Abstract

Historically, business executives, among all company members, have the least opportunities to interact with computers. Executive information system is the only known mature information system dedicated to business executives. However, in the Internet era, computer-based tools have become essential for executives learning to cope with the competitive market. This paper focuses on an empirical study to build a user-based model for a web executive learning system (ELS) by describing the relationship between the learning preferences and content selection of business executives, and their computer usage, leadership style, and content awareness level. The study reached the following conclusions: (1) leadership style has strong influence on the learning style; (2) content awareness has a weak link to the content selections; and (3) user profile on computer usage provides useful clues at design level to meet the learning preference of business executives. The user profile on computer usage, taken from business executives of employee size between 50 and 200, reveals that (1) these executives are frequent computer users; (2) most of them are willing to give ELS a try; (3) they prefer learning after work; and (4) they are willing to spend, on average, 3 days to learn the web-based learning environment. © 2001 Elsevier Science Ltd. All rights reserved.

Keywords: Human–computer interface; Intelligent tutoring systems; Interactive learning environments; Adult learning

1. Introduction

Recent development in Internet services, such as 365×24 non-stop services, low initial setup costs, no distance limitations, easy access, multimedia presentation, and user-friendly interface,
has greatly increased the accessibility of Internet and further contributes to the popularity of certain IT developments (Yo, 1999). In fact, the Internet and the World-Wide Web have become the core channel of most popular IT developments, such as the electronic commerce, distance learning and digital museum. As a result, many traditional information systems are now switching to internet, intranet or extranet-based, and the user population has expanded to older age groups, non-computer users, low-level operation employees and top management teams.

Business executives make important decisions, such as implementing total quality management (TQM) or undergoing business process reengineering (BPR), which involve and impact the whole company. Most of these decision-making processes rely heavily on some sort of information technology (IT) to help collect, sort, and analyze a massive amount of data. Speed is the major characteristic of Internet era where information exposes and exchanges rapidly. Contents of business intelligence can be obtained easily. For instances, IDC (http://www.idcresearch.com), Ninth House Network (http://www.ninthhouse.com), Business Intelligence Center (http://future.sri.com), Masie Center (http://www.masie.com), Knowledge Center (http://www.knowledgenet.com), McGraw-Hill Lifetime Learning (http://www.mhllifetimelearning.com) are a few examples of online providers of business news, research reports, events and resources. MindLeaders (http://link.mindleaders.com), SmartForce (http://www.smartforce.com.tw) and DigitalThink (http://www.digitalthink.com) are examples of e-learning course providers. These online content providers offer news information, professional knowledge, research reports, and case experiences that are critical to business executives’ routine decisions. Consequently, some executives may make IT-supported routine decisions with the help of their chief information officers, but they still face the challenge of using IT themselves, especially IT-based learning systems for quick information/knowledge acquisition to remain competitive in their business.

Executive information systems (EISs) and executive support systems (ESSs) are the most common information systems dedicated to executives. Although EIS and ESS are used interchangeably, an ESS is regarded as having broader capabilities than an EIS (Rockart & De Long, 1988; Watson, Rainer, & Koh, 1991). Few touched the issues in executive learning (Owenby, 1998; Vandenbosch & Higgins, 1994). EISs and executive learning systems (ELS) address very different supporting needs of business executives, i.e. decision-making versus learning. Both contents and software infrastructure of ELSs can be built in-house or through outsourcing. Ubell (2000) listed four popular e-learning software packages, including Blackboards’ Courseinfo, Lotus LearningSpace, WebCT and Topclass by WBT systems. However, studies of ELS usability are minimum and desire more attention. An ELS design may adopt research or empirical results from the already rich EIS studies, but those studies do not address learning-related issues unique to an ELS, such as instructional methods, learning content selections, and learning preferences.

