthermore, we propose OCLC cases and several other alternatives, and then review preconditions for the implementation.

Type A. Method to utilize bibliographic identification numbers and union catalog control numbers as an identity parameter

The OpenWorldCat program of the OCLC analyzed above utilizes the bibliographic identification numbers and OCLC control numbers as identity parameters in order to manifest the deeplink of local library OPAC. Implementing the deeplink of the OCLC was processed as follows:

- The domain information of member library OPACs and the URL pattern of library system vendors were registered in advance.
- A URL was generated to transfer the traffic to the bibliographic unit screen of local library OPAC by utilizing ISBN, ISSN and OCLC numbers as parameters. For the generation of a URL, the domain information of each library and the URL pattern information of each library system vendor, which were previously registered, were utilized.
- System modification was induced in order for library system vendors to use ISBN, ISSN and OCLC numbers as the parameters of OPACs.

Like the OCLC, for the method to change the local library OPAC system parameters to bibliographic identification numbers or union catalog control numbers, positive cooperation from library system vendors must be preconditioned. As a union catalog control numbers must be utilized in case a bibliographic identification numbers does not exist (such as an old book or complimentary copy), a union catalog control numbers must exist in the bibliographic data of the local libraries. A union catalog control

numbers, however, is generated only in the case that the local library applied a shared cataloging process.

Type B. Method to utilize local control numbers as an identity parameter
There is a method to utilize the control numbers of a local library constructed in a union catalog without modifying the local library system OPAC. In such a case, the following procedure and preconditions should be met:

- The union catalog operation center or private portal sites registers the domain information of local libraries and the URL pattern of each library system vendor in advance.
- Generate URLs to transfer the traffic to each bibliographic screen of the local library OPAC by utilizing the local control numbers the union catalog contains as a parameter. For the generation of URLs, the domain information of each library and the URL patterns of each library system vendor, which were previously registered, are utilized.

The local library OPAC system should, however, be using the control numbers as a parameter, and its manifestation is possible only when a relevant local control numbers is correctly constructed in the union catalog database. And it is possible only in the library where the local control numbers are correctly maintained in the union catalog database by uploading holding data faithfully.

Type C. Method to utilize the OpenURL service
A method to install OpenURL servers in local libraries can also be taken into consideration. In such a case, the following procedure and preconditions should be met:

- The union catalog operation center or search portals registers the domain information of the libraries, where OpenURL servers are installed, in advance.
- Automatically converts into OpenURL by combining the metadata and the location information of OpenURL servers.

In this method, the union catalog operation center or search portals becoming sources should install OpenURL converters, and local library OPAC systems becoming targets should install OpenURL servers. By this method, it is possible to manifest the deeplink if using metadata, even though both parties do not have their corresponding identity parameter values.

The three kinds of deeplink methods described above can be comprehensively summarized in Table I.

Conclusions

Although the Korean government has been supplying approximately 17 billion won (US$18.4m) from the national treasury every year to private university libraries, the fact is that public benefits have not yet been developed. It is being pointed out that even national and public university libraries are separated from industrial circles and the local community. In order for university libraries to assist in the lifelong learning of local residents as part of a national knowledge network and to be utilized in the knowledge technology development courses of industrial circles, opening university libraries will have to be reviewed positively. From this point of view, strategically used

Item	Type A	Type B	Type C
Identity parameter information	Bibliographic identification numbers, Union catalog control numbers	Local control number	Metadata elements like bibliographic identity number, book name and author required
Change in local system	Parameter change of OPAC		Installation of OpenURL server
Local library preconditions	Apply a shared cataloging process in the catalog work of local library	Update bibliographic/ holding data without omission to the union catalog	

Table I.
Comparison on the deeplink methods of local library OPAC

search portal sites, which have been positioned as a gateway for the searching out of information by the public, is seen as a very desirable end.

In Korea, numerous public knowledge resources are already being distributed through the internet, and search portals are playing the role of gateway to knowledge resources. Being utilized as the channel for information service for the general public, search portals are seen to have a positive effect in solving the information gap concerning high-grade academic resources. These resources, which have been the sole possession of specific-class users, are being linked and utilized through large-scale private portals all people can conveniently access rather than through public institution sites. In view of this trend of the times, it would be desirable that the library resources of Korea be opened from the possible services and their utilization scope expanded.

Notes

1. A national representative knowledge search site that the Ministry of Information and Communication of Korea established and ran, from 1999 up to the present. The knowledge resources in the fields of science and technology, education and academics, cultural heritage and arts, history, information and communication, construction technology, industry and economy, and maritime materials and fishery, produced by over 640 public institutions across the nation, are included in a full text database, so an integrated search is possible.
2. Available at: http://scholar.google.com/

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About the author

Jane Cho has a PhD in Library and Information Science and is an Associate Researcher at the Korea Education and Research Information Service where her current job is planning research about information service and library cooperation. She has also participated in developing the Korean Union Catalog and Shared Cataloging System.

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Elucidating user behavior of mobile learning

A perspective of the extended technology acceptance model

Jen-Hung Huang and Yu-Ru Lin
Department of Management Science, National Chiao Tung University, Hsinchu, Taiwan, and
Shu-Ting Chuang
Department of Business Administration, The Overseas Chinese Institute of Technology, Taichung, Taiwan

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Abstract

Purpose – The purpose of this paper is to propose and verify that the technology acceptance model (TAM) can be employed to explain and predict the acceptance of mobile learning (M-learning); an activity in which users access learning material with their mobile devices. The study identifies two factors that account for individual differences, i.e. perceived enjoyment (PE) and perceived mobility value (PMV), to enhance the explanatory power of the model.

Design/methodology/approach – An online survey was conducted to collect data. A total of 313 undergraduate and graduate students in two Taiwan universities answered the questionnaire. Most of the constructs in the model were measured using existing scales, while some measurement items were created specifically for this research. Structural equation modeling was employed to examine the fit of the data with the model by using the LISREL software.

Findings – The results of the data analysis shows that the data fit the extended TAM model well. Consumers hold positive attitudes for M-learning, viewing M-learning as an efficient tool. Specifically, the results show that individual differences have a great impact on user acceptance and that the perceived enjoyment and perceived mobility can predict user intentions of using M-learning.

Originality/value – There is scant research available in the literature on user acceptance of M-learning from a customer's perspective. The present research shows that TAM can predict user acceptance of this new technology. Perceived enjoyment and perceived mobility value are antecedents of user acceptance. The model enhances our understanding of consumer motivation of using M-learning. This understanding can aid our efforts when promoting M-learning.

Keywords Learning, Taiwan, Mobile communication systems

Paper type Research paper

1. Introduction

The third generation (3G) mobile services can be used as an efficient learning tool. Mobile learning (M-learning) is an activity in which people carry out learning activities using a mobile device like a cell phone or a personal digital assistant (PDA). M-learning allows users to access learning material anytime and anywhere (Clyde, 2004; Gay *et al.*, 2001; Hill and Roldan, 2005; Liu *et al.*, 2003). This new M-learning technology encourages users to attend a variety of learning activities, including to search for knowledge, participate in discussion groups and access informational contents online

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(Chang *et al.*, 2003; Roschelle, 2003). M-learning compliments electronic learning (E-learning) by creating an additional access channel for mobile users with mobile devices. Because of the potential widespread use of 3G mobile devices, M-learning is likely going to be the next wave of any learning environment, such as museums (Goh and Kinshuk, 2004; Hsu *et al.*, 2006).

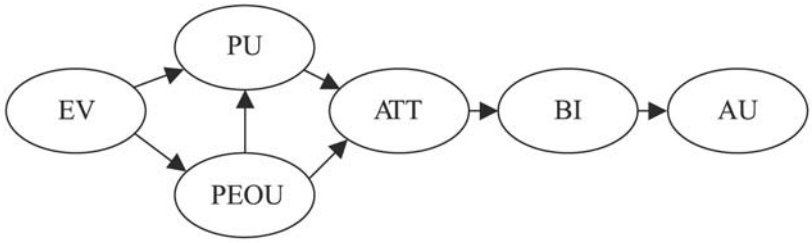
The 3G networks are not yet commonly available, and M-learning is still in its infancy, with many aspects of mobile learning yet to be explored (Taylor, 2003). Previous studies have extensively addressed M-learning from technical perspectives (Chang *et al.*, 2003; Chen *et al.*, 2003; Liu *et al.*, 2003), but few empirical works are available on M-learning from a customer's standpoint. As a result, M-learning suppliers can provide quality M-learning to customers only by studying the customers carefully.

The primary goal of this work was to enhance our understanding of user acceptance of M-learning. This study addresses the ability to predict consumer acceptance of M-learning in terms of individual differences (i.e. perceived usefulness) as stipulated by the technology acceptance model (TAM). TAM is a model for explaining the user acceptance of novel technology, and has been theoretically and empirically justified (Devaraj *et al.*, 2002). Because M-learning technology is still in its development stage, the crucial motivational variables that will affect its adoption by users need to be explored. This study developed two new constructs, namely "perceived mobility value" and "perceived enjoyment". The appropriateness of TAM in explaining consumer acceptance of M-learning is examined using the LISREL software. Because of their familiarity with mobile devices, university students were chosen using an online survey for evaluating user acceptance of M-learning.

2. Theoretical background: Technology Acceptance Model (TAM)

Behavior prediction has been one of the major purposes of psychological theories. Some of the more useful theories include the theory of reasoned action (TRA) (Ajzen and Fishbein, 1980; Fishbein and Ajzen, 1975), the social cognitive theory (SCT) (Compeau and Higgins, 1995; Hill *et al.*, 1987) and TAM (Davis, 1989, 1993). TAM, originally presented by Davis (1989), is derived from TRA (Ajzen and Fishbein, 1980; Fishbein and Ajzen, 1975). TAM is a behavioral model that describes the antecedents of the adoption of information technology (IT), and is considered a robust tool for measuring the adoption of new technology by users (Agarwal and Prasad, 1999; Davis, 1989; Doll *et al.*, 1998; Segars and Grover, 1993). Over the years TAM has been validated by various applications and extensions, including web-based information (van der Heijden, 2003; Yi and Hwang, 2003), internet banking (Wang *et al.*, 2003) and electronic commerce (Henderson and Divett, 2003; van Dolen and de Ruyter, 2002). The M-learning technology is novel, and is therefore appropriate to be examined using the TAM model.

Figure 1 illustrates TAM, which includes six constructs, namely external variables, perceived usefulness, perceived ease of use, attitude, behavioral intention and actual usage. It shows that user behavior is determined by perceptions of usefulness and the ease of use of the technology (Adams *et al.*, 1992; Davis, 1989; Davis *et al.*, 1989; Mathieson, 1991). The concept of actual usage was eliminated from the revised TAM model, because M-learning technology is still at an early stage of development. This study investigates the future acceptance of the emerging M-learning technology, rather



Key:
EV = external variables, PU = perceived usefulness, PEOU = perceived ease of use, ATT = attitude, BI = behavioral intention, AU = actual usage

Source: Davis *et al.* (1989, p. 985)

Figure 1.
Technology acceptance model

than its current usage. Actual usage is not a cogent measure of the value of M-learning, as indicated in previous studies (Lu *et al.*, 2003; Yang, 2005). The following sections describe the constructs of TAM in detail, and its applicability to the present study.

2.1 Perceived Usefulness (PU) and Perceived Ease of Use (PEOU)

TAM posits that two particular behavioral beliefs, perceived usefulness (PU) and perceived ease of use (PEOU), are two fundamental factors for predicting user acceptance, and that the effect of external variables on intention are mediated by these two key beliefs (Adams *et al.*, 1992; Davis, 1989; Davis *et al.*, 1989; Mathieson, 1991). PU is defined as an individual's perception that using a new technology will enhance or improve her/his performance (Davis, 1989, 1993). Applying this definition to this research context, PU means the users' perception that using M-learning enhances their learning performance. A strengthening of this belief creates a positive attitude toward M-learning, thereby increasing the user's intention to use M-learning.

PEOU is defined as an individual's perception that using a new technology will be free from effort (Davis, 1989, 1993). Applying this definition in this research context, PEOU represents the perception that M-learning is easy to use. PEOU is hypothesized to be a predictor of PU. Moreover, both PU and PEOU are affected by external variables (Hu *et al.*, 1999; Venkatesh *et al.*, 2002; Wang *et al.*, 2003). Furthermore, PU and PEOU have a positive effect on attitude. Unlike in TRA, the subjective norm is not a determinant of behavioral intention in TAM; instead, BI in TAM is affected only by PU and attitude (Davis, 1989).

2.2 External variables

Although TAM is a model applicable to a variety of technologies (Adams *et al.*, 1992; Chin and Todd, 1995; Doll *et al.*, 1998), it has been criticized for not providing adequate information on individuals' opinions of novel systems (Mathieson, 1991; Moon and Kim, 2001; Perea y Monsuwe *et al.*, 2004). Davis (1989, p. 985) observed that external variables enhance the ability of TAM to predict acceptance of future technology. In other words, the constructs of TAM need to be extended by incorporating additional factors. Choosing additional factors depends on the target technology, main users and context (Moon and Kim, 2001). Wang *et al.* (2003) noted that variables relating to individual differences play a vital role in the implementation of technology.

Additionally, empirical research based on TAM has discovered strong relationships between individual differences and IT acceptance (Agarwal and Prasad, 1999; Venkatesh, 2000). To understand user perception of M-learning, this study integrated two individual difference variables, namely "perceived mobility value" and "perceived enjoyment", into the proposed TAM model. These two constructs are described below.

