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A Study of HR-XML Based Competency Measurement System

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Abstract: The development of modern information systems and the increasing popularity of the cloud service fore-Recruitment and Selection system has become a new trend for the businesses. However, the majority of the human resource agencies analyze job seekers by considering just their personality, career, interests and work values. Such an analysis makes it difficult for employers to estimate the fitness between jobs and job seekers. To address this challenge, this study will first consider how to combine competency model and gap analysis for building a competency measurement system which is developed a HR-XML based e-Recruitment and Selection system. It enables employers to set job duties and competencies in the system, and then the system calculates the gap and suitability to recommend suitable candidates to employers for further interview. The system produces an ordered selection list for the employers.

Key words: competency measurement system; HR-XML; e-recruitment and selection
JEL codes: M12, M15

1. Introduction

In order to enhance the competitiveness of enterprises, the employees' competency must be upgraded. Training requirements for various levels of employees vary when the business organization strategy changes.

The content and implementation of internal training program and performance evaluation, can be adjusted rapidly by competency-oriented human resource management and functional analysis of knowledge, skill and ability, providing enterprises with more accurate criteria of selection, training and evaluation.

The enterprises can maintain flexibility and competitive advantages in the competitive environment. In the present information age, the competitive advantage of enterprises is derived mainly from "finding appropriate competency for the company". Therefore, good management of human resources is the key to the success of enterprises. The industrial competition for competency is always an important issue, for the enterprises, it is increasingly difficult to recruit new employees of suitable competency, and excellent quality as the recruitment will influence the success or failure of various functions of subsequent organizational human resource management (Barber, 1998).

Finally, this study considers combining the view of competency model with the gap analysis of competency appraisal to construct a competency measurement system. The enterprises can use this system to release duties and set the competencies for duties, so as to carry out competency gap analysis for the existing job seekers and to

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calculate the duty fitness score. Moreover, the enterprises can adjust the requirement for competency degree adaptively considering the average competency degree of all job seekers, so that the system generates a suitable list for the enterprises to select.

2. Literature Review

2.1 HR-XML with Application

HR-XML is developed by the HR-XML Consortium to formulate a standard for data communication between companies, for adoption by the entire human resource (HR) community. HR-XML is based on XML (eXtensible Markup Language), a language for data interchange on the Web. That can best be explained by comparing with HTML. HR-XML will increase the efficiency of information flow up and down this HR supply-chain. The emphasis in human capital management is shifting towards viewing Human Resource processes as a part of a supply-chain, linked together electronically through Web-based applications. HR-XML will have an influence on the development of the most agile applications. Besides, enterprise recruiting will be able to integrate more fluidly with the whole corporate HR strategy.

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Model group reference (not shown): DocumentIDGroup [0..1]
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</CompetencyDefinitions>
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Figure 1 HR-XML 3.0 Competency