Web-based learning follows the development of computer-assisted instruction (CAI) and intelligent CAI (ICAI). With an emphasis in matching instructional treatments to learner characteristics and needs, the use of CAL started in mid-1970s, while ICAI evolved later to provide self-directed and self-paced instructions with the help from other fields, such as artificial intelligence and cognitive science (Ragusa, 1994). Instructional design for web-based learning harvests from decades of studies on computer-based learning. Interactivity, learner control, and learner participation are commonly agreed to be some of the key factors that engage most learning. The field of adult learning also contributes greatly to the design of an effective and instructionally sound learning system. However, few of these studies address the learning specifically for business
executives. A study in Australia found “loss of interest by executives” the second major cause of EIS failure. To address this problem, the literature called for a good user-based model to provide an adaptive interactive environment (Pervan & Phua, 1996). Cognitive theorists believe that understanding the process of the mind is fundamental to understanding human learning (Van-denbosch & Higgins, 1994). When studying complex interactive systems, user-modeling techniques are often used to simulate the user’s interactions with the system at design level. Overall, there are not enough studies on ELS to provide a clear link between business executives and the web-based learning system design. This research addresses these issues by building interactions between a user-based model of executive users and the web-based ELS systems. Previous research on computer-based learning and adult learners were used to build a prototype ELS which was then tested by a select group of business executives for applicability. A thorough literature review is presented in Section 2, while the research methodology, data analyses, and a prototype system and the experiment are described in Section 3, 4, and 5, respectively. Section 6 presents the summary and conclusions of the research.

2. Literature review

A couple of studies shed some light on the research questions at hand. For example, TVA University provided synchronous distance learning programs via satellite to executives and senior managers late in the day to minimize impacts on their work schedules. (Owenby, 1998.) Vandenbosch and Higgins (1994) conducted a three-phased empirical study to measure the learning from EIS and had an insightful review on individual learning, mental models and learning, the mental and management literature. Yet strictly speaking, there is no direct ELS reference related to our research topic. This section summarizes the literature on a few concepts critical to this research. These are: leadership/management styles, learning content, learning styles, CAI/ICAI/web-based learning, and user models, which were briefly introduced in Section 1.

2.1. Leadership/management styles

Sauter (1999) included “interface should be tailored to management style of individual executives” as one criteria to be met by an EIS. Leadership or management style is a result of the leadership characteristics, which is the practice of influence. Caudell (1994) did a fair job of summarizing some of the most quoted leadership styles in literature. Different leadership styles have been categorized as autocratic, democratic and laissez-faire, as authoritarian, participative and aloof, as transactional and transformational, and as implementers, problem-solvers, and pathfinders. This study adopted the following classification of leadership styles — exploitative autocracy, kind autocracy, negotiative democracy, and participative democracy (Yu, 1993) — because of the relative ease of distinction between each.

2.2. Learning subject: BPR

For decades, TQM, BPR, time compress, and customer service (Hirschheim, 1985) have been the most important management methods/issues discussed and implemented in the business.
Among these methods, BPR had suffered a high failure rate in many countries (Chander, 1996; Hammer & Champy, 1994; Lu & Lin, 1996; Vandenbosch & Higgins, 1994). Many scholars concluded that insufficient knowledge and the lack of support from the management were two of the main reasons why BPR projects failed or were not implemented (Chander, 1996; MacIntosh & Francis, 1997; Mayer, 1998; Prosci Co, 1999; Vowler, 1995). It is, therefore, reasonable to include BPR as a good candidate subject for executive learning. To better understand the content of BPR, Ho (1999) collected and analyzed the literature and classified them into a BPR tree structure for learning purpose.

2.3. Learning styles

Learning styles are a student’s preferences on how they receive, process and interpret information. MacKeracher (1996) and Magolda (1992) described learning style preferences on a continuum of intellectual development, which has important implications for the design of inclusive learning environment. Campbell (1999) claimed that an autonomous, separated, or independent style typifies the majority of men, and a relational, connected, or interdependent style typifies the majority of women. Rosati (1996) developed an index of learning styles consisting of four pairs of opposites: active vs. reflective, sensing vs. intuition, visual vs. verbal, and sequential vs. global. Zu and Chang (1998) summarized seven learning styles from the literature, which included constructed learning, situated learning, case-based learning, apprenticeship learning, project-based learning, story-based learning, and collaborative learning.