Perceived mobility value (PMV). Perceived mobility value (PMV) denotes user awareness of the mobility value of M-learning. Mobility has three different elements including convenience, expediency and immediacy (Seppälä and Alamäki, 2003). Mobility permits users to gain access to service/information anywhere at anytime via mobile devices. In other words, mobility brings the ability to guide and support users in new learning situations when and where it is necessary. Previous studies found that mobile users valued efficiency and availability as the main advantages of M-learning, and these advantages are a result of the "mobility" of a mobile device (Chen *et al.*, 2003; Hill and Roldan, 2005; Ting, 2005). Therefore, M-learning is valuable because of its mobility. Consequently, the perceived mobility value is a critical factor of individual differences affecting users' behaviors. This study treats perceived mobility value as a new variable in the TAM.

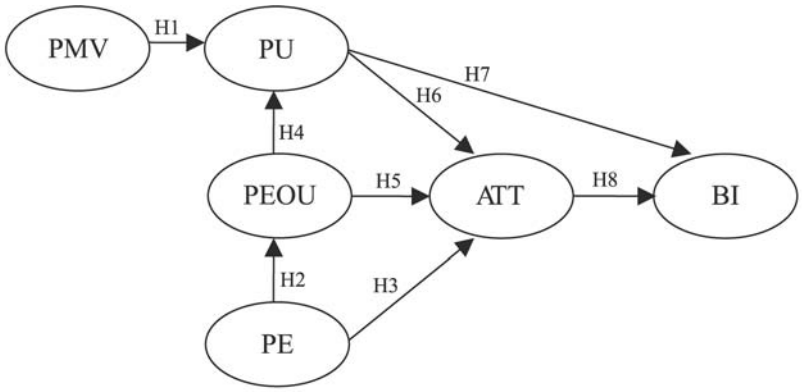
Perceived enjoyment (PE). Individuals engage in activities because these activities lead to enjoyment and pleasure (Teo and Lim, 1997). According to Davis *et al.* (1992), perceived enjoyment is defined as "the extent to which the activity of using the technology is perceived to be enjoyable in its own right, apart from any performance consequences that may be anticipated". In this study, perceived enjoyment denotes the extent to which an individual finds the interaction of M-learning intrinsically enjoyable or interesting. Perceived enjoyment is seen as an example of intrinsic motivation, and it has been found to influence user acceptance significantly. Furthermore, research on the role of enjoyment suggested the importance of enjoyment on users' attitudes and behaviors (Igbaria *et al.*, 1995; Teo and Lim, 1997; Wexler, 2001; Yi and Hwang, 2003). Hence, perceived enjoyment is addressed as a key factor for influencing user acceptance of M-learning.

3. Research model and hypotheses

As shown in Figure 2, the proposed TAM includes two external variables, namely "perceived mobility value" and "perceived enjoyment". These two constructs may significantly affect existing TAM variables. In addition, other relationships between the constructs proposed by the original TAM are also presented (Davis *et al.*, 1989; Venkatesh and Davis, 2000). The next section describes in detail all hypotheses concerning the relationships among the variables in the model.

3.1 Perceived mobility value

PMV has not been tested previously, but it relates to users' personal awareness of mobility value. Mobility enables users to receive and transmit information anytime and anywhere (Anckar and D'Incau, 2002; Coursaris *et al.*, 2003; Hill and Roldan, 2005; Ting, 2005). The mobility associated with time-related needs will encourage users to adopt mobile technology since enhanced accessibility is expected to affect dynamic interaction and high levels of engagement (Anckar and D'Incau, 2002, p. 48). Hence, users who perceive the value of mobility also understand the uniqueness of M-learning and have a strong perception of its usefulness. In other words, perceived mobility value



Key:
PMV = perceived mobility value, PE = perceived enjoyment, PU = perceived usefulness, PEOU = perceived ease of use, ATT = attitude, BI = behavioral intention

Figure 2.
Proposed extended TAM model

has a positive effect on the perceived usefulness of M-learning. Therefore, this work treats perceived mobility value as a direct antecedence of perceived usefulness (PU).

H1. Perceived mobility value has a positive effect on perceived usefulness.

3.2 Perceived Enjoyment (PE)
The concept of perceived enjoyment (PE) adapted from Davis *et al.* (1992) means that users feel enjoyable from the instrumental value of using M-learning. Prior studies on technology acceptance behavior examined the effects of perceived enjoyment on perceived ease of use (Igbaria *et al.*, 1996; Venkatesh, 2000; Venkatesh *et al.*, 2002; Yi and Hwang, 2003). New technologies that are considered enjoyable are less likely to be difficult to use.

H2. Perceived enjoyment has a positive effect on perceived ease of use.

There is a causal relationship between perceived enjoyment and attitude. When users feel that M-learning is enjoyable, the stimulus of happiness in turn enhances their perception of M-learning. Venkatesh (2000) found that perceived enjoyment indirectly influences users on adoption. Other research showed that attitudinal outcomes, such as happiness, pleasure, and satisfaction, result from the enjoyable experience (Childers *et al.*, 2001; Moon and Kim, 2001; van der Heijden, 2003; Yu *et al.*, 2005). These findings indicate that enjoyment highly correlates with the users' positive attitudes.

H3. Perceived enjoyment has a positive effect on attitude.

3.3 Perceived ease of use, perceived usefulness, attitude, and behavioral intention
TAM delineates the causal relationships between perceived usefulness (PU), perceived ease of use (PEOU), attitude and behavioral intention (BI) to explain users' acceptance of technologies. PEOU is hypothesized to be a predictor of PU. Additionally, attitude is determined by two salient beliefs, namely PU and PEOU (Davis, 1989). Finally, BI is determined by PU and attitude.

The influence of PEOU on PU. TAM posits a strong direct link between PEOU and PU. If all other factors are equal, users are likely to consider a technology to be more useful if they perceive that it is easier to use (Brown and Licker, 2003; Bruner and Kumar, 2005; Hu *et al.*, 1999; Igbaria and Iivari, 1995). Therefore, PEOU is likely to have a direct effect on the PU of the construct.

H4. Perceived ease of use has a positive effect on perceived usefulness.

The influence of PEOU and PU on attitude. The attitude toward using a given technology is the overall evaluation that predicts a user's likelihood of adopting that emerging technology. Past research indicates that attitude is influenced by both PEOU and PU components (Childers *et al.*, 2001; Dabholkar and Bagozzi, 2002; Mathieson, 1991; O'Cass and Fenech, 2003). Thus, that attitude is positively influenced by PU and PEOU is proposed herein.

H5. Perceived ease of use has a positive effect on attitude.

H6. Perceived usefulness has a positive effect on attitude.

The influence of PU and attitude on BI. In TAM, BI is influenced by both PU and Attitude. This relationship has been examined and supported by many prior studies (Adams *et al.*, 1992; Davis *et al.*, 1989; Hu *et al.*, 1999; Venkatesh and Davis, 1996, 2000). Therefore, this study presents the following hypotheses.

H7. Perceived usefulness has a positive effect on behavioral intention.

H8. Attitude has a positive effect on behavioral intention.

4. Methodology

4.1 Study context and sample

Undergraduate and graduate students in two Taiwan universities were asked to evaluate their perception of M-learning by completing an online survey. All respondents were guaranteed confidentiality of their individual response. An embedding program was added to the electronic survey to check for missing responses. As a result, 313 usable questionnaires were obtained, of which 47.3 percent ($N = 148$) were from male respondents, and 52.7 percent ($N = 165$) from female respondents. The majority of the respondents, 85.6 percent ($N = 268$), were between 20 and 24 years of age, and 99 percent ($N = 310$) possessed mobile devices. The experience of using mobile devices ranged from 0 to 15 years, with a mean of 6.61 years.

4.2 Questionnaire design

The items used to construct each variable were mainly adopted from previous studies, as shown in Table I, to assure content validity. Appropriate items were designed to measure two new constructs, namely perceived mobility value and perceived enjoyment. Participants were asked to evaluate statements using a 5-point Likert-type scale ranging from strongly disagree (1) through neutral (3) to strongly agree (5). The questionnaire consisted of 19 items addressing all six constructs.

Variable	Description	Type	Items	Source	Questionnaires
PE	Perceived Enjoyment	Independent	3	Moon and Kim (2001); Yi and Hwang (2003); Yu *et al.* (2005)	(PE1) M-learning would make me feel good (PE2) M-learning would be interesting (PE3) I would have fun using M-learning
PMV	Perceived mobile value	Independent	4	Newly created by this research	(PMV1) I know that mobile devices are the mediums for M-learning (PMV2) It is convenient to access M-learning anywhere at anytime (PMV3) Mobility makes it possible to get the real-time data (PMV4) Mobility is an outstanding advantage of M-learning
PU	Perceived usefulness	Independent/Dependent	Davis (1989	Davis (1989, 1993); Venkatesh and Davis (1996); Yang (2005)	(PU1) Using M-learning would save me much time (PU2) M-learning would enhance my effectiveness in learning (PU3) Overall, M-learning would be useful
PEOU	Perceived ease of use	Independent/Dependent	Davis (1989	Davis (1989, 1993); Venkatesh and Davis (1996); Yang (2005)	(PEOU1) Using M-learning would not require a lot of my mental effort (PEOU2) My interaction with M-learning would be clear and understandable (PEOU3) M-learning would be easy to use
ATT	Attitude	Independent/Dependent	3	Bagozzi *et al.* (1992); Hu *et al.* (1999)	(ATT1) In my opinion it would be very desirable to use M-learning (ATT2) I would like to use M-learning (ATT3) I hold a positive evaluation of M-learning
BI	Behavioral intention	Dependent	3	Bagozzi *et al.* (1992); Hu *et al.* (1999)	(BI1) I intend to use M-learning when it becomes available (BI2) If I were asked to express my opinion of M-learning, I intend to say something favorable (BI3) In the future, I intend to use M-learning routinely

Table I.
Research variables

5. Results

A confirmatory factor analysis was conducted using LISREL 8.51 (Jöreskog and Sörbom, 1993) to test the model. The hypothesized relationships among the variables in this model were analyzed, and the parameters were estimated with the maximum likelihood method. Covariances among manifest variables of the technology acceptance model are presented in Table II. The proposed structural equation model was then tested for the fit between data and model. As shown in Table III, the overall goodness of fit of the TAM model was verified with seven fitness measures, namely the comparative fit index (CFI), goodness-of-fit (GFI), adjusted goodness-of-fit (AGFI), normalized fit index (NFI), non-normalized fit index (NNFI), Critical N (CN) and root mean square error of approximation (RMSEA). All the model-fit-indices exceeded the acceptance levels suggested by previous research, and the results indicate that the data fit the TAM model well. Therefore, the TAM model, as expected, clearly explains the user acceptance of M-learning.

All direct paths in TAM were significant, so *H1*, *H2*, *H3*, *H4*, *H5*, *H6*, *H7* and *H8* were all supported. The *t*-value of a parameter indicates the strength of the relationship the parameter represents. The higher the *t*-value is, the stronger the relationship is. Figure 3 indicates that although PU ($t = 6.98$) and PEOU ($t = 2.07$) significantly affect attitude, the effect of PU is stronger than that of PEOU, which is in agreement with previous findings (Gentry and Calantone, 2002; O'Cass and Fenech, 2003; van der Heijden, 2003; Yu *et al.*, 2005). The results indicate that users' perception of usefulness is more important than their perception of ease of use in influencing their attitude of using M-learning. In addition, *H4* was supported, showing that PEOU is likely to have a direct effect on the PU of the construct, which again is consistent with previous research (e.g. Brown and Licker, 2003; Davis *et al.*, 1989; Yu *et al.*, 2005). Therefore, the perceived ease of use of M-learning encourages an individual to regard M-learning as a useful technology. Furthermore, behavioral intention was primarily affected by usefulness ($t = 2.06$) and attitude ($t = 5.56$), which implies that both usefulness and attitude are critical factors. The results indicate that attitude is indeed a mediator between beliefs and user intention (Gentry and Calantone, 2002; van der Heijden, 2003; Yu *et al.*, 2005).

The proposed framework includes the hypothesis that perceived mobility value and perceived enjoyment are predictors of using M-learning. As expected, the significant positive relationships among the constructs confirm these hypotheses. The perceived mobility value significantly increases an individual's awareness of usefulness ($t = 6.94$). The more a user appreciates the value of mobility, the more the user will perceive that M-learning is useful. Hence, this study supports the contention that PMV plays an important role in user perceptions of M-learning, which is consistent with other works (Chen *et al.*, 2003; Coursaris *et al.*, 2003; Ting, 2005). The significant link between perceived enjoyment and perceived ease of use ($t = 3.92$) implies that a user who enjoys using M-learning will find it to be easy to use. This result supports *H2*, and is consistent with those of previous studies. Moreover, perceived enjoyment has a direct effect on attitude ($t = 4.80$), which supports H3. Enjoyable experiences do result in positive attitudes. This result underlies the importance of perceived enjoyment in influencing user acceptance of a new technology (Davis *et al.*, 1992; Teo and Lim, 1997; Wexler, 2001; Yu *et al.*, 2005).