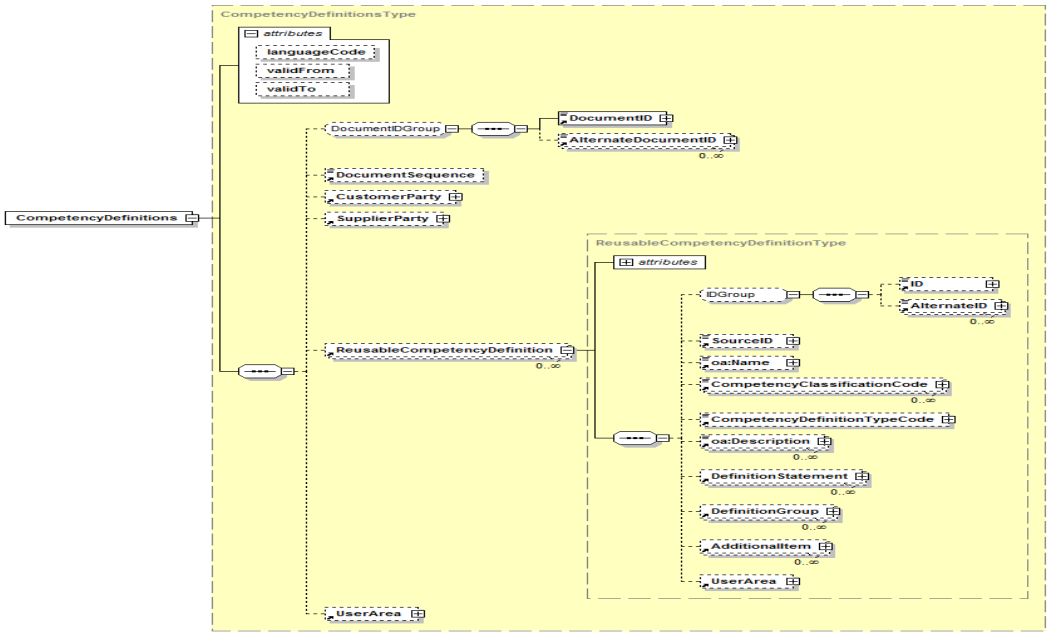


Figure 2 HR-XML Standard of Competencies 3.0

Source: http://www.hr-xml.org

HR-XML is widely used by many enterprises. Implementing HR-XML into human resource management will make data exchanging more quick and efficient. Applying HR-XML to develop competency analysis system can base on attributes of knowledge, skill, ability, psychometric and certification. Using HR-XML will strengthen information exchanging on internal and external human resource of enterprises.

There are five application areas for the HR-XML identified in the recent research, which includes HR-XML standard (Lima, 2002; Todd, 2004), competency definition (Onjira et al., 2007; Panayiotis, 2007), data exchange and integration (WORKFORCE, 2000; Jill, 2000; Maria, 2001; Chuck, 2001; MERitCredit, 2010), system development and improvement (Joe, 2002; Jürgen, 2006; Vladimir, 2006), and education learning (Demetrios, 2009). The analysis of the research literature revealed that “exchange and integration”, “system development and improvement”, “competency definition” and “education learning” are more recent trends in this area.

The competency definition includes competency model, competency description for various enterprise or organizations. The competency management enables the enterprise to manage and develop the skills to recruit the most appropriate candidates, make effective succession planning and employee development plans (Fotis et al., 2008).

2.2 Competency Management System

Fotis et al. (2006) indicated that “the areas of open standard (XML, web services, RDF), semantic technologies (ontologies and the semantic web) and portals with self-service technologies are going to play a significant part in the evolution of CM systems”. Ontology capabilities leading to the semantic web appear to be becoming a core future technology. As a result, ontology-based models of competencies can present a tight integration of capabilities and information in a highly contextualized user interface. At the same time, different services and components may be loosely coupled through a dynamic architecture whose coherence is ensured via a common semantic model in a rich competency ontology.

Macris (2008) presents the ontology-based competency model for the banking domain to develop a business process activity assignment policy. This model is also used to define domain-specific training courses that enable users to meet the competency requirements of process activities. Sicilia (2005) adopts HR-XML for Semantic Web to implement ontology based competency management. This approach focuses on the description of organizational learning based on competency management. However, the effectiveness of learning for process of competency search, matching and analysis needs to be evaluated by these non-dynamic learning mechanisms.

De Meo et al. (2007) proposed XML-based multi-agent recommender system, their proposed approach uses XML files for presentation and information exchange. The multi-agent system takes into account jobseeker’s interest and past historic searches to process selection algorithm. Oscar et al. (2015) proposed Multi-agent and recommendation environment to improve the e-recruitment process. Their paper adopted an HR-XML ontology standard for map-ping CVs. The multi-agent system adopt information exchange, which enables decision making system for case-based reasoning module to select and to recommend for jobseekers and recruiter job advertising.

