

EVALUATION OF A WEB-BASED COMPETENCY ASSESSMENT SYSTEM: A PROTOTYPING APPROACH IN TAIWAN

ESTUDO DE UM SISTEMA DE AVALIAÇÃO DE COMPETÊNCIAS BASEADO NA INTERNET: UMA ABORDAGEM PROTOTÍPICA EM TAIWAN

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RESUMO

Uma pesquisa de avaliação de necessidades válida, que contemple toda a organização, é um necessário precursor do desenvolvimento de competências. Este trabalho sintetiza um quadro referencial para que se faça uma efetiva avaliação de necessidades para o desenvolvimento de competências e introduz uma eficiente ferramenta baseada na Web para gerenciar o processo. O sistema integra pesquisa tipo levantamento com coleta de dados *on-line* e técnicas de análise de *gaps*. Um protótipo do sistema foi testado de modo a avaliar o sistema e metodologia propostos. Uma avaliação do protótipo com experientes Gerentes de Recursos Humanos de Taiwan demonstrou uma aceitação geral do modelo e, prontidão para adotar ferramentas que aumentem a eficiência no desenvolvimento de competências organizacionais.

ABSTRACT

A valid organization-wide needs assessment is a necessary precursor to successful competency development. This paper summarizes a framework for an effective needs assessment for competency-based development, and introduces an efficient web-based tool to manage the process. The web-based competency assessment system integrates survey design and on-line data collection with gap analysis techniques. A prototyping evaluation is conducted to assess the acceptability of the proposed framework. The evaluation of a prototype system by a group of Taiwan's experienced human resource managers showed a general acceptance and readiness in adopting efficiency-enhancing technologies to develop organizational competencies.

PALAVRAS-CHAVE

Avaliação de competências, Avaliação de necessidades de treinamento, Automação, Sistema baseado na internet.

KEYWORDS

Competency assessment, Training needs assessment, Automation, Web-based system.

INTRODUCTION

The notion of a resource-based perspective in a new knowledge economy reinforces the idea of employees being the most important asset to an organization (Wernerfelt, 1984; Barney, 1991; Priem & Butler, 2001). Human resource departments in many companies were compelled to look for ways to increase human capital (Kessels, 2001). One viable way to increase a company's human capital in order to gain competitive advantage is through carefully implemented HR practices such as training and development, performance evaluation and planned manpower changes (Schuler & MacMillan, 1984; Lado & Wilson, 1994; Huang, 1999). Training, especially, is an important strategic practice in the development of internal competence. Training activities preceded any knowledge management practices currently in fashion as the primary means to transfer programmed organizational knowledge and "know-how's" to employees. However, unlike knowledge management practices, there seems to be a lack of efficient use of or coordination in modern technologies in training related processes.

A needs assessment which occurs during the initial planning and analysis of a training program, is the most vigorous and important step in the training and development process. The accuracy of the analysis determines the legitimacy and effectiveness of training program design and subsequent deliveries in the latter stages of the training process. There are various ways to determine employees' developmental needs. The most commonly used method is survey questionnaires to the employees and their managers measuring the employees' competence level. However, as with any survey research, this method in its traditional manner is extremely tedious and time consuming, and requires a certain level of analytical expertise from the human resource development (HRD) professionals. Most companies without adequate in-house HRD personnel either do a sloppy work, or don't do it at all, consequently compromising the efficacy of any training and development activities.

This paper summarizes a conceptual model for effective training needs assessment, and presents an efficient web-based tool to assist HRD professionals in the needed analysis. The proposed web-based training needs assessment system was further validated by a selected group of experienced human resource managers in Taiwan. The later sections of the paper describe the evaluation process as well as managers' suggestions for improvement.

THEORETICAL BACKGROUND

Competency-based perspective

Identifying and developing organizational core competencies is a viable approach to build competitive resources. Lado & Wilson (1994) defined organizational competencies as "firm-specific resources and capabilities that enable the organization to develop, choose, and implement value-enhancing strategies." These resources and capabilities "include all firm-specific assets, knowledge, skills, and capabilities embedded in the organization's structure, technology, processes, and interpersonal relationships." They are often referred to as "core competencies" because they are basic to firm survival (Baghai, et al, 1999), and a critical element for many companies to gain competitive advantage in their business (Kessels, 2001).