	PE1	PE2	PE3	PMV1	PMV2	PMV3	PMV4	PEOU1	PEOU2	PEOU3	PU1	PU2	PU3	ATT1	ATT2	ATT3	BI1	BI2	BI3
PE1	0.33																		
PE2	0.19	0.29																	
PE3	0.14	0.15	0.26																
PMV1	0.06	0.06	0.06	0.30															
PMV2	0.07	0.06	0.06	0.15	0.38														
PMV3	0.05	0.06	0.06	0.16	0.15	0.30													
PMV4	0.06	0.05	0.06	0.14	0.15	0.17	0.28												
PEOU1	0.06	0.06	0.05	0.06	0.05	0.05	0.06	0.40											
PEOU2	0.05	0.04	0.04	0.04	0.04	0.05	0.05	0.17	0.30										
PEOU3	0.04	0.04	0.03	0.07	0.05	0.05	0.05	0.18	0.14	0.29									
PU1	0.06	0.06	0.06	0.09	0.08	0.09	0.08	0.06	0.07	0.07	0.24								
PU2	0.04	0.04	0.03	0.05	0.07	0.08	0.08	0.04	0.03	0.03	0.11	0.33							
PU3	0.02	0.03	0.02	0.08	0.07	0.07	0.08	0.05	0.04	0.05	0.12	0.14	0.21						
ATT1	0.09	0.09	0.07	0.06	0.07	0.07	0.07	0.09	0.08	0.07	0.08	0.12	0.09	0.30					
ATT2	0.10	0.08	0.07	0.07	0.08	0.07	0.06	0.07	0.06	0.06	0.08	0.10	0.07	0.17	0.27				
ATT3	0.05	0.04	0.04	0.07	0.08	0.07	0.06	0.04	0.04	0.03	0.08	0.12	0.09	0.12	0.12	0.25			
BI1	0.06	0.06	0.04	0.08	0.08	0.08	0.09	0.06	0.04	0.06	0.08	0.09	0.07	0.10	0.09	0.10	0.26		
BI2	0.05	0.06	0.03	0.07	0.08	0.08	0.08	0.05	0.05	0.04	0.07	0.09	0.08	0.12	0.12	0.10	0.12	0.24	
BI3	0.06	0.07	0.06	0.07	0.07	0.07	0.07	0.06	0.04	0.06	0.05	0.07	0.06	0.09	0.08	0.06	0.11	0.12	0.25

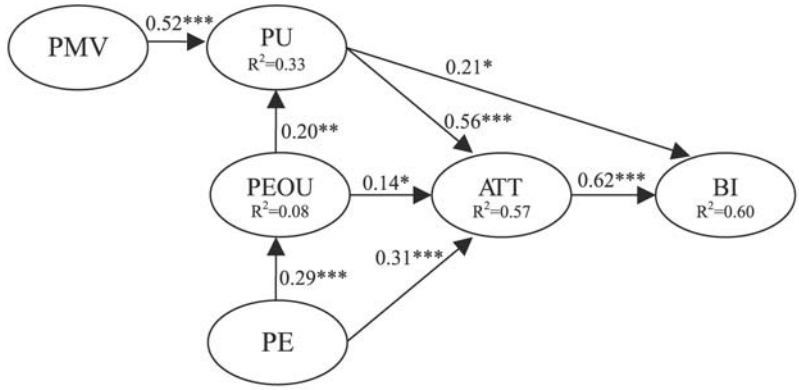
Table II.
Covariance among the research variables for the TAM

6. Conclusions

This work proposes and verifies that TAM can be employed to explain and predict the acceptance of M-learning. The findings of this study have several implications for M-learning providers and researchers interested in M-learning. First, this study found that perceived usefulness (PU) and perceived ease of use (PEOU) are key determinants of user perception of M-learning. However, PU affects individual's attitudes more than PEOU does. Although customers need a simple way to use M-learning, perceived usefulness is critical. In addition to designing a straightforward way to utilize the M-learning technology, providers should also endeavor to maximize the usefulness of

Fit indices	Suggested value	Source	TAM model
Comparative fit index (CFI)	CFI $>$ 0.95	Bentler, 1995	0.99
Goodness-of-fit (GFI)	GFI $>$ 0.9	Hu and Bentler, 1999	0.95
Adjusted goodness-of-fit (AGFI)	AGFI $>$ 0.9	Hu and Bentler, 1999	0.93
Normalized fit index (NFI)	NFI $>$ 0.9	Bentler and Bonnet, 1980	0.92
Non-normalized fit index (NNFI)	NNFI $>$ 0.9	Bentler and Bonnet, 1980	0.99
Critical N (CN)	CN $>$ 200	Hu and Bentler, 1999	351.81
Root mean square error of approximation (RMSEA)	RMSEA $<$ 0.05	Hu and Bentler, 1999; McDonald and Ho, 2002	0.019

Table III.
Fit indices for the extended TAM model



Key:
PMV = perceived mobility value, PE = perceived enjoyment, PU = perceived usefulness, PEOU = perceived ease of use, ATT = attitude, BI = behavioral intention

Note:
The figure shown in the edge connecting any two nodes represents the number of unit increase in the dependent variable if the causing variable increases by one unit.
R^2 represents the proportion of the variance of the variable that could be explained by its causing variables

* significant at a 0.05 level
** significant at a 0.01 level
*** significant at a 0.001 level

Figure 3.
Path coefficients of TAM Model

M-learning. Second, this study has shown the importance of perceived mobility value (PMV) to an individual's acceptance of M-learning. The most significant feature of mobile technology is mobility, which enables customers to access learning information at anytime and anywhere. Mobility allows M-learning to become an important channel for obtaining learning material. Therefore, advantages of mobility are crucial to users. Third, individuals who perceive the M-learning technology as being pleasant will also find that using M-learning is simple to use, and they also have a positive attitude toward M-learning. The fact that it is enjoyable is significant to attract users. Fourth, in order to predict user acceptance of M-learning, this study adds two external constructs, perceived enjoyment and perceived mobility value. The predictive power of these two added constructs shows that the new variables are imperative.

As other new technologies become available for digital libraries and museums, TAM can be employed to predict and to explain the acceptance of the new technologies. When applying TAM in another context, the external variables for that context have to be found and examined carefully to ensure that TAM is a viable model for that context. Furthermore, the subjects of this study are students, who are relatively homogeneous as compared with the general population. Population in general may vary substantially in terms of their acceptance of a new technology. For example, adolescents' perception, interest and attitude toward M-learning would be different from those of the elderly. TAM can be employed to compare the differences as well as the similarities of accepting a technology among various groups of populations.

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About the authors

Jen-Hung Huang is a professor at the Department of Management Science, National Chiao Tung University. His research and teaching interests include Internet marketing and information management.

Yu-Ru Lin is a PhD candidate in the Department of Management Science, National Chiao Tung University. Currently, her research interests are related to human-computer interaction and mobile learning. Yu-Ru Lin is the corresponding author and can be contacted at: taro513.ms91g@nctu.edu.tw or taro513@yahoo.com.tw

Shu-Ting Chuang is an Instructor at the Department of Business Administration, the Overseas Chinese Institute of Technology. She is also a PhD candiate in the Department of Management Science, National Chiao Tung University. Her present research interests include tourism management and consumer behavior.

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E-book reading groups: interacting with e-books in public libraries

Monica Landoni
Department of Computer and Information Sciences, University of Strathclyde, Glasgow, UK, and
Gillian Hanlon
Kirkintilloch High School, Kirkintilloch, UK

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Abstract

Purpose – The purpose of this paper is to describe an experiment in introducing fiction e-books in two reading groups run by a public library.

Design/methodology/approach – A user study involving two reading groups run over a period of three months. Electronic versions of titles of interest to each group were given out to each participant on Personal Digital Assistants (PDAs). Readers were then asked to fill in a satisfaction questionnaire and discuss their experience with the rest of their group.

Findings – Readers were not too negative about using a new tool/gadget like the PDA but they did not see any advantage in reading an electronic version of the selected book.

Research limitations/implications – It was realised quite earlier on that the target readers were emotionally so attached to physical books to feel as if they were betraying them when reading them electronically. A different sample of users more inclined to use technology and more open to different publishing models would have possibly provided a better insight.

Originality/value – The group reading approach introduced a social side to the adoption of e-books and it was hoped that that would have made a difference. It was also one of the first attempts to look into the use of fiction e-books in public libraries as opposed to an already existing number of studies looking into e-books and their use in education and academic libraries. As such it can benefit both publishers and librarians.

Keywords Fiction, Books, Electronic books, Group discussion, Public libraries

Paper type Case study

1. Introduction

Despite an inauspicious market entrance, electronic books (e-books) are becoming an increasingly viable format due, in large part, to the emergence of Personal Digital Assistants (PDAs) as practical reading devices. Consequently, public libraries in the UK and abroad are beginning to realise the potential benefits of adding e-books to their collections and are addressing the matter of e-book acquisition. In so doing, the public library sector faces a major challenge in identifying appropriate audiences and methods for introducing e-books to patrons and, ultimately, collections.

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This paper describes a study that aims to assess the viability of incorporating e-books into a book discussion group setting while, at the same time, gathering valuable feedback on e-book usability from a real user group. Central to this is an experiment involving the circulation of PDAs, pre-loaded with e-books, to two existing book discussion groups held within two public libraries. Next section introduces the background for this research while methodology is described in section 3 followed by the analysis of the findings and their critical discussion in relation to previous similar previous studies.

2. Background

When dedicated e-book readers first came onto the market in the late 1990s, the demise of traditional paper-based collections was considered an imminent inevitability by many observers. Indeed, despite the hyperbole surrounding electronic publishing, there is at present no real threat to paper books. The main reason for this is perhaps the technology; e-books, or rather the hardware/software required to read them, is not yet accomplished enough to attract consumer confidence and promote widespread use. However, this situation is continually improving as research and development in this area moves forward.

Indeed it is not a matter of choosing between print and electronic materials, rather as Garrod (2003) observes, new media (such as e-books) add to the choices rather than substituting one form for another. Libraries of the future will be hybrid environments where different media contribute to the evolving service and accommodate the developing needs and expectations of patrons.

The e-book format offers several significant advantages over print, which could have a positive impact on the library environment. E-books have the potential to be cheaper, easier and quicker to produce than paper copies (Long, 2003); they provide the functionality and potential to manipulate associated with computers (Ardito, 2000; Long, 2003) they can be updated frequently at a low cost (Hawkins, 2000; Marcinko, 2000); font size can be changed to aid the visually impaired (Rao., 2003) and many volumes can be held on light-weight reading devices (Long, 2003). All of these factors have the potential to prove beneficial in the library context with multi-user access to titles likely to be the most advantageous of all (Long, 2003; Ardito, 2000). Furthermore, on a practical level, there is no chance of e-books going missing or being damaged in the same way as print books (Rao, 2003; Vidana, 2003) and less administration may be required – no stamping out or shelving returns (Marcinko, 2000; Vidana, 2003).

Academic libraries were first to explore the possibilities of e-book provision and many now subscribe to e-book vendor services such as netLibrary. Certainly, much of the research that has been carried out to date has focussed on the academic environment and the usability of electronic textbooks (Landoni *et al.*, 2000; Wilson *et al.*, 2003; Bennet and Landoni, 2005). However, this is changing and public libraries in the UK are now beginning to consider the development of collections and services to encompass e-books. Recent studies carried out in England (Dearnley *et al.*, 2004; Marshall and Ruotolo, 2002), have achieved significant results and present valuable lessons for other libraries contemplating e-book acquisition.

This study centres on the incorporation of e-books into a public library book discussion group setting. Book discussion groups have become increasingly popular in recent years and are now considered an important part of the library service in the UK and elsewhere. The group members were thought likely to have an interest in the

development of the book and due to the fact that book groups are established units, they provided convenient access to real user groups.

3. The experiment

It was initially expected that the experiment would employ PCs, as these are freely available to all library users and many people are likely to have access at home. However, it was agreed that it would be difficult to convince users to attempt to read an entire novel in this way, especially if this involved sitting in front of a terminal within the library building. It was therefore suggested that, if possible, PDAs should be obtained and employed in the e-book experiment. In total, 11 PDAs were made available by Strathclyde University for use in the experiment.

3.1 The participants

For the purposes of this study it was decided that two of the 19 book groups in the city of Glasgow would be involved. In using two groups as opposed to focusing on just one, it was felt that it would be possible to compare the experiences in order to gain a truer idea of the issues related to implementing such a programme. The view was that the combination of these two groups would provide a more rounded background for the study:

(1) The Dennistoun library book discussion group was established in April 2004 and is still, therefore, a relatively new group. The group specialises in crime fiction and reads two titles per month, which are usually selected by agreement of the group from lists prepared by the organising librarians. The meetings take place in the evening. The Dennistoun group has a higher proportion of male participants than most other reading groups in Glasgow. Ten members (four male and six female) attended the first meeting at which the study was proposed and the PDAs distributed.

(2) The GoMA (Gallery of Modern Art) book discussion group was formed in December 2002 and is therefore a more established group. The group reads a diverse range of contemporary fiction, reading two titles per month, which are selected by the librarians responsible. The library is located in Glasgow city centre and meetings take place at lunchtime, thus attracting a diverse range of people – from those who are on lunch break from work to retired people. The members are, however, predominantly female. Twelve members (one male and eleven female) attended the first meeting.

3.2 The procedure

In preparation for attending the book discussion group meetings the following steps were taken:

- The appropriate titles (in the correct format) had to be loaded onto the devices via a PC, with both titles onto each device.
- Comprehensive guidelines for viewing the e-books via a PDA were prepared for issue to participants.
- A simple web page was constructed offering links to both titles (in PDF or plain text format).