2.4. CAI, ICAI and Web-based learning

Ragusa (1994) analyzed the advantages and disadvantages of CAI and ICAI. Computer-based instructions have the following advantages over traditional classroom instructional methodologies:

1. It uses rich multimedia presentation formats that increase student motivation.
2. Simulation can be incorporated into instruction.
3. Students become active participants in the learning process.
4. Learners can progress at their own pace.
5. Computer-based courses provide consistency of instructions.

The list of disadvantages of computer-based instruction include:

1. It is expensive and time consuming to develop and maintain.
2. Different subjects require new content development.
3. A single teaching strategy is unlikely to meet an individual learner’s needs and preferences.
4. The courseware developer must anticipate in advance many possible student answers and provide branched paths for each.

The primary advantage of ICAI is that the instruction is tailored for each individual student based on embedded heuristics or rules. Also, ICAI technologies have been able to build on contributions from other fields, such as AI, software engineering, and authoring systems. However, ICAI still requires tremendous development time and is usually very expensive. More importantly, the instructional effectiveness of these systems has not been fully validated and remains a controversial issue.
Evolving from CAI and ICAI, Web-based learning is a typical example of distance learning. Moore (1990) pointed out that effective distance learning has five characteristics: deliberate, planned, structure, facilitated by an instructor, and separation of the originator and the learner. Like CAI and ICAI, it employs rich visual media and includes opportunities for human interaction in order to be effective (Owenby, 1998). Ausserhofer (1999) emphasized that a computer-based education system must always be an improvement over traditional education in order to be used. Therefore, features such as interaction, annotations, questioning, discussing, individuality, and activities are necessary to be implemented, which all together are not trivial. Building a Web-based teaching and learning environment is easy, from a technical point of view. However, analyzing, designing, and implementing the contents of an education system are very difficult. Adaptive system is especially non-trivial (Ausserhofer, 1999).

Web page design involves three elements: contents, techniques and user friendliness. Although all three elements are important, user satisfaction is the ultimate indication of the success of system design. In many cases, user friendliness alone leads to higher satisfaction without sophisticated techniques and content. That is why in preparing Web-based learning materials, Kostur (1999) focused on profiling the characteristics of learners, understanding how they learn, mapping the materials to the learners’ needs, evaluating the process, measuring audience’s reaction, and managing the project, all targeted at raising user satisfaction.

2.5. User models

Sun and Newton (1997) helped by presenting an online method for EIS user to configure the information space based on the decision space for retrieving useful information. In their study of the measurement of learning from executive information systems, Vandenbosch and Higgins (1994) claimed that mental models, created out of humans’ prior experiences and understanding as they encounter each task, have significant implications for executive learning. Averbukh et al. (1997) presented a user-model-based design of adaptive human–computer interface. User model comprises information about the users, particularly their anthropological features, professional capacities, psychological features and linguistic aspects. Interface model presents interface parameters to be adjusted to the individual users, such as interaction speed, communication style layout, and level of assistance required.

Most user models are domain dependent; Durrani (1997) presented a domain independent user model that can be adapted in system designs without being affected by the applicable domain. McBride (1995) claimed that there is a need to balance statistical surveys and factor analysis with more detailed, longitudinal case studies on information systems in organizations, which implied combining qualitative analyses into the usual quantitative analyses.

3. Research methodology

The model building process started with formulating the research questions and an initial conceptual user-based model based on the results of the literature review in Section 2. Then this initial model was validated through a statistical survey method and a qualitative prototyping experiment.
3.1. Research questions and initial user-based model

To contain this first user study on ELS within a reasonable scope, only computer usage, leadership style, BPR awareness, learning preference and BPR content were selected as the basic constructs as seen in Fig. 1, which were also used to construct the user-based model. BPR was selected as the executive learning subject in this study for reasons presented in Section 2. In addition to the descriptive statistical analysis of computer usage, three hypotheses were tested as follows:

H₁: Learning preference is independent upon leadership style.
H₂: Learning preference is independent upon degree of awareness of the learning content.
H₃: Learning content selection is independent upon degree of awareness of the learning content.