Companies can buy core competencies but, to maintain sustainable competitive advantage, it is better to develop them internally. Researchers and academics have also attempted to suggest a list of common "core competencies" (Lado & Wilson, 1994; Baghai, et al, 1999), but adopting the whole list would defy the notion of resource uniqueness. Hafeez, et al. (2002) suggested a structural method using collectiveness, uniqueness and strategic flexibility as criteria to identify core competencies. Once identified, a systematic way to developing, maintaining or upgrading these core competencies is through competency-based training. (Lado & Wilson, 1994)

Training needs Assessment

Training resources, like other resources in the organization, are limited. To utilize training resources to the best advantage, companies must put a fair amount of effort in training needs assessment. Gilley & Eggland (1989) defined need as "a gap between a current set of circumstances and some changed or desirable set of circumstances", and needs assessment as the process of "measuring (as scientifically as possible) or appraising that gap."

Results of a needs assessment can be used in a lot of areas. They have been documented to "help curriculum planning, diagnose individual problems, assess student learning, demonstrate accountability, improve practice and safety, or offer individual feedback and educational intervention." (Grant, 2002) The most widely accepted application of needs assessment is to ground training and development efforts to specific organizational objectives. Without a clear understanding of needs, organizations' training efforts may completely miss the mark resulting in a total waste of valuable resources. There is also a psychological merit to doing needs assessment. Because the process involves employees and management, a well-executed needs assessment also increases credibility and support for the design of the subsequent training program among those who participated. (Gilley & Eggland, 1989)

In 1961, McGehee & Thayer cornered the core framework of needs assessment as consisting of three levels of analysis: organization analysis, operations analysis, and man analysis. Today, researchers and practitioners still abide by the three-level framework although terms may have changed over time—operations analysis is now task or work analysis and man analysis is individual or person analysis. (O'Connor et al, 1996, Holton III, Bates and Naquin, 2000) The most effective needs assessment should take into consideration all three levels of analysis starting from the organization level.

Methods of Needs Assessment

There are numerous reported "methods" for assessing needs in the literature. Gilley & Eggland (1989) believed that the ways, strategies, and schemes which were normally referred to collectively as "methods" may aggregate to a total of 20 or 30. Grant (2002) diagramed 46 formal and informal methods of self assessment from The Good CPD Guide. Among those, Grant listed formal needs assessment methods often used to identify group needs, which include critical incident techniques, gap analysis, objective knowledge and skills tests, observation, revalidation, self assessment, video assessment, and peer review. Gilley & Eggland also pointed out six most useful methods in human resource development including interviews, questionnaires, tests, group problem analyses, records and report studies, and job analysis and performance reviews.

Although the literature generally reports only on the more formal methods of needs assessment, HRD practitioners use a wide range of formal or informal ways of identifying training needs as part of their ordinary practice. Depending on the method used, the needs data collected can be categorized as "felt needs (what people say they need), expressed needs (expressed in action), normative needs (defined by experts), and comparative needs (group comparison)." (Grant, 2002) Among those, the "felt-needs" methodologies, which usually ask employees to simply list or rank desired training courses, have often been used to assess needs of large numbers of employees. (Holton III, Bates and Naquin, 2000) However, this approach is also most criticized for not being able to gauge true needs because employees usually don't know what the organizational objectives are and often report "wants" instead of "needs".

Gap analysis, though not commonly practiced in assessing training needs, is actually a widely

used tool for assessing discrepancies between “what is” in reality and “what was intended to be” in many fields. (Kochhar et al., 1991; Bannister & Jesuthasan, 1997; Khan & Hafiz, 1999) It is a formal method to quantify discrepancies and has the added advantage of prioritizing assessed items to expedite action planning. When used in assessing competency-based training needs, gap analysis “involves comparing performance with stated intended competencies-by self assessment, peer assessment, or objective testing”. (Grant, 2002) Data collection for gap analysis is usually administered via a survey-type questionnaire to the employee, the employee’s manager, or other intended personnel.

Automated Needs Assessment Tools

There is a general lack of development and practice in technology-assisted training support. Guo (1989) advocated that though companies may adopt various training models or processes, they all need to establish a training information system as a reference for determining an effective training plan. However, a 1998 survey indicated that among regular human resource information system (HRIS) functions, adoption rate for employee training and development was merely 30%, which was only higher than the 25% adoption rate for employee relations and 16% for diversity programs (Greenard, 1999).