At the actual meetings, the basic idea of the study was presented to the group members, who were then asked to volunteer to participate. Reading group members were asked to trial the electronic title suggested by researchers on PDAs in addition to their usual monthly reading material. The PDAs were distributed to interested group members – six were issued at the Dennistoun group and five at the GoMA group.

Once all available PDAs had been issued, any remaining members who expressed an interest to participate were guided towards the PC versions and issued with the appropriate instruction guide. Participants were then free to pose any additional questions or clear up any reservations before taking the devices away. In both cases, the remainder of the meetings were then conducted in the usual way, and at the end the members were also issued with two new books (in addition to the e-book) to be read before the next monthly meeting.

3.3 Collecting feedback

Feedback was predominantly collected though questionnaires (see Appendix). These were designed by following the methodology designed for the EBONI project, (Wilson *et al.*, 2003), so that data collected could have been compared with that from previous studies. The questionnaire was split into three sections: Personal Details, Technological Background and E-book Feedback.

The first section surveyed the gender, age and occupation/job sector of the respondents in order to establish the demographics of the group.

Section two then attempted to ascertain the level of technological awareness of the respondents, which was necessary in order to assess their response in the appropriate context. This section included questions regarding PC and PDA access, usage levels, and previous experience in reading from screen in general (editing on-line documents, reading web sites or e-mails) and e-book in particular and level of e-book awareness.

The final section contained ten subjective satisfaction questions relating to different aspects of the actual e-book reading experience. In this section, participants were asked to rate their impressions of e-books before and after reading. They were also asked to rate the ease with which they read and navigated the e-book. This section covered the value of additional electronic functionalities, such as the "find" facility and navigation icons for example. The respondents were also asked for general conclusions (more or less difficult than expected) and comments (likes and dislikes). A question regarding factors that could have potentially enhanced the experiment was also included. Finally, the respondents were asked to rate the likelihood of reading an e-book in the future.

Although the questionnaire was the primary feedback mechanism, at both destinations there was also an element of informal feedback obtained through participant discussion over the course of the meetings.

3.4 The selection of material

Due to the financial restraints and in order to avoid copyright issues, it was decided that only titles available free of charge via the internet would be used in the study. Since the first group was a crime fiction discussion group the title selected by the researchers for them was *The Mysterious Affair at Style: Poirot's First Case* by Agatha Christie. The title chosen for the second group was *Pride and Prejudice* by Jane Austen. For both, www.blackmask.com was the source.

The PDA used in this study was the Sony Clie PEG-SJ22. Released in March 2003, the PEG-SJ22 has since been discontinued and supplanted with superior technology, offering increased functionality and usability. The PEG-SJ22 operates on Palm OS Software (version 4.1) and has a high-resolution colour display (320 × 320 pixels) with backlighting. It weighs just 4.9 oz. and its dimensions (in inches) are 4.125 (H) × 2.875 (W) × 0.682 (D).

The software used for the purposes of the study was *iSilo* which was downloaded from the company website (www.iSilo.com) on a free trial basis. The iSilo product is a versatile document reader that is available for Palm OS, Pocket PC and Windows handheld devices and computers. The main reason for selecting this reader software was the availability of the desired titles in iSilo format together with the high text compression that allows for the storage of more and larger documents on a the device and the fact that it enables navigational hyperlinks and displays images, which add to the visual appeal.

4. Results and analysis

Of the 11 participants between the two groups, two did not attend the second meeting (one from each group) and did not therefore complete the questionnaires. Thus the following results are based on nine completed questionnaires. Because of the overall low number of participants it was decided at this stage to join contributions from the two groups to provide a more solid insight. Anyway the small size of the sample does not allow for any conclusive evidence to be drawn from the study but makes it possible to observe and discuss some trends especially when in relation to similar studies.

The majority of participants were female, which is reflective of the overall demographic of the groups included in the study and, indeed, of reading groups in general. There was considerable spread in the age groups covered – ranging from 25-34 to 75 plus.

The vast majority of respondents had PC access at multiple locations. Most of the group members were fairly frequent PC users, with only two people saying that they did not uses PCs at all. However, only one respondent had previously used a PDA and "rarely". There was no variation in the PC functions most often used by the seven PC users within the study group with only one participant having any previous experience of reading fiction e-books.

There was, overall, a fairly low level of e-book awareness among participants, with "knew a little about e-books" being the highest level of previous knowledge selected by group members.

4.1 Subjective satisfaction feedback

The vast majority of respondents only viewed the e-books via the PDA but one participant also viewed the titles using a PC. None of the group members who had not been issued with a PDA chose to participate in the experiment by viewing e-books via a PC.

On the whole, the respondents reported that they found the e-book text difficult to read.

There was, however, a more positive response to the navigational aspects of reading the e-books; six respondents rated ease of navigation at level "3" (on a scale of 1 to 5) or above.

Question 5, concerning the helpfulness of electronic functionalities, was attempted by just five of the participants (who, on average, commented on 2.8 of the features listed). Overall e-book functionalities were not perceived as useful.

When asked to rate the overall experience of reading an e-book according to initial expectations (i.e. whether it was more or less difficult) the responses were fairly balanced in that 3 respondents found the experience less difficult, two said it was as expected and four said it was more difficult.

Prior to reading an e-book, most participants were fairly optimistic about the ease of use. At the end of the experiment it would appear that the respondents, on the whole, found the reading devices easier to use than expected, with level "4" being the most selected option.

The overall initial impression of accessibility was similarly favourable, with five respondents opting for level "3" or above and only one person selecting level "2". After reading, opinions altered slightly but the majority of respondents still opted for level "3" or above.

There was very little change in how electronic texts were viewed in comparison to traditional print; both before and after the experiment, the readers expressed a definite preference for printed text.

On the whole, group members found e-books less appealing at the end of the experiment. Similarly, views on the helpfulness of e-books diminished at the end of the experiment. When asked about how this experience of reading an e-book could have been enhanced, two users reported that "more time to get used to e-books" could have improved the experience and two thought that the experiment would have benefited from "more/different titles" being selected.

All participants answered the final question, surveying the likelihood of future e-book reading. On the whole, the responses were negative.

4.2 Participants' comments

Two questions in Section 3 asked users to remark on their particular likes/dislikes or what they found most/least useful about reading the e-book. They were also encouraged to include comments on the devices used to read the books.

Most of the positive feedback focussed on the convenience of using the PDA; three people singled out the "lightness" of the device and a further two respondents remarked that they appreciated the PDAs being "small" and "compact".

On the other hand, the two most frequently occurring negative comments concerned the issue of screen glare and the size of the text (too small) detracting from overall readability. Both of these factors were raised by five of the nine respondents. Three people also felt that the screen was too small, and two of the participants described the text as "unclear" or "poorly defined". A further two respondents remarked that the quality or readability of the text declined as the autoscroll increased in speed, thus, causing frustration. It was also noted that the battery power was used up far more quickly when using backlighting.

There were also some general comments about e-books and their use. Two of the group members raised the portability issue, stating "would be very useful when on holiday or travelling" among the most useful features.

In addition to these shared points, there were some far more individualistic comments. For example, one person described the page-turning sound (which is

supposed to replicate the traditional reading experience) as "irritating" and another stated, "print too far on left of page". One of the participants simply stated, "Despite a great deal of PC experience I found great difficulty in navigating the book and in general cannot imagine *ever* wanting to repeat the experience."

Overall it looked as if the social side of the reading group worked against the adoption of e-books. All members of the groups shared very strong feelings about paper books and in a certain way felt like betraying paper books when using e-books. The novelty of introducing a new gadget worked as an initial incentive but wore off very soon.

4.3 Similar studies

In assessing the results of this e-book group experiment, it is illuminating to consider similar studies involving the circulation of PDAs to library patrons in both the academic and public sectors. Two directly comparable pilot projects have taken place in Blackburn with Darwen and Essex County Council libraries. Although specific details of the results garnered from these two most recent experiments have not been made widely available, both were sufficiently successful to progress from the pilot stage to mainstream implementation across the library service. Looking at more established studies the results of experiments reported in Dearnley *et al.* (2004) and McKnight and Dearnley (2003) are in agreement, even if on a more positive side, with our own findings in that reading is a very personal activity and reading from a PDA has to go a long way in order to compare with the classic enjoyment derived from reading a fiction paper book.

The use of PDAs is now also being increasingly considered in the academic sector. In a study run at the University of Virginia (Marshall and Ruotolo, 2002), PDAs were loaded with required course material (including fiction titles) and loaned to students in two different year groups. Feedback was collected via observation and interviews. This study found that the users preferred to read shorter texts using the PDAs, as the screen was considered too small for more lengthy materials. When reading from the PDAs a skimming approach was favoured and, as such, the devices were used more as a supplement than a primary tool.

Waycott and Kukulska-Hulme (2003) at the Open University, reported some similarities in their findings. For instance, they found that students used the PDAs to supplement rather than replace other formats. In common with both the University of Virginia case study and the e-book discussion group experiment, participants identified the size of the screen as being problematic, particularly when reading longer texts. The same authors noted that reading on screen was generally considered as inferior to paper. In expressing their overall views on reading course material in electronic format, the majority of the students involved said that they had found the PDAs useful. However, 68 percent found the devices difficult to use. It was also reported that students did not generally exploit the additional electronic capabilities of the devices.

5. Conclusions

This experiment was designed to serve two main aims: to assess the viability of targeting book discussion groups as a platform for introducing e-books to libraries and to obtain feedback on fiction e-book usability issues from a real user group.

It was expected that the participants would initially express a definite preference for traditional printed books. This hypothesis was affirmed anecdotally by the experience of proposing the experiment to the book groups and qualitatively by the questionnaire feedback. There was very little change in the before and after perspectives – e-books were rated low in both cases (decreasing slightly in the after reading rating). Many of the group members referred to traditional books on an emotional level; one group member commented that print books conjured up memories of events that had taken place in his life at the time of reading and another participant discussed the tendency to clutch or embrace particularly enjoyable books after reading. This issue is raised by Peters (2001) who points out that feelings about the traditional book tend to run deep making it difficult for people to adjust to and accept new formats.

Participants did not on the whole report that they had experienced particular difficulties on account of unfamiliarity with the PDA, even though only one person had previously used a PDA. Surprisingly though, the participants with the highest level of exposure to technology were no more positive about e-books and the reading experience than the rest. Given the small number of participants in the study group, however, it would be unwise to base any general conclusions on this aspect. Naturally, larger study groups with greater variation among the population would be better placed to ascertain this kind of trends. In particular it is suggested that involving in a further similar study readers who have experienced e-books from an academic perspective, and have subsequently been introduced to them within a public library (fiction) domain could provide some interesting insight.

Finally it was considered unlikely that general readers of fiction would find significant merit in the ability to search, highlight or annotate for example. This was confirmed to be the case as the lack of remarks on this issue indicates that the participants did not widely use the additional functions of the electronic device and did not hold the additional functionalities in high regard.

On the whole, the responses from the book group members suggest that there was general dissatisfaction with reading fiction e-books on the PDAs. In further analysing users' comments, however, many of the critical remarks can be seen to refer to the reading device rather than e-books in general. For example, the most frequent remarks focussed on screen/text size and clarity. This suggests that improvements in device capabilities would have enhanced the overall impression of e-books.

There is undoubtedly a role for e-books in the public library service and perhaps even in book discussion groups too. The most obvious progression in experimenting with e-books and the discussion group format would be to pilot a wholly electronic scenario – that is, a virtual book discussion group to be implemented via the library website. It is likely that such a service would attract new users to the library service and perhaps would better serve patrons with special needs (such as mobility impairments). Alternatively, it would be interesting to attempt another experiment with the traditional book group format but involving a group assembled specifically to discuss e-books, as opposed to a pre-existing group used to discussing print books; young people could be the ideal niche for this kind of endeavour.

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Appendix

Thank you for participating in this e-book discussion group experiment. Please complete this questionnaire based on your experience of using e-books. It should take around 15 minutes to complete.

Section 1: Personal Details

Please complete this short section giving some basic details about yourself by ticking the appropriate boxes.

1. Gender: Male ☐ Female ☐

2. Age:

16-24 ☐
25-34 ☐
35-44 ☐
45-54 ☐
55-64 ☐
65-74 ☐
75+ ☐

3. Occupation/job sector:

Admin/clerical	☐	Marketing/advertising	☐
Arts/media	☐	Professional	☐
Education	☐	Retail/sales	☐
Finance/legal	☐	Retired	☐
Health care	☐	Self-employed	☐
Homemaker	☐	Student	☐
I.T/computer related	☐	Transport	☐
Leisure/tourism	☐	Unemployed/between jobs	☐
Manufacturing/production	☐	Other	☐

Section 2: Technological Background

1. Where do you have access to a PC (computer)? Please tick all that apply.

Home ☐ Public Library ☐ Work ☐
School/College/University ☐ Other ☐
Nowhere ☐

2(a) How often do you use a PC? Please tick the appropriate box.

Daily ☐ Every few days ☐ Weekly ☐
Monthly ☐ Occasionally ☐ Rarely ☐
Not at all ☐

Figure A1.
Electronic book group questionnaire

(continued)

2(b) How often do you use a Personal Digital Assistant (PDA)? Please tick the appropriate box.