The operational definitions of leadership style, BPR awareness and learning preference were as follows:

1. Leadership style: autocratic style and democratic style, while autocratic style included two variations — exploitative and kind, and democratic style included negotiative and participative variations.
2. Learning preference: mainly the learning styles of experiential, case-guided and insight-analysis, while experiential learning included story-based and situated variations, case-guided included case-based and apprenticeship variations, and insight-analysis included constructed and project-based variations. Collaborative learning was not considered in this research of an individual-learning setting. Other learning preference items were used to assist the design of a prototype ELS only.
3. BPR awareness: low and high, while low indicated an executive had little or no knowledge or experience of BPR, and high indicated the opposite.

3.2. Research design

The questionnaire was designed based on a five-person initial interviews and related references, then it was modified according to the suggestions of a selected group of decision-makers and experts. Also, a test–retest method was administered to three subjects who completed the questionnaire twice within 3 weeks. A good validity score of 0.89 was achieved.
Likert’s five-point scale was applied to appropriate questions with scores one to five representing very low, low, no opinion, high, and very high. The questionnaire was divided into four parts: leadership style, BPR theory and practice, computer-assisted learning method and personal preference, and BPR contents. According to the research structure in Fig. 1, descriptive statistics, chi-square test and ANOVA were used to analyze the collected data. The target population was executives from medium-sized enterprises where executives were most likely to be in modernized and computerized environment, yet without enough staff to gather and learn information for them. Thus, the survey was administered to business executives of 500 manufacturing companies in Taiwan with employee size ranging from 50 to 200 people, randomly drawn from the online database of the Ministry of Economic Affairs, Republic of China. The questionnaire contained 50 questions, which took about 15 minutes to complete.

4. Data analysis

A total of 72 questionnaires came back, but only 63 of them were valid, which equated to a 12.6% response rate. SPSS 8.0 was used to analyze the data.

4.1. Descriptive analysis

4.1.1. Computer usage

Seven issues were studied in the computer usage section, and the analysis of each follows:

4.1.1.1. Willingness of trying out ELS. Fifty-six (88.9%) of the subjects were willing to try out ELS for learning new knowledge in business management, which was extremely positive in the era of information technology. Busy work routines or limited computer skills might explain why the remaining six (11.1%) showed low interest in trying out ELS.

4.1.1.2. Learning curve of new information systems. How long would the subjects tolerate to facilitate the ELS? Fifteen subjects (23.8%) agreed on a 3-day average. Among the subjects, the overall average was 8.8 days with the shortest being a half day and the longest 60 days. This result seemed to be in contrast to common expectation since, similar to using EIS systems, the shorter the learning curve the better. The main reason for this unexpected result could be the lack of confidence in the executives in their computer skills, which caused them to be conservative in estimating the learning period.

4.1.1.3. Frequency of computer usage. Forty-five subjects (71.4%) reported to be everyday computer users, while only a low percentage of subjects used computers once a week or less. Since the target companies were small to medium sized, their executives were often younger and highly computer-literate. This result was within expectation.

4.1.1.4. Most often used computer functions. The biggest computer usage, reported by 40 (63.5%) subjects, was the Internet. Evidently, most business executives did not exclude themselves from the mighty influence of the Internet. The Internet, in addition to all other praises placed upon it
by the literature, had contributed greatly to the frequent usage of computers by the executives, which was a very promising notion to this study.

4.1.1.5. Learning approach for BPR. The highest percentage of respondents (42 subjects, 66.7%) preferred attending a conference or a short class to learn BPR, compared with 37 (58.7%) subjects who chose ELS as a flexible alternative for learning BPR by busy executives.

4.1.1.6. Critical factors for choosing the learning approach. When choosing the learning approach, 39 (81.9%) subjects considered the effectiveness of learning, and 35 (55.6%) voted for time arrangement.

4.1.1.7. Time frames for learning. Fifty (79.3%) subjects preferred learning during after-work hours, which confirmed that executives were too busy to allocate time for learning during normal work hours.