Advances in web technologies in recent years provide a promising new avenue for the development of training support applications. Attributes such as instant communication and capability to send information back and forth without errors are two important advantages of incorporating web technologies in training needs assessment. Meade (2000) emphasized that web-based HRIS software provides self-service convenience to the employees and managers via Internet for mutual

communication. Pettit (1999) explored using World Wide Web (WWW) for conducting a psychology questionnaire and concluded that WWW is a viable method for data collection because it is easy, quick, and with few errors. However, organizing the web pages did take a lot of time, which can be easily supported by questionnaire design tools (Tao and Yang, 1999).

A FRAMEWORK FOR COMPETENCY-BASED TRAINING NEEDS ASSESSMENT

In light of the competency-based perspective, Yeh (2000) developed a comprehensive needs assessment process for competency-based training. The framework contains three stages of a competency-based training assessment process with specific output items signifying each stage: 1) competency identification stage, 2) gap identification stage, and 3) training curriculum design stage.

As seen in Figure 1, the first stage of the process starts with identifying the company’s vision, mission, business strategies, and most importantly the company’s core competencies. These steps assure that core competencies will support company strategy in order to fulfill corporate vision and mission. After company core competencies are identified, a task analysis is conducted to further identify required knowledge, skills and abilities/attitudes (KSA’s) of each respective competency. Then needs assessment is conducted to measure the gaps between “expected performance” and “actual performance” of an employee on each of the required knowledge, skills and abilities. Finally, after ruling out non-trainable gaps, the HRD professional plots the training curriculum for each employee by filling each individual gap with a learning activity. This training needs assessment process was adapted as the framework of this research and the skeleton of the proposed prototype system.

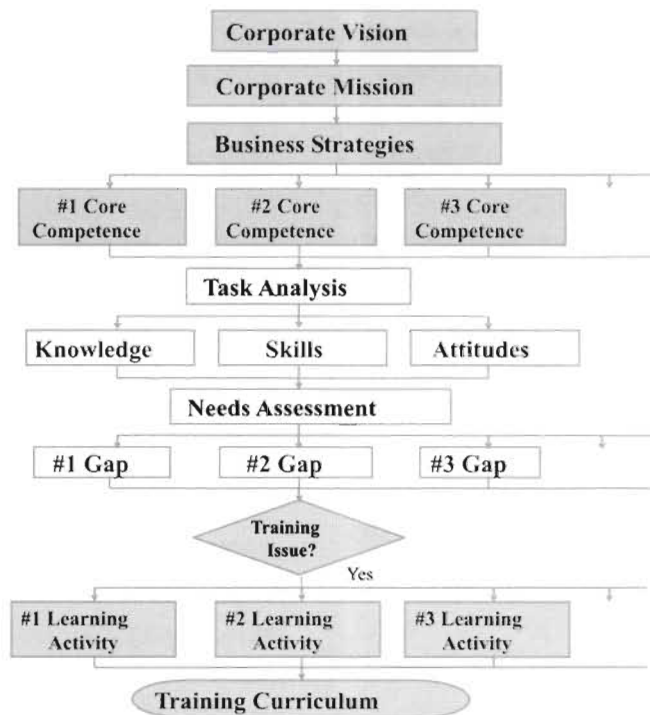


Figure 1. Competency-based training development process
Source: YEH (2000)

SYSTEM DESCRIPTION

The framework provides an effective competency-based approach to planning a training program. This research converted the above conceptual model into an automated process with necessary activities for the HRD professional to accomplish the task of analyzing training needs. A supporting web-based environment is then constructed to assist the HRD professional to design the training curriculum more efficiently. The functional structure chart as shown in Figure 2 illustrates the five modules for training needs assessment, which includes 1) employee data management, 2) core competence management, 3) survey questionnaire management, 4) needs assessment management, and 5) information management.

The employee data management module, which includes basic employee data (e.g., name, title, department, e-mail, etc.) and their training

records, is regularly updated through routine HR management activities. The system can also retrieve these data from a subset of a larger HRIS. The core competence management module stores the most current competence data identified by the company using a competence identification process similar to what we described in figure 1. Accompanying each competence is the associated KSA's resulted from a task analysis.