Daily ☐ Every few days ☐☐ Weekly ☐
Monthly ☐ Occasionally ☐ Rarely ☐
Not at all ☐

3(a) If you use a **PC**, please indicate the **3** functions you most use and put them in rank order by entering the appropriate number in the corresponding box: 1= most used, 2= second most used and 3= third most used. **If you do not use a PC, please go straight to question 4.**

Applications/Word Processing	☐
CD-ROM	☐
Email	☐
Entertainment (games/film/music)	☐
Internet access	☐

3(b) If you use a **PDA**, please indicate the **3** functions you most use and put them in rank order by entering the appropriate number in the corresponding box: 1= most used, 2= second most used and 3= third most used. **If you do not use a PDA, please go straight to question 4.**

Applications/Word Processing	☐
CD-ROM	☐
Email	☐
Entertainment (games/film/music)	☐
Internet access	☐

4. Was this your first experience of reading a fiction e-book? Please circle as appropriate.

YES **NO**

5. Please select the statement that best reflects your awareness of e-books prior to participating in this study. Tick **one** box only.

Had not heard of e-books at all	☐
Had heard of e-books	☐
Knew a little about e-books	☐
Knew quite a lot about e-books	☐
Familiar with e-books	☐

Section 3: E-book Feedback

1. Which version of e-book did you view?

PDA Version ☐ PC Version ☐ Both ☐

(continued)

Figure A1.

2. Please circle the appropriate number next to each of the following statements to show your **initial** impression of e-books **before** you started reading.

Difficult to use	1	2	3	4	5	Easy to use
Inaccessible	1	2	3	4	5	Accessible
Inferior to print	1	2	3	4	5	Superior to print
Not user friendly	1	2	3	4	5	User friendly
Unappealing	1	2	3	4	5	Appealing
Unhelpful	1	2	3	4	5	Helpful

3. Please circle the appropriate number on the scale to indicate how easy you found reading the text.

Not at all easy	1	2	3	4	5	Very easy

4. Please circle the appropriate number on the scale below to indicate how easy the e-book was to navigate.

Not at all easy	1	2	3	4	5	Very easy

5. If you used any of the functionalities listed below, please indicate how helpful you found them to be by circling the appropriate number.

	Not helpful				Very helpful
Bookmark facility	1	2	3	4	5
Find facility	1	2	3	4	5
Highlight facility	1	2	3	4	5
Navigation icons	1	2	3	4	5
Page of Contents facility	1	2	3	4	5
Change of font size*	1	2	3	4	5

*Applies only to PC versions of the e-books.

6. Please circle the appropriate number next to each of the following statements to show your overall impression of e-books **after** reading.

Difficult to use	1	2	3	4	5	Easy to use
Inaccessible	1	2	3	4	5	Accessible
Inferior to print	1	2	3	4	5	Superior to print
Not user friendly	1	2	3	4	5	User friendly
Unappealing	1	2	3	4	5	Appealing
Unhelpful	1	2	3	4	5	Helpful

Figure A1. *(continued)*

7. On the whole, did you find the experience of reading the e-book more or less difficult than expected? Please mark the appropriate point on the scale below.

Far less difficult	Less difficult	As expected	More difficult	Far more difficult

8. What did you particularly like or find most useful about reading the electronic version of the book? Please include any comments on the device used to view the e-book.

9. What did you particularly dislike or find least useful about reading the electronic version of the book? Please include any comments on the device used to view the e-book.

10. What could have enhanced this experience? Please tick all that apply.

More/different titles selected ☐☐
More instruction/assistance in using/accessing e-books ☐
More time to get used to e-books ☐
Don't know ☐
Other ☐
Please specify_____

10. Please circle the number on the scale that indicates how likely you are to read an e-book in the future.

Unlikely	1	2	3	4	5
Likely	1	2	3	4	5

Thanks again for participating in this study and taking the time to complete this questionnaire.

Figure A1.

About the authors

Monica Landoni holds a PhD in Information Science and has been a lecturer in the Department of Information Science, University of Strathclyde since 1996. Prior to this she was a Research Fellow in the Department and at JRC ISPRA. Her research interests lie mainly in the fields of information retrieval, electronic publishing and e-learning, particularly in the area of user interface aspects. She leads the eBook group in the department. She has worked on and still is involved in a number of major projects including: REVEAL THIS (REtrieval of VidEo And Language for The Home user in an Information Society); PENG (Personalised News Content Programming)- STREP Contract N. 004597), DELOS (Network of Excellence in Digital Libraries) and EBONI (Electronic Books ON-screen Interface). She is a member of the British Computer Society's Information Retrieval Specialist Group committee, and Program Chair of the IRSG99

21st Annual Colloquium on IR. She is a peer review panel member for the Arts and Humanities Research Council (AHRC). She has published numerous papers in the eBooks and information retrieval area and won the Dynix prize for best paper in *The Electronic Library* (co-authored) and the Literati Club Highly Commended Award in 2001 and 2006 (both co-authored). Monica is also a member of the Editorial Advisory Board for *The Electronic Library*. She is the corresponding author and can be contacted at: Monica.Landoni@cis.strath.ac.uk

Gillian Hanlon holds a Masters in Information and Library Studies from the Department of Computer and Information Sciences at the University of Strathclyde. She is currently working as school librarian at Kirkintilloch High School, East Dunbartonshire, Glasgow. Gillian has been selected as an ICT Champion within East Dunbartonshire and has been appointed as a national mentor for the development of Glow, Scotland's educational intranet. This has provided opportunity for further experimentation with e-books and Gillian is currently conducting a pilot project involving the use of e-books to support leaning and teaching of advanced higher courses.

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A study of the information literacy capabilities of the Kuwaiti police officers

Sultan M. Al-Daihani and Sajjad ur Rehman
Department of Library and Information Science, College of Social Sciences, Kuwait University, Kuwait

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Abstract

Purpose – The purpose of this paper is to investigate the information literacy capabilities of Kuwaiti police officers by focusing on computing and information skills and perceived value of information sources. The study is designed to test the hypothesis that there existed significant differences in information literacy capabilities based on three personal characteristics.

Design/methodology/approach – A questionnaire-based survey was conducted of 211 police officers enrolled in a training program; 60 percent responses were received and analyzed using SPSS package.

Findings – It was found that generally the Kuwaiti police officers had weak computing and information capabilities. They were generally poor in searching skills. It was further found that departmental affiliation exhibited significant differences for computing and information skills.

Originality/value – The study is the first of its type in this region and has significant value in making it clear that appropriate programs of training are needed for the development of information and computing skills among Kuwaiti police officers.

Keywords Kuwait, Police, Information literacy, Computers, Information media

Paper type Case study

Introduction

Information literacy is considered to be an essential element of education and practice in various academic and professional domains. McCullough (2006) analyzed the value of the information literacy component in engineering education and practice and proposed modules that would enhance capabilities of engineers in their education and practice. Cheuk (2002) prepared a policy paper outlining the significance of information literacy in different work settings. The researcher asserted that lack of skills incurred a huge cost for employers. Information literacy could be enhanced through a number of knowledge management practices and the use of selected best practices for application in various settings. Fjallbrant (2000) described the use of two projects funded by the European Union – EDUCATE and DEDICATE – that had a definite bearing on developing IT capabilities among employees in various settings that would enhance their information literacy capabilities. Rehman and Ramzy (2004a) studied the situation of information literacy among health professionals and concluded that a large number of them lacked awareness and had low search and use skills in their use of electronic resources. The respondents had proposed a variety of measures of formal orientation and training to become effective users. Rehman and Ramzy (2004b) also analyzed internet use by the health professionals and found that they wished to be further empowered through rigorous training and the alleviation of problems that

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inhibited their internet use. In the present paper, the authors examine information literacy in another group of professionals, namely the police.

The police can be seen as a time-critical and knowledge intensive organization. Police officers need to make right decisions within seconds, which need to be grounded in a sound body of information and knowledge. Information technology (IT) has fundamentally changed information and record management from paper-based to digital-based (Chen *et al.*, 2002). Police officers need to be efficient in using information systems and sources for excelling in their jobs. During the last few decades, a large number of IT-based systems and sources have been developed that have become a critical resource for both strategic and operational business of police officers. In order for these officers to effectively exploit this vital resource, they need to be equipped with computing and information skills that are instrumental in using these systems and sources. They also need to be well-prepared in using electronic information sources. Information literacy is increasingly included in training programs of police courses. These trends are global in nature and the police officers in any part of the world are required to develop these capabilities as part of their basic training. However, few systematic studies have been conducted to explore the information behavior of police officers (Baker, 2004). And in developing nations, there is a serious paucity of literature in this area.

Studies have documented the use of computers and databases in criminal investigation and detective work. An overwhelming 85 percent of detectives say that computers have made it easier to get information and that save their time. Patrol officers find computers extremely helpful in detecting crime and guiding their investigations. It has been established that computers and information systems have substantially enhanced the performance of police (Hastings, 1982; Morgan, 1990). Conversion of information into electronic records, instant retrieval, and visualization of integrated information onto one screen have influenced the design of new systems (Brahan *et al.* 1998; Oatley and Ewart, 2003; Redmond and Baveja, 2002). Chau *et al.* (2001) have pointed out several issues in the design of such systems such as distributed and heterogeneous data sources, security and confidentiality, and trust and willingness for sharing information, and they have also proposed solutions for these problems. Nulden (2002) investigated the use of IT by patrol cars in an experimental study of 200 hours, based on theory-in-use actual practice. In another study, Lundin and Nuldén (2004) also investigated the use of mobile technology in conjunction with other IT applications. These studies have highlighted the use of a variety of IT applications in police work.

In an extensive study of the use of IT by the Canadian police force, LeBeuf (2000) examined the use of IT as communication and information tools. He also explained the use of databanks and databases. Access to data banks and other computerized instruments provides officers with more information and thus allows police officers to develop more effective strategies for combating both traditional and high-tech crime (McLean-Lipinski, 1999). Borglund (2005), based on a research study, concluded that access and use of electronic records opened up a new way of gathering information for police officers. Information systems have brought police officers better options to be prepared for difficult assignments. In proactive police work, information proved to be crucial and without using electronic records decision making had become difficult. And reality television programs such as the BBC's *Car Wars* or *Sky Cops* show how computers and IT are actually being deployed to obtain instant recognition of vehicle

license plates and checking of insurance and tax details. They thus help prevent crime and tremendously assist the police in their work.

Baker (2004) conducted a study about the information needs of female police officers involved in undercover prostitution work. The results revealed that the officers needed a variety of information tools and their work demanded the use of several information sources such as media, fellow officers, members of the community, supervisors, etc. Information literacy capabilities among police officers are gaining significance. Northrop (1993) investigated information literacy and the frequency of the use of information systems by police officers and concluded that attributes of users were associated with their extent of use. User friendly systems and training appeared to be the key variables for effective use. LeBeuf (2000) emphasized that technology-based crime investigation required new high-performance working tools that required very specialized training for their use. The present investigation looks into the information literacy capabilities of Kuwaiti police officers by focusing on their computing and information skills and perceived value of information sources.

Research setting

Kuwait is a small state in the Arabian Peninsula, with a population of about one million native inhabitants. Despite its modest population, by virtue of owning the second largest petroleum reserves in the world, it commands global prominence. It has an expatriate population of 1.7 million. Kuwait Police functions under the authority of the Ministry of Interior, responsible for public security and law and order. Additionally, the Kuwait Police also maintains public services, which include national documents, immigration services, driving licenses, vehicle registration and inspection, amongst others. The Kuwait Police has organized its work in many departments including traffic, petrol, immigration affairs, police academy, planning and organization, national security, border security, corrections, legal affairs, nationality and passport affairs, and criminal investigations.

In order to manage its affairs, the Kuwait Police selects young cadets who need to graduate from a four-year degree program, termed as Bachelor of Security Sciences. The in-service officers have to attend a number of training courses. A two-month obligatory course is a pre-requisite for promotion of these officers to higher ranks.

The Kuwait Police has an elaborate infrastructure of IT and networking system. It creates, manages, and uses a large number of databases, ranging from stand-alone utilities to portable entities. Each patrol car's laptop is linked with a number of databases such as vehicle directory, citizens' database, address database, etc. for checkouts and investigation. The immigration department is linked with national citizen and residence databases. Likewise, traffic department is also responsible for a number of databases. The general department of Information Systems is responsible for providing computing and technical support to various police departments. The officers are expected to be well-conversant with these information systems, databases, electronic records, and internet-based services. They are provided with opportunities for training and development in IT applications.

Problem

It is a fair assumption that in today's technology-driven work context, police officers need to be equipped with adequate information literacy skills in order to carry out their

duties effectively and efficiently. The availability of a variety of information sources in electronic format also requires that police officers have positive perceptions about the value of diverse information sources. Computing and information skills and preferences in the choice and use of information sources reflect information seeking behaviors of police officers that need to be critically examined for the design of information systems and utilities. The Kuwaiti police force has employed ICT systems and applications in all the domains of its operations. The public authorities in Kuwait have made major investments in creating electronic databases, archives, files, internet, and other infrastructural elements. Officers in different divisions are not expected to achieve optimal performance without having the capabilities of using these systems and applications. A need was felt to examine how the Kuwaiti police officers rate their computing and information skills and what are the patterns of their perceived value for diverse information sources. It was also found worth investigation whether departmental affiliation, educational qualifications, and ranks of officers had ay implications for their level of computing and information skills and perceptions about the value of information sources. It is expected that a clear understanding about these aspects would help in articulating the needs of officers for training and development. It may also help in articulating policies and practices for the design and implementation of ICT infrastructure for the police force in the country.