The above mentioned approaches adopt multi-agent to implement the matching for jobseekers and recruiter jobs, the first approach just adopts XML for information exchange, and the second approach adopts HR-XML. HR-XML ontology can provide scalability in the different systems and platforms.

3. The Methodology and System Development

The research framework of the information system consists of environment and knowledge base which

supplement each other. In order to improve the fitness of job seekers for competency appraisal, the competency gap analysis has been provided in this study, in an attempt to continuously, improve the competency appraisal system, and help the job seekers to obtain more appropriate information.

The information system is developed using PHP and JavaScript. HR-XML is standard that covers a wide range of HR process and specification to be stored and retrieved data. The SQL database stores job, competency, competency difference and calculated job fitness for the employer and job seeker. The competency gap analysis and fitness analysis calculation can be generated from these data in SQL database.

The workflow of information system is described by six steps process for the competency analysis is shown in the Figure 3.

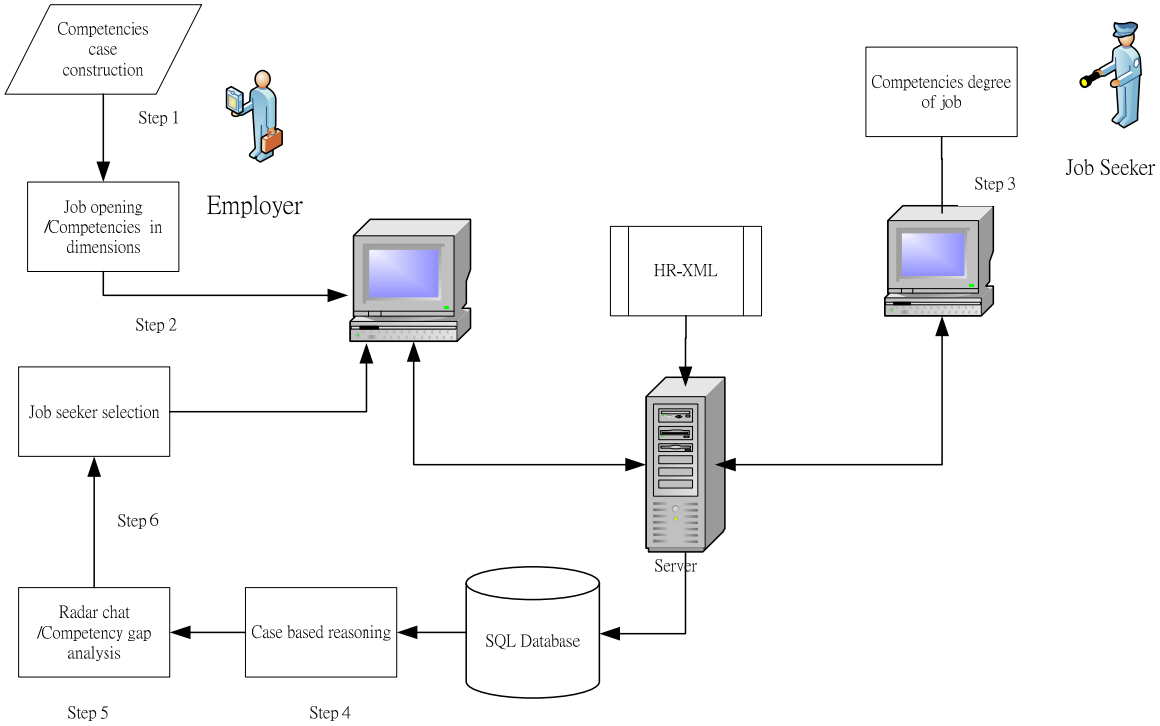


Figure 3 Workflow of Proposal Information System

Step 1: Competency base construction

The employer can create the competencies for jobs to construct the competency base.

Step 2: Job release

The enterprise selects the required competency for the job from the competency base and makes related requirements of the competency in order to look for talents competent for a job. Figure 4 represents enterprise creates job titles, and give dimensions for the competences in Figure 5.