The survey questionnaire management module includes questionnaire design, online questionnaire fill-out and questionnaire delivery sub-modules. This is where the training needs assessment task is initiated and administered. The questionnaire design sub-module assists the HRD professionals by generating a questionnaire template with questions matching the KSAs stored in the core competence management module. Once finalized, the questionnaire is posted online with the online questionnaire fill-out sub-module. The HRD professional then selects and sends the ap-

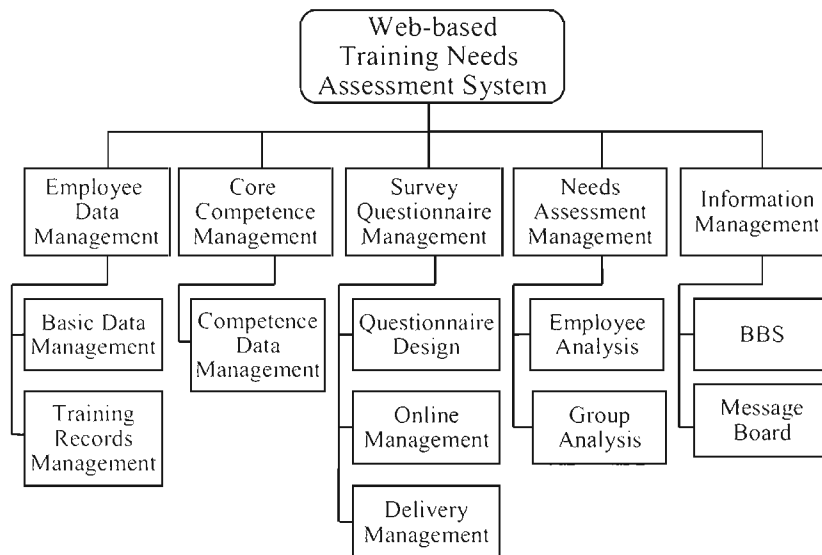


Figure 2. Functional structure chart

Source: The authors

appropriate personnel and their managers an electronic notice and survey instruction through the delivery sub-module which accesses employee contact information from the employee data management module.

Once the questionnaires are completed online, data is automatically collected and stored in a database. Using the employee analysis and group analysis sub-modules, the needs assessment management module accesses the survey data, calculates the competence gaps, reports these gaps for an individual employee or a group of employees, and recommends appropriate training. The information management module includes BBS and message board sub-modules, which HR professionals can use to disseminate or discuss training related information.

Selander and Cross (1999) proposed a two-stage process redesign analysis, which includes process mapping and value analysis, to evaluate the improvements and cost-savings of the new process. This research adopted their ideas by first laying out the process of traditional/manual training needs assessment, identifying the tasks and errors that were not value added, and then dele-

ting them in the new process. The proposed web-based prototype thus attempts to increase the effectiveness of the HRD professionals by relieving them from some of the tedious, time-consuming, and repeated tasks in training needs assessment procedures, which include designing, printing, and mailing the training needs questionnaires; collecting returned questionnaires, coding and entering the data, calculating survey results, and matching employee needs to training classes. (See Figure 3.) Most of these tasks are not value-added, and can be converted to an automated process. With the proposed web-based system the needs assessment tasks are minimized to a few key strokes. Once the needs questionnaire is finalized, all the HRD professionals have to do are posting the questionnaire, setting up the mailing list, scheduling the survey, selecting the mode for calculation, and matching intended training classes to needs questions; the computer would then do the rest. Figure 3 compares the procedure using the proposed prototype against that of the more traditional, manual method on the four phases of a needs assessment process (i.e., task analysis, data collection, data analysis, and training recommendation).