Research questions

In order to carry out the investigation, the following research questions were formulated for this study:

RQ1. How do Kuwaiti police officers rate their computing skills?

RQ2. How do Kuwaiti police officers rate their information skills?

RQ3. How do Kuwaiti police officers rate the value of different information sources?

Another pertinent dimension worth investigation was whether there existed any statistically significant differences related to personal variables of departmental affiliation, educational qualifications, and officer rank for their computing and information skills and perceived value of information sources. The primary hypothesis was that there did exist significant differences among different categories of officers related to their departmental affiliation, educational qualifications, and ranks with regard to their information literacy capabilities. The following three sub-hypotheses were derived from the general proposition:

(1) There are statistically significant differences among different categories of Kuwaiti police officers based on their departmental affiliation, educational qualifications, and ranks in their computing skills.

(2) There are statistically significant differences among different categories of Kuwaiti police officers based on their departmental affiliation, educational qualifications, and ranks in their information skills.

(3) There are statistically significant differences among different categories of Kuwaiti police officers based on their departmental affiliation, educational qualifications, and ranks in their perceived value of different information sources.

Methodology and procedures

Participants

This study was designed to investigate the information literacy capabilities of Kuwaiti police officers. It was decided to gather data from different ranks of Kuwaiti police officers. Those police officers who had enrolled in a two-month training course at the Police Academy were identified to participate in this study. One apparent reason was that these officers came from all the departments where police officers were assigned to duty. Second, it is a compulsory training course for all the police officers and they are not considered to be eligible for promotion to the next level unless they have passed this course. Third, one of the objectives of this course is to enhance research and information gathering skills of police officers for better decision making, which is the focus of this study. Fourth, the participants of this course had diverse ranks of police officers from the rank of First Lieutenant to that of Lieutenant Colonel. Altogether, there were 210 participants of the course held in November 2005 to February 2006 and all of them were considered bona fide participants of this study. Necessary approval of the responsible commandant officer was obtained for the conduct of survey.

Research instrument

A questionnaire was designed in Arabic, the first language of the participants. The questionnaire had four sections. The first question had a number of questions related to their computing skills. A 5-point Likert scale was provided on which they could rate their level of skill on the continuum of very poor to excellent. In the second section, seven information literacy capabilities were listed and the participants were asked to rate their level of proficiency for each of them. In the third section, 17 types of information sources were listed and the officers were requested to mark their value on a 5-point scale. In the fourth section the officers were asked to provide personal information about departmental affiliation, educational qualifications, and ranks. Since there are scores of police departments, five categories of "security", "field", "administration", "public service", and "general service" were used for merging departments into meaningful categories for the purpose of testing and analysis. The category of "general service" was comprised of departments such as state security, criminal investigation, ministers' department, etc. Also, keeping in view the actual frequencies of educational qualifications of officers, it was considered practical to convert them into two categories of those having a degree form the Kuwaiti police academy and those who had different qualifications.

The questionnaire was pilot-tested using four officers who were not included in the survey. They provided valuable feedback for making modifications in the instrument and removing jargon. It was noted that those officers who worked in the departments of state security, investigation, and cabinet affairs were might be apprehensive in answering the survey. In order to conceal their identity, the term "general" service was used in the revised questionnaire.

Administration of questionnaire

The questionnaire was distributed among 210 participants. They were given three days to respond to it. Announcements of administration and reminder were made at three points while they were attending their training session. In total, 118 responses were collected, which is 60 percent of the population. It was found that eight responses

were not usable due to a number of problems and these had to be left out. The findings of this study are thus based on 111 responses.

Findings

Respondent profile

The breakdown of the respondents by rank is as follows: first lieutenant: 26.4 percent, captain: 25.5 percent, major: 38.2 percent), and lieutenant colonel: 10 percent. Eleven respondents (10 percent) were found to be from the Correction Institutions, ten (9.1 percent) from the Immigration Department, ten (9.1 percent) from the Traffic Department, ten (9.1 percent) from the Police Stations, and the remaining 32 (29.1 percent) for general service departments. Further, it was found that a clear majority of the respondents, 68.2 percent, had a Bachelor degree in Security Sciences; 22.7 percent had different degrees such as Bachelor in Law; 3.6 percent had a Master's degree and 5.5 percent had undergraduate diploma.

Computing skills

The first research question was to find out the computing skills of police officers. It also covered the respondents' capability to access computing and internet facilities. These skills were related to handling of computer, operating system, document management, database search, spreadsheets, multimedia, e-mailing, chatting, and training. Mean scores were computed for each of these factors and then these were computed into a cumulative measure of overall skill-level. Table I shows mean scores and standard deviations for these 12 variables and the overall skill score.

When Table I is examined, it is clear that computer availability is close to very good, yet a majority of the respondents is deficient in vital computing skills. They received the lowest mean scores of 2.09, 2.4, 2.61, 2.73, 2.9, and 2.96 respectively for database management, spreadsheets, multimedia features, chatting, file management, and computer training. All these scores are below 3, which is the midpoint, indicating fair level of skills. They received the highest means score of 3.59 for computer availability. Other factors that received higher than 3 scores were keyboard and mouse skills, word-processor, MS Windows, e-mail, computer training, file management, and

Skills	Mean score	SD
Availability of computers	3.59	1.44
Keyboard and mouse skills	3.43	1.12
Using word-processor	3.08	1.34
Working with Windows	3.04	1.33
Email	3.02	1.50
Training in computing	2.96	1.24
Managing files	2.90	1.47
Chatting	2.73	1.45
Using multimedia features	2.61	1.43
Spreadsheets	2.40	1.23
Database design and management	2.09	1.15
Overall skills	2.92	1.08

Note: $n = 110$

Table I.
Computing skills

chatting. For three of these skills, they received the mean scores of between 3 and 3.08, quite marginal and indicating low level of skills. If the overall mean score of 2.92 is taken into consideration, it also indicates that the respondents had weak or moderate levels of computing skills.

We tried to seek an explanation to this state of low use. Five respondents (4.5 percent) explained that they had no interest in using computers or internet while as many of them mentioned that they did not have the capability or skills to use computers. Supplementary questions were asked about their ability to access computers at work and more than one third of them (38.2 percent) rated it excellent. It appears that many of them are delegating computer use to their subordinate and support staff and they themselves are not active users.

Computing skills and personal variables. One sub-hypothesis was that there existed significant differences for computing skills among different categories based on departmental affiliation, educational qualifications, and official ranks. One-way ANOVA was conducted to test this hypothesis at the significance level of 0.05. Results of the test are shown in Table II. In order to ascertain nature of differences among different categories, *post hoc* test of LSD was used. It was found that with regard to departmental affiliation, there existed significant differences for eight of the ten skills. They did not differ for keyboard and database skills, implying that these officers by and large differed with each other for computing skills in line with their departmental affiliations in the five categories. The *post hoc* results indicated that those officers who served in the field departments had lower level of skills for Windows, e-mail, multimedia, and word processing as compared to those serving in public and general service categories. For file management, it was found that those serving in field departments had lower level of skills than those serving in the departments related to security, and general service. For the skill of chatting, it was found that again those in field department had a lower level of skills than public service and general service categories. Also, public service departments were found with a significantly higher level of skill than those serving in administration departments. For spreadsheets, field officers were found to have lower level of skill than those who worked in security, service, administration, and other departments. For training, it was found field officers had lower skills than public service department officers and also those who served in

	Departmental affiliation df: 4, 105		Educational level df: 1, 108		Ranks df: 3, 106	
	F	Sig.	*F*	Sig.	*F*	Sig.
Keyboard and mouse skills	1.615	0.176	1.63	0.205	1.623	0.205
Working with Windows	3.235	0.015	0.038	0.845	0.038	0.845
Using word-processor	3.698	0.007	0.030	0.863	0.030	0.863
Managing files	4.284	0.003	0.588	0.445	0.588	0.445
Chatting	3.528	0.010	0.250	0.618	0.250	0.618
Spreadsheets	4.499	0.002	0.693	0.407	0.693	0.407
Email	3.315	0.013	0.034	0.854	0.034	0.854
Training in computing	4.921	0.001	0.201	0.655	0.201	0.655
Multimedia	2.799	0.030	0.110	0.741	0.110	0.741
Database design and management	1.622	0.174	0.463	0.498	0.463	0.498

Table II. One-way ANOVA computing skills and personal variables

general service. Also officers serving in security departments were found to be having a lower level of skill than those who served in general departments. These results have indicated that officers serving in field department have lower level of computing skills as compared to officers serving in security departments. They also had lower level of skill as compared to officers in general service departments and security departments for a number of skills. The officers exhibited no significant difference for their computing skills in relation to their educational qualifications or ranks. Based on these results, it is concluded that this sub-hypothesis is partially supported.

Information skills

Another vital area of skills for police officers is related to information searching and handling. The officers were asked to rate their skill-level for seven vital skills related to internet searching, databases, electronic resources, and archives. They were also asked to indicate their perception about searching and the training they have had in information skills. Table III shows the mean scores for the seven skill statements in a ranked order. It was found that the officers perceived that their highest skill-level was for internet searching, a mean score of 3.28. The only other skill that received higher than 3 mean score was related to their searching capability for electronic files. All the other four skills had the mean scores in the range of 2.61 to 2.85 and these were searching skills in the following ranked order: databases, electronic directories, archives, and level of their training. The last statement is about the search strategy, receiving the mean score of 1.83, indicating a poor level of skill. It appears that the respondents have low perception of their searching capability. They have relatively higher rating for internet searching, as it is expected that a majority of them might have some exposure to it. They have quite low perception about their capability of searching databases, directories, and archives. They do not appear to have any capability about the fundamentals of search strategy. When the seven statements were converted into an overall measure of information skills, the mean score was 2.74, again reflecting the generally low level of information skills of these officers.

Information skills and personal variables. In order to test the hypothesis that there existed significant differences for information skills among police officers in relation to three personal variables, one-way ANOVA was conducted. Results of the test are displayed in Table IV. It was found that for departmental affiliation, officers showed statistically significant differences at criterion 0.05 for six of the eight skills. Differences were found to be insignificant for internet searching and ability to using

Skills	Mean score	SD
Searching Internet	3.28	1.52
Searching electronic files	3.17	1.48
Searching databases	2.85	1.38
Searching electronic directories	2.66	1.37
Searching electronic archives	2.64	1.40
Training in searching	2.61	1.32
Ability to use search strategy	1.83	0.98
Overall information skills	2.74	1.14

Table III.
Information skills

Note: $n = 110$

	Departmental affiliation df: 4, 105		Educational Level df: 1, 108		Ranks df: 3, 106	
	F	Sig.	*F*	Sig.	*F*	Sig.
Searching databases	3.289	0.014	0.185	0.668	0.964	0.413
Searching Internet	2.135	0.082	1.428	0.235	3.618	0.016
Searching electronic files	2.937	0.024	0.307	0.580	3.670	0.015
Searching electronic directories	2.726	0.033	0.170	0.681	1.078	0.362
Searching electronic archives	3.421	0.011	0.063	0.803	0.397	0.755
Ability to use search strategy	0.777	0.543	5.488	0.021	1.508	0.217
Training in searching	3.752	0.007	0.128	0.721	1.270	0.289
Overall information skills	3.504	0.010	0.030	0.864	1.193	0.316

Table IV.
One-way ANOVA information skills and personal variables

search strategy. However, for the personal attributes of educational level and rank, the officers exhibited significant differences for only 1 and 2 skills. Educational level was associated with significant difference for ability to develop search strategy and ranks was significantly associated with the skills of internet searching and searching of electronic files.

In order to examine the patterns of differences, the LSD *post hoc* measure indicated that for database searching, officers in public service departments had significantly higher capability as compared to those in security, administration, and field departments. For searching of electronic files, officers in the public service departments and general service were found to more skilled than security and field officers. For searching electronic directories, officers in public service had a higher skill level as compared to those in security and filed whereas officers in general service had a higher skill-level than field officers. Likewise, officers in public and general service departments were found to be more skilled than field officers. For training in searching, it was found that public service officers had a higher skill-level than security, administration, and field officers. Also, those in general service were found to be more skilled than administration and field officers. For overall skill-level, it was found that public service officers were significantly more skilled than security, administration, and field officers whereas officers of general service were better skilled than field officers. These results have indicated that by and large public service officers are more skilled than those in general service. Also those officers of general service are better than officers in certain categories for six of the eight information skills.

Post hoc results for officers' ranks indicated significant differences only for two skills of internet searching and searching electronic files. It was found that first lieutenants were significantly more skilled that captains and colonels for internet searching and captains and colonels for searching electronic files. Majors were found to be more skilled than captains and colonels for the respective skills of internet searching and searching of electronic files. Based on these findings, the sub-hypothesis that personal variables had significant differences for information skills was partially supported. The variable that was found to be most pertinent was departmental affiliation. The other two variables of educational qualifications and officer ranks showed little significance in this context.