Step 3: Job seeker fill in form of job competency degree

The system compares the job seeker's competency degree with the competency degree requirement of the job. This study obtains the competency degree of actual job seeker by implementing 7-point Likert questionnaire appraisal. Figure 6 represents job seekers fill in the 9 job requirements of competency degree.

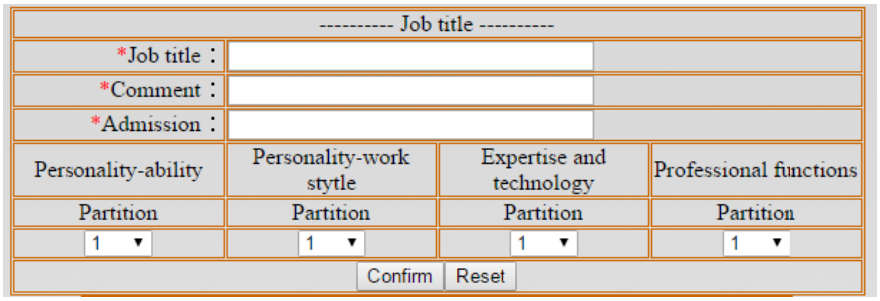


Figure 4 Job Creation

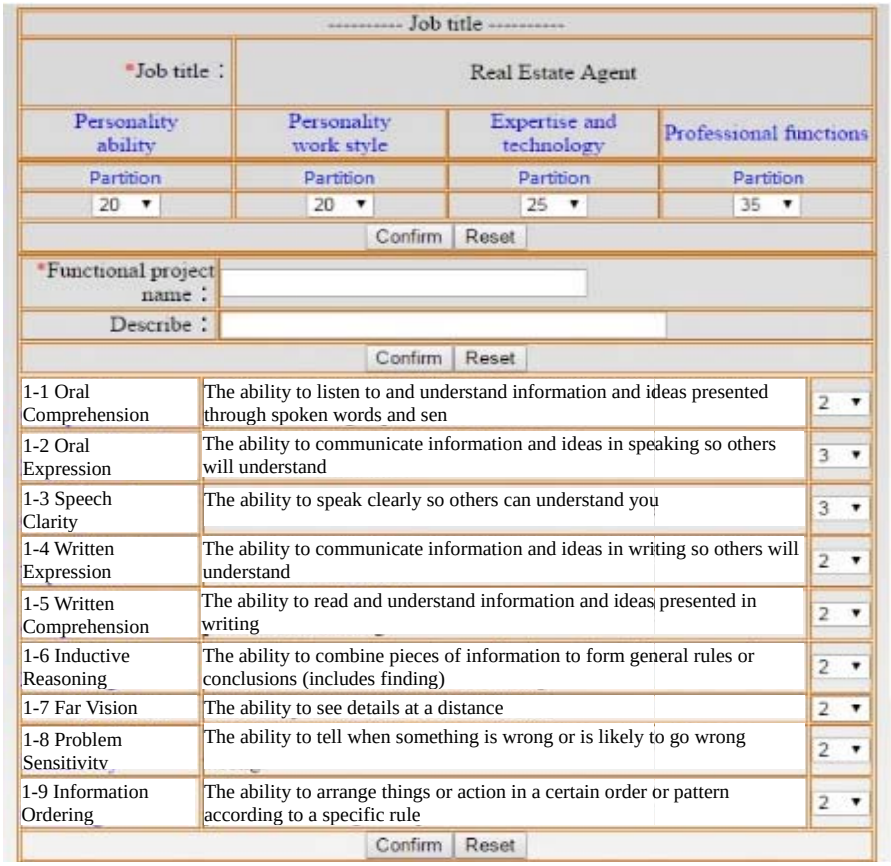


Figure 5 Competencies in Dimensions

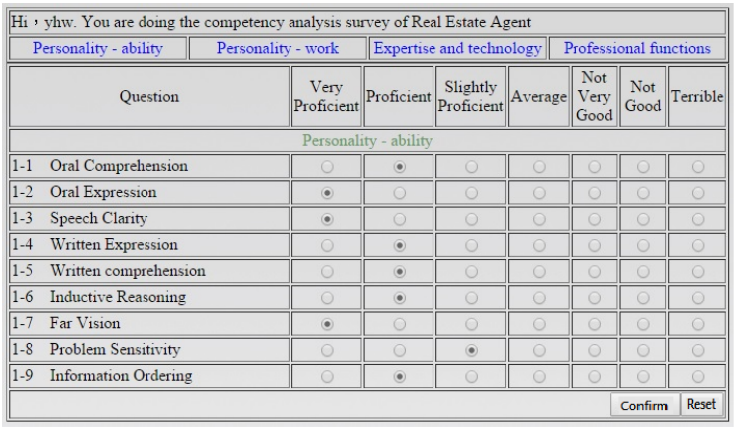


Figure 6 Job Seeker to Fill in

Step 4: Nearest-Neighbor Retrieval:

The Nearest-Neighbor retrieval method is used in this study; the new input case will be compared with the cases in the case base according to its eigenvalue. The similarity is calculated by a similarity function. Furthermore, an integrated similarity value can be obtained by defining the weight of each attribute. The cases are retrieved according to the similarity between cases, the attribute of input case is compared with the attributes of cases in the case base, and the weight of case attribute is used to calculate the total weight of similarity between the input case and the cases in the case base. The similarity equation is expressed as follows:

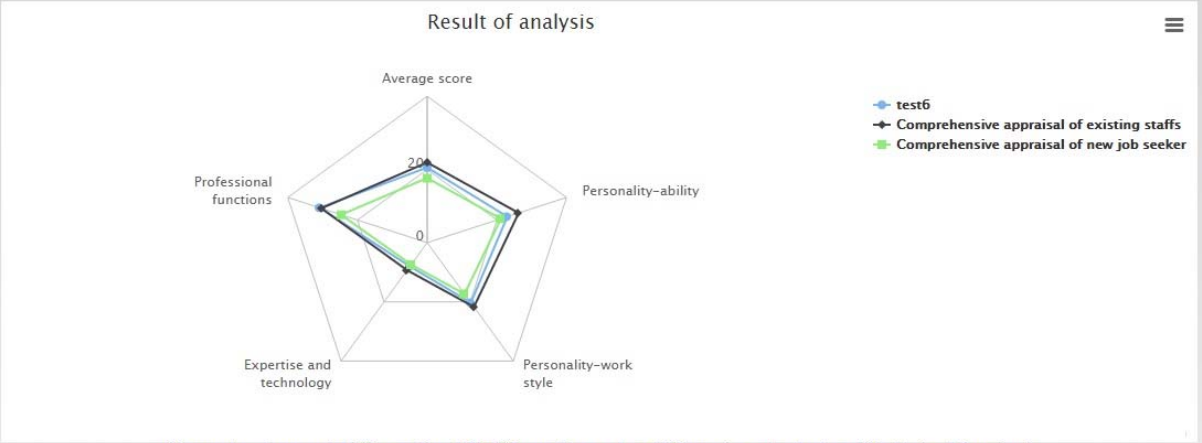
$$Similarity(T,C) = \frac{\sum_{i=1}^{n} W_i \times Sim(f_i^T, f_{ji}^C)}{\sum_{i=1}^{n} W_i}$$

$Similarity(T,C)$ represents the similarity between target case T and case C of case group, the larger the value is, the higher is the similarity between the input case and the current case.

Step 5: Competency analysis-radar char with competency gap analysis

The analysis result is generated after the job seeker finishes filling, the job seeker can see his score and the overall appraisal of competency score of current employees as reference, including the mean and median of competency dimensions, and can know the mean score gap between him and other job seekers. The score of comprehensive appraisal is converted from the original dimension weights set by the company manager according to the scores of four dimensions. According to different weights of dimensions, the job seeker with equivalent ability performs more excellent than others in the specific preference dimension of company, more likely to be recommended.