4.1.2. Leadership style
Fourteen (22.2%) subjects rated themselves as having autocratic leadership style, and 49 (77.8%) subjects democratic leadership style. Most business executives were inclined to use democratic leadership style.

4.1.3. Degree of BPR awareness
Seventeen (27%) subjects were classified as having low degree of BPR awareness, while 46 (73%) were high, which meant many executives already possessed basic understanding of BPR concepts.

4.1.4. Personal learning preferences
There were 21 (33.3%) subjects who preferred experiential learning; 22 (34.9%) preferred case-guidance learning and 20 (31.8%) preferred analytical learning. The result indicated that business executives were evenly scattered in learning preferences.

4.2. Chi-square tests on \( H_1 \) and \( H_2 \)

4.2.1. Learning preference vs. leadership style
Based on the hypothesis \( H_1 \): Learning preference is independent upon leadership style, Table 1 calculates \( \chi^2 = 4.566993 > 3.84 \) which rejects \( H_1 \). Therefore, learning preference is related to

<table>
<thead>
<tr>
<th></th>
<th>Experiential</th>
<th>Case-guided</th>
<th>Insight-analysis</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Autocratic</td>
<td>2</td>
<td>3</td>
<td>9</td>
<td>14</td>
</tr>
<tr>
<td>Democratic</td>
<td>21</td>
<td>23</td>
<td>5</td>
<td>49</td>
</tr>
<tr>
<td>Total</td>
<td>23</td>
<td>26</td>
<td>14</td>
<td>63</td>
</tr>
</tbody>
</table>

\( ^a \alpha = 0.05, \chi^2 > \chi^2(0.95,1) = 3.84. \)
leadership style. As shown in Table 1, most autocratic leaders prefer the insight-analysis learning method which was the least favorite of the democratic leaders.

4.2.2. Learning preference vs. degree of BPR awareness

Based on H2: learning preference is independent upon degree of BPR awareness, Table 2 calculates $\chi^2 = 0.02437 < 3.84$ which does not reject H2. Therefore, degree of BPR awareness has no effect on learning preference.

4.3. ANOVA analysis on H3: BPR learning content vs. degree of BPR awareness

Let $\mu_1$ be the expectation of BPR content selection of low BPR-awareness executives, and $\mu_2$ the expectation of high BPR-awareness executives, then the hypothesis can be presented as H3: $\mu_1 = \mu_2$. The ANOVA analysis of the 10 BPR learning subjects is shown in Table 3.

When the $F$ value is smaller than $F_{1,61} = 4.00$, H3 is accepted, thus the BPR subject is needed by both executive groups having low and high degrees of BPR awareness. As shown, every subject is accepted except the item “proper application of information technology”. Because the result is nine vs. one in favor of the H3, it is weak to claim the relationship between executives with different degree of content awareness and their learning content selections. On the other hand, the study only divided the executives with various degrees of content awareness into high

Table 2
Learning preference vs. degree of BPR awareness

<table>
<thead>
<tr>
<th></th>
<th>Experiential</th>
<th>Case-guided</th>
<th>Insight-analysis</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low awareness</td>
<td>6</td>
<td>6</td>
<td>4</td>
<td>16</td>
</tr>
<tr>
<td>High awareness</td>
<td>17</td>
<td>20</td>
<td>10</td>
<td>47</td>
</tr>
<tr>
<td>Total</td>
<td>23</td>
<td>26</td>
<td>14</td>
<td>63</td>
</tr>
</tbody>
</table>