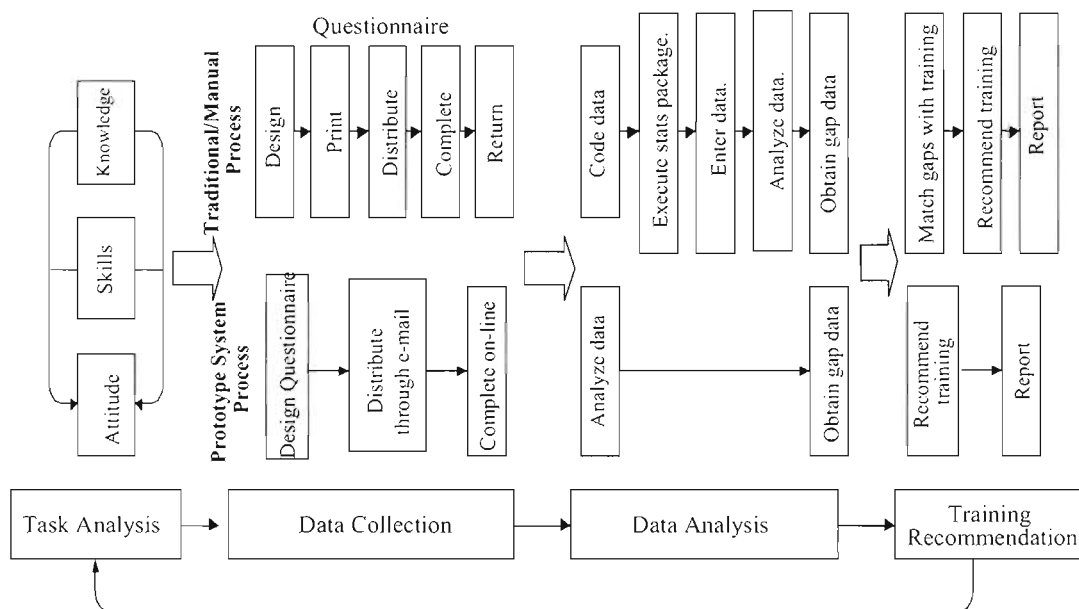


Figure 3. A comparison of a manual needs assessment process and the prototype system process

Source: The authors

The web-based environment is designed to assist the HRD professionals to effectively perform training needs assessment with the aid of intranet technology in the company. The proposed prototype does not replace the role of a training expert. That is, a HRD professional still needs to be skillful with the tasks of a training needs assessment, but the proposed web-based information system will make the execution of the process faster, easier and with less data handling error.

EVALUATION OF THE WEB-BASED PROTOTYPE SYSTEM

5.1. Validity Testing

The prototype system was implemented using MS IIS 5.0 web server, ASP web programming language and MS Access 2000 database. (See figures 4 and 5) The prototype went through a two-phase evaluation process to establish its validity and effectiveness.

Phase one—Quantitative measures

The purpose of this phase-one evaluation was to gauge the validity of the competency-based needs assessment model and the prototype system from a practical standpoint. We looked for experienced HR practitioners as our study sample because they were most qualified to judge whether the system was valid to use in the field as a needs assessment tool. We carefully selected a class of experienced managers who were registered in a MIS (Management of Information Systems) course offered through the HRM program in a major university in Taiwan. Thirty-one managers participated in the study, most of whom had experience in training related jobs.

The complete process of a needs assessment using the prototype system was demonstrated in the MIS class. The demonstration took 40 minutes followed by a 20-minute Q&A. Then the class was asked to fill out a questionnaire. The questionnaire was composed of demographical questions and

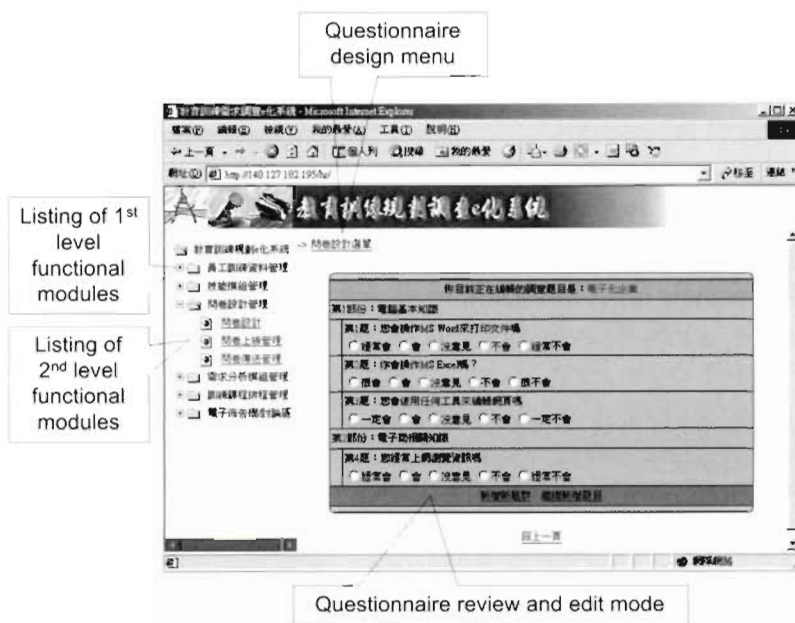
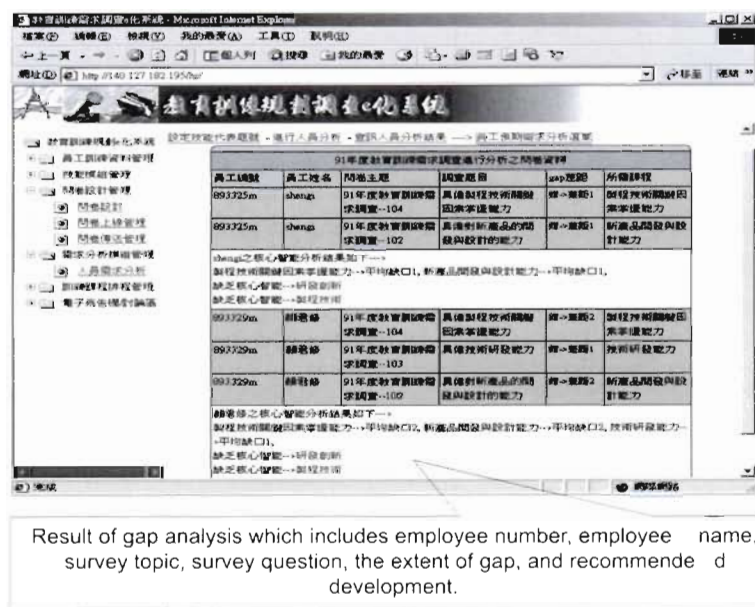