The system executes competency gap analysis for the job seekers according to the required competency degree requirements for the job. Therefore, the result of reasoning is more coincident, the employer considers the competency degree of current job seeker, and then checks the similarity and correlation between job cases to adjust the requirement for competency degree, so that the job releaser of employer adjusts the requirement for competency degree (see Figure 7).



[Comprehensive appraisal][Personality-ability][Personality-work style][Expertise and technology][Professional functions]

Score of comprehensive appraisal 82.143

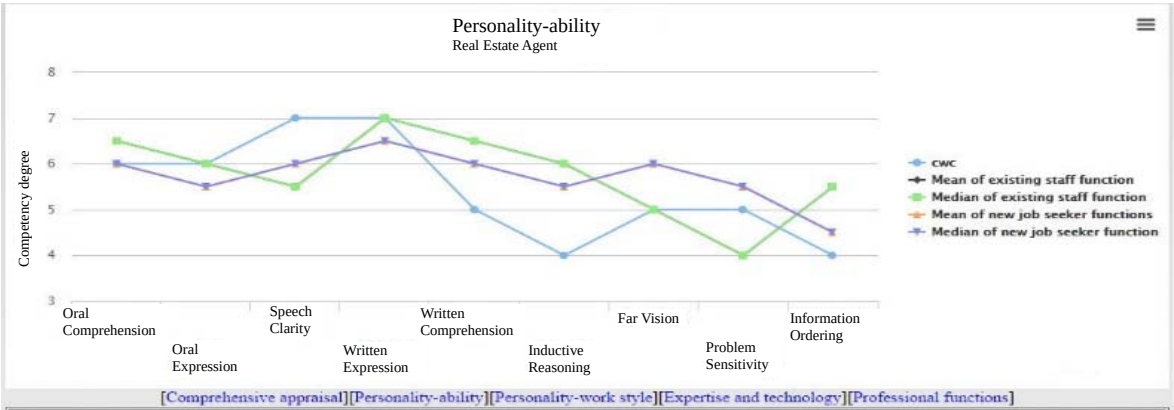
Personality -ability	Personality -work style	Expertise and technology	Professional functions	Average score
23.000	20.286	8.000	30.857	20.536

Figure 7 Analysis Result

Step 6: Job seeker selection

The system calculates the fitness of all job seekers for the job according to the adjusted competency degree requirement, and generates a list for the employer, and the competency appraisal system based on HR-XML standard generates an appropriate job seeker selection list for the enterprise gradually.

The administrator can see the detailed competency data of job seekers from the background, as well as the complete result as basis of choosing talents. The system lists and draws line chart and histogram of the score of comprehensive appraisal of job seekers. The lower form works out the scores according to the competency data of the imported employees and arranges them according to distance, the minimum competency score distance is the system recommended job seeker. The system administrator clicks personal competency condition according to the system recommendation to see a single job seeker and the existing employees, the median and mean gaps of these job seekers, and it then observes and judges whether the job seeker is a talent for the company (see Figure 8).



[Comprehensive appraisal][Personality-ability][Personality-work style][Expertise and technology][Professional functions]

Real Estate Agent

	Functional project name	New job seeker function	Mean of existing staff function	Median of existing staff function	Mean of new job seeker function	Median of new job seeker function
1-1	Oral Comprehension	6	6.50	6.5	6.00	6
1-2	Oral Expression	5	6.00	6	5.50	5.5
1-3	Speech Clarity	5	5.50	5.5	6.00	6
1-4	Written Expression	6	7.00	7	6.50	6.5
1-5	Written comprehension	7	6.50	6.5	6.00	6
1-6	Inductive Reasoning	7	6.00	6	5.50	5.5
1-7	Far Vision	7	5.00	5	6.00	6
1-8	Problem Sensitivity	6	4.00	4	5.50	5.5
1-9	Information Ordering	5	5.50	5.5	4.50	4.5