$\alpha = 0.05, \chi^2 > \chi^2_{(0.95,1)} = 3.84.$

Table 3
ANOVA analysis of BPR learning content vs. degree of BPR awareness

<table>
<thead>
<tr>
<th>BPR Subject</th>
<th>F-value</th>
<th>Reject H3 at $\alpha = 0.05^*$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common crisis</td>
<td>0.381</td>
<td></td>
</tr>
<tr>
<td>BPR myths</td>
<td>0.006</td>
<td></td>
</tr>
<tr>
<td>BPR beliefs</td>
<td>0.036</td>
<td></td>
</tr>
<tr>
<td>Powerful leadership</td>
<td>0.334</td>
<td></td>
</tr>
<tr>
<td>BPR team members selection</td>
<td>0.007</td>
<td></td>
</tr>
<tr>
<td>Practical and feasible BPR blueprint</td>
<td>2.193</td>
<td></td>
</tr>
<tr>
<td>Important preparations of BPR</td>
<td>2.220</td>
<td></td>
</tr>
<tr>
<td>Innovative beginning</td>
<td>0.020</td>
<td></td>
</tr>
<tr>
<td>Proper application of information technology</td>
<td>4.392</td>
<td>✓</td>
</tr>
<tr>
<td>Precious experience sharing</td>
<td>0.020</td>
<td></td>
</tr>
</tbody>
</table>

$^*\text{Critical value } F_{1,61} = 4.00.$
and low groups. The nine vs. one ratio may change if analysis was done by dividing the population further into four groups with the two content awareness variables, knowledge and experience, each having high and low values.

5. Prototype system and experiment

Based on the statistical data analysis in Section 4, the user-based model is finalized as in Section 5.1. A qualitative evaluation of the user-based model is also applied in Section 5.3, based on the prototype system implemented in Section 5.2.

5.1. User model

Fig. 2 presents the user-based model for ELS systems. The user-based model includes a user model and an interface model. The user model contains user profile on computer usage, leadership style and BPR awareness, while its counterpart, interface model, contains learning preferences and BPR content selections. The user-based model shows the connections between the user-model components and the interface-model components:

1. user profile on computer usage provides useful clues at design level to construct the system containing learning preferences elements. Learning preferences include learning styles, self-composed learning contents and multimedia presentations.
2. leadership style has strong influence on learning preferences.
3. BPR awareness has no effect on learning preferences.
4. BPR awareness has a weak link to the BPR content selections.

The summarized user profile on computer usage shows:

1. business executives of companies with an employee size between 50 and 200 are frequent computer users;
2. web-based learning environment is not the first choice of business executives’, but since Internet is the top reason for using computers, most of them are willing to try out ELS;
3. most business executives prefer learning after work due to their busy daytime schedule, which can be arranged due to the flexibility of web-based learning; and
4. business executives are willing to spend, on average, 3 days to learn the Web-based learning environment, but the actual time spent should be much less since most of them are already Internet users.

5.2. A prototype Web-based ELS on BPR

The BPR prototype ELS system was simplified and the system and interface designs were primitive. The focal point of the system design is to provide business executives with a flexible interactive learning environment. Description of the prototype follows:

1. the prototype system adopted Ho’s (1999) two-layer BPR knowledge structure. The top layer is shown in Table 3 and is circled in Fig. 4.
2. The prototype system provides four different learning styles, namely, experiential, case-guided, quick introduction, and insight-analysis. Quick introduction and insight-analysis styles are similar except that quick introduction is a shorter version of the insight-analysis style.

3. As shown in Fig. 3, a set of five simple questions were asked for assessing the leadership style of the users, the answer (in circle A) was then matched to the corresponding learning style (in circle B) derived from the survey statistics. Although our analysis did not reveal distinct connections between leadership types and learning styles, it did show a tendency of democratic leaders favoring experiential and case-guided learning and autocratic leaders insight-analysis learning. In order to assist business executives to quickly select a proper learning style, subjective heuristics were added to automate the mapping process as follows:

![User based model diagram]

Fig. 2. User based model.
4. Business executives were asked to answer the following questions with a check on a three-point scale ranging from low to high:

- Question (1). How would you rate the degree of trust you place upon your staff?
- Question (2). How would you rate the frequency of your staff coming to you for a discussion?
- Question (3). How would you rate the degree of participation your staff presents in the decision process?
- Question (4). How would you rate the frequency of your staff being severely punished for their mistakes?
- Question (5). How would you rate the frequency of you accepting your staff’s suggestions?