Information sources

This study also investigated the use of a variety of information sources that are expected to be relevant for their official business. For this purpose, a list of 17 information sources was presented to the respondents and they were asked to assess their value, based on their actual experience. Table V presents ranked order of these sources according to their mean scores. They assessed official circulars as the most valuable information source with a mean score of 3.85. The next course with a mean score of 3.45 was mass media outlets such as television, newspapers, radio, etc. Three sources that received the mean scores of 3.33, 3.25, and 3.21 were respectively telephone, meetings, and training activities. There were four additional sources that had mean scores of higher than 3, indicating moderate value, were: departmental archives (3.15), departmental manuals or guidebooks (3.08), personal files (3.07), and colleagues (3.02). Eight sources received mean scores lower than 3, which are: databases (2.98) government documents (2.95), conferences (2.68), internet websites (2.61), legal documents (2.46), e-mail (2.44), intelligence reports (2.27), and informants (2.25). These sources appear to have little value as information sources. internet, email, public documents, intelligence reports, and informants are not trusted as valuable sources. It is quite revealing that the police department relies so much on these reports and informants, but the officers have low regard for their value. Colleagues and departmental manuals also did not receive high score for their values. However, these officers treat official memos and directives as the most significant information source, more valuable than colleagues and personal communications of e-mail. These results are quite significant and may reflect the socio-cultural and institutional influences on these officers.

Information sources and personal variables. It was hypothesized that the Kuwaiti police officers have statistically significant differences for their perceived value of different information sources based on their three personal characteristics. Results of

Sources	Mean score	SD
Official circulars and memos	3.85	1.42
Media (newspapers, TV, etc)	3.46	1.10
Telephone	3.33	1.45
Meetings	3.25	1.38
Training activities	3.21	1.42
Departmental archives	3.15	1.43
Departmental manuals or guidelines	3.08	1.34
Personal files/documents	3.07	1.42
Colleagues	3.02	1.26
Databases	2.98	1.46
Government documents	2.95	1.41
Conferences	2.68	1.36
Internet websites	2.61	1.41
Legal documents	2.46	1.38
Email	2.44	1.46
Intelligence reports	2.27	1.39
Informants	2.25	1.38

Note: $n = 110$

Table V.
Information sources

one-way ANOVA are given in Table VI. It was found that these officers did not show any significant difference for their perceived value of information sources for the personal variables of departmental affiliation and educational level. For their rank, only the information source of departmental archives showed significant difference. No difference was found for the other 16 information sources.

The LSD *post hoc* test indicated that the only significant difference for departmental archives was for officer ranks. Accordingly, majors were found to have higher value for this source than colonels and captains. Based on these results, the third sub-hypotheses that statistically significant differences existed among different categories of offices toward their perceived value of various information sources was rejected, implying that officer perceptions appeared to be independent of these three personal factors.

Conclusions

This study has provided insight into the status of computing and information skills of the Kuwaiti police officers and their potential use of information sources. The Kuwait Police has set up an elaborate computing and information infrastructure that is also connected with other national systems and the internet. Effective use of the vital information resource is dependent on the capability of police officers in exploiting these resources, which is only possible if they have adequate computing and information skills. This study has indicated that Kuwaiti police officers are weak in both computing and information skills. Their overall computing skill level was found to be 2.92 on the scale of 1-5, indicating an inherent weakness. However, these officers reported that they were most deficient in the areas of database design, use of spreadsheets, using multimedia features, and file management. The overall level of their skills for wordprocessing, Windows, and e-mail was also reported to be marginal.

	Departmental affiliation df: 4, 105		Educational level df: 1, 108		Ranks df: 3, 106	
	F	Sig.	*F*	Sig.	*F*	Sig.
Informants	0.586	0.674	0.424	0.516	0.700	0.554
Intelligence reports	0.521	0.720	0.045	0.832	10.015	0.389
Legal documents	0.460	0.765	0.388	0.535	1.091	0.356
Departmental archives	0.519	0.722	0.024	0.877	2.938	0.037
Departmental manuals or guidelines	0.293	0.882	0.225	0.636	1.304	0.277
Media (newspapers, TV, etc)	0.094	0.984	0.107	0.745	0.470	0.704
Colleagues	0.304	0.874	0.070	0.792	1.495	0.220
Internet websites	0.856	0.493	0.934	0.336	0.022	0.996
Email	0.445	0.776	10.853	0.176	0.335	0.800
Meetings	0.292	0.882	0.810	0.370	1.824	0.147
Telephone	1.177	0.325	1.131	0.290	1.264	0.291
Databases	0.593	0.668	0.618	0.433	1.434	0.237
Government documents	0.463	0.763	0.139	0.710	0.776	0.510
Personal files/documents	1.528	0.199	0.612	0.436	0.736	0.533
Conferences	0.620	0.649	2.354	0.128	0.284	0.837
Training activities	1.724	0.150	0.036	0.850	0.845	0.472
Official circulars and memos	0.969	0.428	0.392	0.533	0.414	0.743

Table VI.
One-way ANOVA information sources and personal variables

When these computing skills are viewed together with their information skills, a clearer picture emerges. These officers reported that they were the weakest for their search strategy skills (mean score of 1.83). Their search skills for archives, directories, and databases were also reported to be on the weak side of the scale. However, they reported that had somewhat better search skills for internet and electronic resources.

It is relevant to look into the reasons underlying this state-of-affairs. One explanation these officers provided that they largely depended on junior staff to conduct searches for them for seeking and accessing needed information. However, it is plausible that such a dependence of officers on staff might constrain them in intelligent use of information systems. The authorities of the Kuwait Police need to examine the training opportunities and their integration with the work assignments of these officers. Training approaches and methods also need to be examined for their relevance and usefulness. Also, their might be a need to examine the user interfaces of information systems so that these are made more user friendly. Appropriate incentives also need to be introduced for those officers who excel in these skills and apply them in their work.

This study also examined the perceived value of different information officers. Interestingly, they found official memos as the most valuable source, followed by media, telephone, and meetings. It means that these officers prefer written word to face-to-face interactions. It is commonly observed that officers heavily rely on informants and intelligence reports in their work. But, their perceived value was among the lowest. Databases, websites, government documents, and legal documents also received mean scores lower than 3 on the scale, reflecting that their value was not high in the view of these officers. These officers perceived archives and manuals to be marginally valuable. These results indicate that formal and official information sources are perceived to be more valuable. Electronic resources are relegated to lower value-level. Those sources which require extensive search capability and effort are also perceived to have insignificant value. These are interesting results and the authorities need to take them into consideration when they are designing information systems and training programs.

Investigated in addition was whether personal characteristics had any significant association with the three variables that served as independent variables. It was found that departmental affiliation of officers was a significant factor in regard to the computing and information skills of officers. Educational qualifications and officer ranks had little significance. It was also noted that those officers who served in public and general service departments had higher skills as compared to those who served in field or security departments. It means that nature of work of these officers is a significant factor in the acquisition of computing and information skills. These police officers exhibited no significant difference for their perceptions about the value of information sources.

This study is the first of its nature dealing with information capabilities of Kuwaiti police officers. There is a need to conduct additional investigations so as to bring forth a better understanding of information dynamics in the police force. Indeed information is the most critical resource. Availability of extensive information systems does not guarantee their effective exploitation. It is the human resource whose capabilities matter the most in the process.

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About the authors

Sultan Al-Daihani earned his PhD from Loughborough University in 2002 and currently he is working in Kuwait University, Department of Library and Information Science as Assistant Professor. He is also directing the IT Unit of the College of Social Sciences of this university. His teaching and research interests are related to information and knowledge organization, information behaviour, databases, and Web applications. He is the corresponding author and can be contacted at: s_aldaihani@hotmail.com

Sajjad ur Rehman has been serving Kuwait University as Professor in Library and Information Science since 1996. Currently he is directing its MLIS program. He was the founding head of the graduate MLIS program at IIU, Malaysia during 1991-1996. He teaches graduate courses related to information and knowledge management, information sources and services, knowledge organization, and corporate information. Besides, he has served in academic, managerial and professional positions in three different continents. He has published extensively and his current research focus is in the areas of information studies, information management, knowledge management, information and knowledge education, and corporate information.

Book reviews

Internet Reference Support for Distance Learners

Edited by William Miller and Rita M. Pellen
Haworth Press
New York, NY
2004
212 pp.
ISBN 978-0-7890-2938-6
US$19.05 soft cover
Keywords Distance learners, Reference services

Internet Reference Support for Distance Learners has been co-published simultaneously as *Internet Reference Services Quarterly*, Vol. 9 Nos 3/4, 2004. Together with *Improving Internet Reference Services to Distance Learners* (simultaneously co-published as *Internet Reference Services Quarterly*, Vol. 9 Nos 1/24, 2004) this publication is a must read for all distance librarians as well as librarians offering virtual reference services. In fact, anybody involved with digital library services can benefit from the publication.

It is interesting to note the editors' comments on the contributions (p. 1): "They reveal that librarians do not make a sharp distinction between reference and instruction in the distance learning context, and that there is no clear demarcation between 'true' distance learners and the more traditional students who might use the services designed with distance learners in mind".

Against this background *Improving Internet Reference Services to Distance Learners* covers a wide spectrum of relevant topics such as a historic overview of library and information services to distance learners and a synthesis of the guidelines and standards for the provision of distant services, the variety of types of reference services for distant learners, academic library websites to support distance learners, support to web-based courses, chat services, student support portals, and the design of software to support different virtual reference services. The need to work with faculty, open source software, the development of self-paced tutorials, copyright, the use of Camtasia as alternative to live video and the integration of library reference services into online courses is also covered.

The editors, William Miller and Rita Pellen, are both experts in the field and did an excellent job of the publication. *Improving Internet Reference Services for Distant Learners* is well-bounded and well-written, with a detailed 12 page index.

Internet Reference Support for Distance Learners is highly recommended to practitioners in the field of distance library and information services, as well as reference librarians involved with digital libraries and virtual reference services.

Ina Fourie
Department of Information Science, University of Pretoria, Pretoria, South Africa

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0264-0473

Managing Electronic Records
Edited by Julie McLeod and Catherine Hare
Facet
London
2005
216 pp.
ISBN 1-85604-550-1
£39.95 hard cover
Keywords Records management, Electronic media

The management of electronic records is an increasingly big challenge for organizations in public, private and academic sectors. Many organisations are faced with this challenge. A wide variety of record types, roles and issues are involved and the problem of the creation, caption, organisation and preservation of electronic records are being faced by various levels of organisational management. This includes IT managers, middle management and senior management (the policy makers), as well as the people on the ground floor who have to complete the actual tasks involved in record management. According to John McDonald (p. 7): "Leadership (and the lack thereof) is the single most important factor impacting the ability of organizations to move forward on the management of electronic records in the 'wild frontier'". According to him positive change can be influenced by vision, awareness, accountability, architecture and capacity building.

To address the diversity and complexity of record management, contributors from five continents share their views and experiences. The contributors including IT specialists, consultants, a managing director, academic researchers, and practicing record managers come from China, Australia, France, South Africa, the United States, Canada, and the United Kingdom.

Managing Electronic Records addresses a variety of theoretical and practical aspects – important issues are explored and solutions offered. These include the infrastructure required, legal aspects, the role of management, the use of standards and models, the importance of metadata, digital preservation, preservation technologies, ethical aspects, human resources and the competencies required, electronic record keeping in the public sector, as well as two case studies from the French private sector. There is especially a strong emphasis on the need for ongoing efforts to achieve greater efficiency and effectiveness.

All chapters are well-written. Personally I found the contributions of Xiaomi An and Thijs Laeven very interesting. Xiaomi An deals with the contribution of research in electronic management including the different research roles, the benefits, stages of research, and research agendas. The InterPARES project is discussed in more detail. Laeven, on the other hand, considers competencies and the development of human resources as the most important issue in electronic record management. He provides an interesting overview of continuous professional development, models of change management, and competency management.

Managing Electronic Records is well-bounded and well-edited. All chapters include lists of references that range from reasonable to very extensive. The book is concluded with an eight-page index. A complete list of web addresses is available as companion to the book at www.facetpublishing.co.uk/managingelectronicrecords/

It is highly recommended to all practitioners who is faced with the challenge of managing organisational records (this includes functions such as caption, organisation, preservation and creation of electronic records), as well as students doing courses in records management.

Ina Fourie
Department of Information Science, University of Pretoria, Pretoria, South Africa

Going the Distance: Library Instruction for Remote Learners

Edited by Susan J. Clayton
Facet
London
2007
239 pp.
ISBN 978-1-85604-619-0
£39.95 soft cover
Keywords Library instruction, Distance learning

More and more students are currently completing their tertiary or further education through distance education institutions. This notion greatly impacts on library services with librarians having to find innovative ways to support these remote students through online library instruction. Editor Susan J. Clayton approached more than 20 distance instruction librarians from across the USA to share their remedies and practical experience with other librarians finding themselves in similar situations. *Going the Distance: Library Instruction for Remote Learners* is the result.

This volume explores and maps four main areas of distance library instruction: design, deliver, collaborate and assess distance instruction.

Part 1 "Designing distance instruction" features a variety of topics varying from models and methods that could be used to design library instruction to teaching an online library instruction course. This part also introduces copyright concepts, the history of copyright, legal aspects concerning copyright, the effect of technology on copyright, as well as the economic and global contexts of copyright. This part concludes by taking a careful look at the different types of plagiarism, the reasons for plagiarism and the connection to distance learners.

The following six chapters (Part 2) examine the struggles and successes of various teaching experiments. These chapters delve into the creation of subject-specific online tools, the formulation of online tutorials using the Blackboard Course Management Systems and the creation of surveys to determine the format preferred by distance education students.

"Collaborating for Distance Education" (Part 3) comprises of two chapters on finding faculty and information technology (IT) staff who are interested in collaborating with librarians. Chapter 14 recommends ways for librarians to become involved as participants in online courses while Chapter 15 presents a number of ways to market library instruction to off-campus students and faculty.