Figure 8 Background Personal Analysis Result

4. System Validation and Test

The purpose of the system evaluation in this study is to provide a reference for enterprises to screen talents. The user test is presented below:

In order to prove whether the system can answer precisely to the requirement of every user, the user's expectation for the system quality and the user demand for system function can be found with the assistance of auxiliary means. This standard divides the quality model into six quality characteristics, including functionality,

reliability, usability, efficiency, maintainability and portability. The user's acceptance in the system quality and the deficiencies in system can be known by applying the standard, so as to improve the system to meet the user requirements.

The questionnaire was designed according to six dimensions of ISO/IEC 9126, the questionnaires were sent to 30 respondents, including webpage programmers and product division employees. The Likert 7-point scale is used for dimension item questionnaire appraisal. According to the questionnaire result, most of means of this system in various dimensions are above 4, meaning that the testers are mostly satisfied, the Q4 efficiency is very satisfactory. The questionnaires result shows that the users have positive attitude towards the system performance indicating that the system actually conforms to ISO/IEC 9126 software quality criteria and meets the user demand. The following table shows the mean and standard deviation of sub-dimensions of six major dimensions of questionnaire:

Table 1 Questionnaire Analysis Result

	No.	Content	Mean	Standard deviation
Functionality	1-1	System has appropriate functional items meeting user's view and specific assignment requirement	4.25	1.56
	1-2	System provides correct analysis result and appropriate suggestion	4.08	1.39
Reliability	2-1	System can protect data from being modified by unauthorized persons	4.28	1.47
	2-2	System can prevent abnormal conditions from misoperation	3.97	1.65
	2-3	System gives warning of operation mistakes	3.93	1.74
Usability	3-1	The user can know the use and usage of system rapidly from description	3.94	1.47
	3-2	System layout is clear and legible	4.08	1.84
Efficiency	4-1	User can log in system quickly	4.28	1.81
	4-2	System can reflect user demand instantly (skip page, register, enter data)	4.37	1.38
Maintainability	5-1	System program error can be diagnosed and repaired quickly	4.26	1.32
	5-2	System can make appropriate modification for different users	4.02	1.41
	5-3	Local correction of system does not influence the operation of overall system	4.17	1.33
	5-4	The data of system adjusted according to user demand can be used for result validation	4.43	1.29
Portability	6-1	System can be installed in specified environment and work normally	4.21	1.61
	6-2	According to the developers' installation instruction, the system can be installed and used successfully in specified environment	4.01	1.62
	6-3	System coexists with other software in the same execution environment for resource sharing	4.15	1.67

5. Conclusion

In the global and rapidly changing economy, mastering human resources has become an important factor for enterprises to maintain competitiveness. With the concept of global village and internationalization of enterprises, the talents of enterprises will be more important. Therefore, it is important to be able to know how to attract and retain talents with appropriate knowledge, techniques and abilities. The application of HR-XML standard and e-recruitment and selection are feasible and promising. Therefore, the HR-XML standard is certainly the spirit of human resource application for presenting the macro thought of internationalization and standardization thoroughly. This study constructs a competency appraisal system which can be adjusted dynamically, so that the system can learn, and the enterprises can use this system to release jobs and set the competencies for the jobs. The competency difference can be analyzed and the job fitness can be calculated for the existing job seekers, and the

enterprises can adjust the competency degree requirement adaptively while considering the mean competency degree of all job seekers, then the system generates a suitable list for the enterprises. The job seekers can find the competency gap to specific jobs, and the enterprises can use the competency base to release jobs and make related competency requirements, so as to find the job seekers matching the competency requirements. In summary, this research provides an exploration of competency integration between HR-XML and human resource management, furthermore, proposing the new infrastructure has given the new direction for HR system development in the future.

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