Figure 4: Sample survey design screen from the prototype system

Source: The authors



Result of gap analysis which includes employee number, employee name, survey topic, survey question, the extent of gap, and recommended development.

Figure 5: Sample gap analysis result screen from the prototype system

Source: The authors

several measures of validity using a Likert-type scale of 1 to 5 (1 means strongly disagree and 5 means strongly agree).

The respondents' demographic characteristics are shown in table 1. The gender was balanced between males and females. While a majority

(61%) had more than ten years of working experience, respondents were normally distributed on the six categories of the length of training-related experience. Although 68% reported working with a company that employed training and development personnel, only 50% of respondents believed that

their company regularly conducts needs assessment. The profile of the respondents fit the purpose of our research nicely, and responses on their company's training function were within expectations.

Table 2 presents the results of the validity measures. Respondents showed positive reactions toward each of the seven measures. The concept of a competency-based training needs assessment received most favorable ratings, followed by the

use of gap analysis to assess these needs. Respondents were also impressed with the ability of the system to shorten operation time required of a competency-based training needs assessment.

Phase two—Qualitative measures

The purpose of this second-phase evaluation is to measure the effectiveness and the usability of the prototype system. To this end, we conducted

Table 1: analysis of demographic data

Demographic Variables	Categories	Frequencies	Percentage (%)
Gender	Male	16	51%
	Female	15	49%
Work Experience	None	0	0%
	1 year and below	0	0%
	Above 1 yr to 3 yrs	1	3%
	Above 3 yrs to 5 yrs	2	7%
	Above 5 yrs to 10 yrs	9	29%
	Above 10 yrs	19	61%
Training-related Work Experience	None	3	10%
	1 year and below	6	19%
	Above 1 yr to 3 yrs	9	29%
	Above 3 yrs to 5 yrs	4	13%
	Above 5 yrs to 10 yrs	5	16%
	Above 10 yrs	4	13%
Company has training and development personnel	Yes	21	68%
	No	10	32%
Company regularly conducts training needs assessment	Yes	15	50%
	No	15	50%

Source: Research Data

Table 2: Results of validity measures

Validity Measures	Mean	S.D.
1. Accept the concept of a competency-based training needs assessment	4.23	0.88
2. Accept the concept of using gap analysis to assess training needs	3.84	0.90
3. The system effectively assist the planning phase of a competency-based training	3.32	0.94
4. The system simplifies the process of a competency-based training needs assessment	3.48	0.93
5. The system shortens operation time required to conduct a competency-based training needs assessment	3.71	0.97
6. The system effectively expedites the transmission of training needs assessment information	3.65	0.91
7. The system makes analysis results of employees' competence gaps more accessible to HRD professionals	3.48	1.06

Source: Research Data

one-on-one interviews with three training and development managers after they had experienced the operation of the prototype system hands-on.

The three T&D managers were from different industry background. Manager A was a T&D manager for a major department store and had 8 years of working experience in HR-related functions. Manager B worked as a T&D supervisor for a government agency for more than 10 years. Manager C was in charge of training for an area hospital and had 3 years of HR-related experience. Each manager received a 10-minute introduction of the competency-based training needs assessment model, then worked through each of the five modules of the prototype system to complete a hypothetical needs assessment process. The hands-on experience took 15 to 20 minutes, followed by a 30-minute semi-structured interview. (See table 3 for a complete list of interview questions.)