Each answer was assigned a numerical score. To questions (1), (2), (3) and (5), a “low” answer accounted for one point, “average” accounted for two points and “high” accounted for three points on an autocratic-democratic leadership style continuum. Scores of the answers to question (4) were reversed. The system calculated the scores and mapped the learner to an experiential style if the score was above twelve, a case-guided style if the score was above nine, a quick introduction if the score was six, and an insight-analysis style for everyone else.

5. Business executives reviewed the two-layer structure of BPR menu as seen in Fig. 4 (circle B) and selected only the parts desired for learning. Consequently, the learning screens were customized to their personal needs.

6. Multimedia presentation was applied to the experiential learning style (see Fig. 5). JavaScript was used in HTML Web pages to present PowerPoint-like animation for the experiential
learning style. However, only background music was added to enhance the learning atmosphere and to retain business executives’ learning interest; sound effect and verbal introduction were not used in the prototype.

7. Interface design principles were applied throughout the systems (Figs. 3–5). Many design principles can be applied together, but they may conflict with each other or show only marginal effects (Newman & Lamming, 1995). Therefore, the central usability idea was to provide a simple, concise and consistent environment for business executives. To stay within the guideline of simplicity and conciseness, the system adopted a course presentation style that mimicked PowerPoint presentation, a style which most business executives were familiar with, and without unnecessary graphical decorations. Guideline on consistency was achieved by organizing presentations for different learning styles around the same BPR contents and using the same PowerPoint or PowerPoint-like presentations.

5.3. Evaluation

A 30-min experiment was conducted with five business executives who were videotaped while working on the prototype BPR Web-based ELS. The subjects were asked to learn BPR via two of the three approaches: learning guidance, self-constructed contents or the subject directory as seen in Fig. 4 (circle A). They were interviewed after the experiments and their thinking-aloud learning processes were later transcribed for a protocol analysis. Because verbal protocol and interviews were combined to collect users’ response, this evaluation was able to acquire both in-depth objective and subjective user data. However, the tradeoff for this approach was that it was extremely time-consuming to acquire and analyze each set of user data. Therefore, only five
business executives were tested and the results of qualitative data analyses were presented for assessing the effect of the proposed user model.

Overall speaking, the acceptance and satisfaction of the prototype system were high from both the interviews and the protocol analysis. Some of the qualitative analyses are summarized as follows:

1. All five subjects agreed in their interviews that it would be an average system without the flexibility in learning interactions.
2. All subjects showed no problems using the user interface and admitted in their interviews that it took less than 30 min to learn to operate the Web-based ELS.
3. In the protocol data, it was observed that most subjects viewed all three approaches and enjoyed trying out these options.
4. The learning contents were not as attractive as the learning options for most of the subjects.
5. Most subjects showed high interest in the experiential learning style. Two subjects indicated in their interviews that more multimedia effects would be better even on bulleted texts.

We intended to demonstrate that a carefully designed system and interface could enhance the usability of a system with average contents and non-sophisticated programming techniques, and thus raise the satisfaction of the targeted users. The qualitative evaluation seemed to favor our intention, even though the subjects did desire better contents and richer presentations.

6. Conclusions and summary

The survey results confirmed the hypotheses as follows: (1) leadership style has influence on learning preference; (2) learning preference is not related to perceived content awareness; (3) perceived content awareness does not affect content subject selections.
We also built a prototype Web-based BPR learning system, and conducted a usability test with five business executives. The initial tests indicated that interested business executives were satisfied with the prototype ELS that was developed based on an appropriate user-based model. It is reasonable to expect that this user-based model can be applied to other management topics, such as total quality management, electronic commerce, knowledge management, etc. to prepare business executives for the increasing challenges in their daily routines.

The research concept in this study was not complete or unique. For example, the over-simplified prototype did not allow much learner participation during the course of experiment. Although the learners did have control on selecting and maneuvering through the contents, the prototype was not able to provide sufficient interaction to engage deeper processing of the contents. Furthermore, due to the limitation on the scope of the study, the learning of the five executives on the prototype web-based ELS was not tested. The authors call for further theoretical and empirical studies to build adequate knowledge of ELS system at design level.

References