Part 4, "Assessing Distance Education" offers alternatives to traditional face-to-face library instruction courses for training in online environments. This part also reviews different resources that are available on the assessment of distance learning library instruction. The volume concludes with a history of distance library instruction and

instruction assessment, suggesting that distance librarians must develop, improve and realise the importance of assessment in library instruction.

Going the Distance provides advice and examples to help librarians bridge the gap of distance. Clayton's team of authors offers practical advice on taking libraries to their distant users – whether this service involves an introduction to library research or supporting faculty in advanced courses. The volume includes bibliographic references at the end of each chapter and an extensive index.

Madely du Preez
University of South Africa, Pretoria, South Africa

Understanding Knowledge as a Commons: From Theory to Practice

Edited by Charlotte Hess and Elinor Ostrom
The MIT Press
Cambridge, MA
2007
367 pp.
ISBN 978-0-262-08357-7
US$36.00 hard cover
Keyword Information policy

This useful set of essays explores major policy issues associated with providing access to recorded knowledge, especially that presented in electronic formats. It does so by applying the idea of a "commons", defined within a generously-wide societal context, to "knowledge . . .as a shared resource" noting, as it goes, the consequent "puzzles and issues all forms of knowledge share, particularly in the digital age" (p. 3).

The editors, in their introductory chapter, identify the general direction and tenor of the collection, begin to clarify the basic terms (an ongoing task), and report useful distinctions, such as between seeing a commons as a "resource system" (characterizing types of economic goods, in particular "common-pool resources") and a commons as a property-rights regime (as "common property" controlled by a "jointly owned legal set of rights") (p. 5). Co-ordinating both viewpoints would seem necessary, of course; hence the value of setting these issues in as wide a socio-political framework as possible. There are many issues which need to be canvassed, and the unsurprising conclusion is that there is "no one solution to all commons dilemmas" (p. 12).

The collection is divided into three parts. The first (with essays by Hess, Ostrom and Bollier) outlines the basic issues, and sketches a way the editors' Institutional Analysis and Development (IAD) framework might apply to them.

The second part (Protecting the Knowledge Commons) looks at the protective role of research libraries (Kranich), the effects of copyright and licensing restrictions (Boyle) and the preservation of digital resources (Waters).

The third part (Building New Knowledge Commons) deals with open access (Suber), intellectual property (Ghosh), stimulating research of public value (Levine), lessons to be learned from the open source software movement (Schweik), and libraries in a digital environment (Lougee). The volume finishes with a description of EconPort, an open-source digital library in experimental microeconomics, as a case-study in the "incentives, risks, and possible negative externalities" of such an enterprise (Cox and Swarthout). An index covers the entire collection.

Despite the broad framework against which the issues are set, a weakness of this collection is that there is only a ghost of an historical perspective. This leads the editors to claim, contentiously, that "before 1995 few thinkers saw the connection" between "information" and "commons" (p. 4), and that "most of the problems and dilemmas discussed . . . have arisen since the invention of new digital technologies" (p. 10). These are surprising, often made, assertions, given that the basic issues encapsulated in copyright and intellectual property law and manifest in the mediaeval enclosure of land commons have ancient histories indeed! The entire collection resorts to a vocabulary that is rich in precedent that could be exploited much further.

Overall, the volume reminds us of the range of unresolved policy issues that need to be addressed. It remains more "theoretical" than "practical", but is no less valuable for that.

Fletcher Cole
University of New South Wales, Australia

Advancing Knowledge and the Knowledge Economy

Edited by Brian Kahin and Dominique Foray
The MIT Press
Cambridge, MA
2007
503 pp.
ISBN 978-0-262-61214-2
US$38.00 soft cover
Keyword Knowledge economy

This collection of 25 chapters by different authors is a contribution to the literature on the knowledge economy (KE). It is based upon the premise that knowledge is a key resource for economic growth, but that there are factors that can inhibit its effective use. On the one hand technology might be a means to stimulate the use of knowledge, but access to technology and legal constraints on its use all inhibit the connection of knowledge to innovation and economic development.

The book is divided into an introduction of three chapters, with seven subsequent sections of two or more chapters on a range of topics. The editors have each written a chapter that helps to provide some context for the subsequent contributions to this volume. There are two chapters in the section on measuring knowledge. One is fairly general, the other devoted to measuring a country's potential for innovation. Both contain good ideas but don't seem likely to provide a complete solution to the problem, which is, after all, a hugely difficult process. The section on "Knowledge communities" contains three chapters with an emphasis on the importance of social capital.

There are four chapters on the role of institutions in the KE which naturally give a good deal of attention to universities. Cowan's chapter is challenging for anyone working in universities because it throws some doubt on the impact of university research on innovation and new knowledge; instead, he argues, their greatest contribution is in the codification of existing knowledge. Information managers will enjoy the chapter by Hedstrom and King (both work at the University of Michigan) because it features the role of libraries, archives, museums, galleries, and even zoos and aquaria, in the knowledge economy. The authors argue that it is through these

institutions that we know what we know. The example of global climate change illustrates the point: no one collected the data now being used for climate change research with that purpose in mind, but such data was collected in libraries and other institutions simply because it might be useful at some future date. Skills known to information managers such as the identification, evaluation and collection of potentially useful information, its description and organisation, and provision for its retrieval and access, have all contributed to the KE. This infrastructure is the greatest resource we have in the KE at present and it needs to be nurtured so that it continues to be a resource for the future.

Two chapters on the relationship between knowledge and place give another dimension in the overall picture of the knowledge economy. Fagerberg's chapter on the digital divide in developing countries at times makes for dispiriting reading, but it does offer some hope through the identification of technology as a means of catching up with the developed world. This requires capacity building on a fairly huge scale, and there are all sorts of obstacles in the way. There are four chapters on innovation and five on control and cooperation. The last section is composed of two chapters on an emerging infrastructure in which the authors naturally predict that much knowledge creation will soon be done in a digital environment.

This is a book that has its place in almost every university library and LIS academics will find something of interest in its contents.

Philip Calvert
Victoria University of Wellington, Wellington, New Zealand

Out Front with Stephen Abram: A Guide for Information Leaders

Compiled by Judith A. Siess and Jonathan Lorig
American Library Association
Chicago, IL
2007
203 pp.
ISBN 978-0-8389-0932-4
US$40.00 soft cover
Keywords Libraries, Leaders

No doubt about it – Stephen Abram says what's on his mind. For his entire career he has been passionate about libraries, librarianship and the future of information technology. His current position as vice president of innovation with SirsiDynix allows him the flexibility and the venue to speak about hot topics regardless of whether they impact the company he works for or not. He is always guaranteed to provoke a response and those responses can cover a spectrum of feelings. He has offended, rallied, angered and inspired. So it is a very interesting read to have so many of his publications in one place. The editors collected 92 articles and 63 presentations and offered up the best of the best. The book is divided into four sections: Advocacy; Technology; Communities and Generations; and The Future. Also included is a biography, a selected bibliography of his works, an index and a section of additional readings. The only complaint in this arrangement is the lack of information regarding the additional readings. It would have been useful and interesting if the editors

identified how this list was compiled, particularly if the readings were recommended by Stephen Abram himself.

Each of the four sections leads off with a provocative quote and that is only the tip of the iceberg. Abram wades in on everything, from what libraries do well to the next generation of technology. He warns librarians not to dawdle "The strategic window for opportunity for librarians is huge, but keep in mind it won't be open long." (p. 146) His shock factor manner of communicating makes this read an emotional ride and not for the sensitive at heart librarian who is uncomfortable hearing an opinion about what the profession is doing wrong. But this read can be motivational and might spur many to action. Abram always balances his criticisms by emphasizing repeatedly what librarians and librarianship are doing right and how we can correct the wrongs. "Libraries make a difference. Libraries transform lives. Let's never forget that. Let's speak up." (p. 22)

Su Cleyle
Memorial University of Newfoundland, Canada

Subject Librarians: Engaging with the Learning and Teaching Environment

Edited by Penny Dale, Matt Holland and Marian Matthews
Ashgate
Aldershot
2006
xix + 199 pp.
ISBN 0754640957
£50 hard cover
Keywords Librarians, Curriculum subjects

In their introduction the editors remark that the importance of the work performed by subject librarians has not been fully reflected in the literature. Accepting this as a challenge, I searched LISA and found that they were substantially correct. I was initially faced with the problem of which keywords to use in my search. Should I use subject librarians, experts or specialists, knowledge brokers (suggested by one contributor in this book), faculty or department librarians or even the broader term, academic librarian? In the end, I did separate searches for all of those, but was not convinced that I had it completely nailed. In fact, herein lies the problem. In the light of the momentous changes in education and technology over the last ten years or so, what exactly is the role of subject librarians – however we describe this endangered species? Do they exist any more in the old-fashioned sense of experts in a particular subject field who work as information and educational auxiliaries in the higher educational environment?

I was hoping to find answers to some of these questions and to see if there is a future for the subject librarian. The example of the eight recently sacked Bangor subject librarians serves as a reminder that not everyone in higher education recognizes the professionalism and expertise of such specialists. The more I read, the more I realized that it was not actually what subject librarians were which this book is describing but what these librarians should become to remain relevant, serve their constituencies and just survive.

The editors have assembled chapters from a wide variety of mainly UK practitioners to showcase the changing roles of subject librarians. The first chapter is a comprehensive literature review and background study which sets the scene quite nicely in its historical context. The second chapter deals very clearly with the modern issues of "professional engagement" in higher education and touches on the thorny problem of the attitude of academic staff to the involvement of librarians within the learning and teaching process. This process is a natural progression for subject specialists in the new educational environment and is explored more fully in a separate chapter. Other chapters of note include one on librarians' contributions to virtual learning environments and four separate but thematically linked reviews on serving different constituencies: undergraduates, asynchronous learners, researchers and international students. Most chapters contain case studies which are useful and interesting. The overwhelming impression is of a very changed environment where librarians require skills which enable them to do a little bit of everything – contributions to e-learning, planning, liaison, teaching, administration, technical support. In fact, pretty much everything except what a subject specialist was previously known for. Which leads me back to my LISA search and original question, what is a subject librarian?

This book does not really fully answer that question and wanders off-topic in many directions, but is still an interesting and worthwhile read.

Frank Parry
Loughborough University, Loughborough, UK

Organising Knowledge: Taxonomies, Knowledge and Organisational Effectiveness

Patrick Lambe
Chandos Publishing Ltd
Oxford, UK
2007
277 pp.
ISBN 1-84334-227-8
£39-95 soft cover
Keyword Classification

In many ways, taxonomies are a fundamental aid to human existence within a variety of different contexts. For example, in many countries it is important to know and recognise which snakes are poisonous and which are not. The human mind has a remarkable ability to develop and use taxonomic structures. Needless to say, such structures play an important role in many areas of human endeavour, particularly those related to information and knowledge management. Indeed, most people will be familiar with the need to organise files on a personal computer and to classify their "favourite" internet sites using a web browser. Of course, in these situations, each and every individual is likely to use his/her own rules of classification in order to produce taxonomies that meet his/her own particular circumstances. For those who are less well-versed in the basic principles of classification and knowledge management, this book provides a useful introduction to the concepts involved and the derivation (and application) of taxonomic systems for use in various target domains.

There are ten chapters in the book. These are organised logically into two equal parts.

The first part of the book (Chapters 1 through 5) explores introductory issues and provides a foundation and framework for the material that follows later in the second part (Chapters 6 through 10). This latter section of the book has a more pragmatic orientation; it deals with the more practical aspects of designing and implementing a taxonomy project.

The opening chapter of the book serves to define terminology and introduce the basic concepts with which the book deals. The following chapter then discusses the various forms that taxonomies can take (such as lists, tree structures, matrices, system maps, and so on) and the relative merits of each approach. In chapter 3 the author discusses the meaning of organisational effectiveness and explains its dependence on knowledge articulation and knowledge management (KM); taxonomies are then introduced as a KM tool to facilitate the prevention of organisational inefficiency. Chapter 4 examines the broader role of taxonomies in relation to helping organisations to function effectively; a number of case studies are used to illustrate how this goal can be achieved. One of the main objectives of taxonomy work is to simplify access to and management of a knowledge domain. This latter issue is considered in Chapter 5 which addresses the different roles that taxonomies can play within the context of knowledge management.

In Chapter 6 the author surveys and summarises the various functions that taxonomies can perform within an organisational perspective; much of this chapter is devoted to a consideration of the Cynefin framework (based upon known, knowable, complex and chaotic domains) and its impact on the application of taxonomic processes. Subsequent chapters then go on to present a 12-stage approach for creating and controlling taxonomy projects that fall within the known and knowable domains of the Cynefin classification. The various procedures that are involved are organised into three basic phases. The first of these deals with preparatory aspects (Chapter 7), the second is devoted to design and testing issues (Chapter 8) and the third covers implementation considerations (Chapter 9). The final chapter of the book discusses the future of taxonomy work. Amongst the topics considered in this chapter are ontologies (and machine intelligence) the growing use of folksonomies and the future possibilities offered by "spimes".

This book introduces some interesting new perspectives on the importance of taxonomies within organisations – both for the purpose of knowledge management and for improving organisational effectiveness. The claims that are made in the book are well-illustrated and supported by a rich collection of relevant case studies. For people who are new to taxonomy work, this book would undoubtedly be a very useful asset. Established practitioners in this area might also find this volume a valuable "refresher" – especially in terms of the range of case studies that are presented.

Philip Barker

University of Teesside, Middlesbrough, UK