Similar to the findings in the previous survey, all three managers agreed that the web-based prototype system provides a good model to assess employees' training needs, reinforces the concept of competency-based training, and simplifies the analysis stage of a planning process for training. While the training managers were positive about the effectiveness and the time saving prospects of the system, they also stressed the importance of customization to realize these benefits. The extent of customization included company organization and communication channel, a company-wide competency databank, training curriculum, process linkage to training course registration and administration, etc. Concerns of employees mistaking a training needs analysis to performance evaluation were raised. Though not a system problem, one of the managers-Manager C-suggested adding this message to the survey: "For development

Table 3: Interview findings

Interview Questions	Results	Improvement Suggestions
Do you agree with the concepts imbedded in the prototype system?	Positive	
Will the system facilitate the use of competency-based training needs assessment in your company?	Positive	- Customization is required prior to implementation.
Will the system help save time in planning employee training?	Positive	
Will the system simplify the assessment process for employee training?	Positive	- Provide choices of analytical tools
Is the system effective in assisting a competency-based training needs assessment?	Positive	
Effectiveness of questionnaire management module: Design? Dissemination? Collection?	Positive	- Automatic confirmation when message is received by the receiver. - Provide stats on send, reply and follow-up status.
Effectiveness of needs assessment module in quantifying employees' competence gaps?	Positive	- Stress "the survey is for developmental purpose only, and will not be used in performance evaluation"
Is the prototype system easy to follow and user-friendly?	Positive	- Provide system maps and on-line instructions.
Aesthetic appeals of the screen display: Consistency? Appropriate placement and size of text and graphic?	Positive	
Legibility, accuracy and flow of contents in the system?	Positive	- Provide option to setup the order of how respondents fill out the questions. - Remind respondents of missing answers.

Source: The authors

purpose only, and will not be used in performance evaluation" to minimize the possibility of employees sending falsified information.

In terms of the functionality of the system, the managers suggested the following improvements:

- Provide multiple methods for data analysis or allow exporting of data to other statistical program for further data manipulation.

- Send an automatic confirmation when the survey is received by the intended employee.

- Provide better tracking mechanism, such as status on send, reply and follow-up.

- Provide better navigation functions, such as backtrack, system maps and on-line instructions.

- Provide options to setup the order of how respondents fill out the questions.

- Remind respondents of missing answers.

IMPLICATIONS AND CONCLUSION

We have presented a conceptual model in training needs assessment to assist organizations in their pursuit of competitive core competencies. We have also designed a web-based prototype system based on this conceptual model to improve the efficiency and effectiveness in collecting and analyzing competence data for training and development purpose. Neither the competency-based training approach or the needs assessment method is new to seasoned HRD professionals. But these concepts are rarely implemented in the real world (Selmer, 2000) because the processes required are both tedious, and time-consuming. (Gilley & Eggland, 1989; Goldstein, 1993; Guo, 1987)

This study contributes to the organization's information service practice in several ways. First, it revealed a general perception among HR managers that there was a lack of effective tools in the tasks of training needs assessment. Second, it showed that HRD professionals did recognize the power of web technology in helping them become more efficient. Lastly, it proved that a web-based training needs assessment system for competency-based training, like the one designed for this study, was well-received by the HRD professionals.

Because of its versatility, the proposed prototype system can be used with any kind of survey instruments to determine deficiencies of any subject under investigation (e.g., cross-cultural understandings, technical skills, product knowledge, etc). It is designed to efficiently manage organization-wide as well as departmental and group assessments. It also has a high potential of serving as a testing tool for selection. Just enter any test items which can be answered with a Likert-type scale and pre-program the desired answers in the "expected

level". The system will automatically calculate the gap between a job candidate's test score with the desired answer for each test item. The application is not limited within the HR functions. Using similar approach, the system can also assist in analyzing knowledge deficiencies in an organization for knowledge management purpose.

The goal of this research was to demonstrate how web-based applications improve the effectiveness of a very important HR function. Future work includes the enhancement of the conceptual model and the prototype structure with various activities commonly seen in a practical training process, and an expansion of the prototype to include the upstream of hiring and the downstream of evaluation related to human resource management. ➤

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