Recruitment Agency Based on SOA and XML Web Services

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***Abstract*—The objective of this research was to develop a recruitment agency system via web services technology that aims at interchanging electronic data between applications via SOAP (Simple Object Access Protocol) protocol based on XML language (eXtensible Markup Language) structure, which is compatible with different operating systems, devices and programming language for development. The system provides more opportunity for finding like-minded jobs for users with less response time, reducing the amount of storage and increasing the usefulness of the recruitment system's application development. The system assessment has been done with both information technology and human resource specialists as the users. Results of assessments represent the system's efficiency in mean and standard deviation. The assessment by information technology specialists is lower but the efficiency is more consistent with a mean of 4.04 and a standard deviation of 0.43 while common users evaluated the system with a mean of 4.40 and a standard deviation of 0.63. In summary, the overall of efficiency of the system is at a good level.**

***Index Terms*—recruitment agency system, Xml web services, Xml resume**

I. Introduction

Nowadays, there are many unemployed and employed people who use the internet for seeking jobs in conformity with their needs and their educations from many websites providing job seeking services and human resource management personnel from several organizations utilize this online media in order to connect to job seekers (persons or group of person who wish to work in those positions) [1] by entering data and details by the management personnel and job seekers and they could communicate between them instantly, making rapid interview procedure; moreover, taking decision regarding acceptance is convenient, fast, time-saving and acceptance that is done immediately in case all requirements are met. However, most job-seeking websites are developed in the form of web application as "Business to Customer" or B2C causing a lack of data sharing and transfer in order to conduct another "Business to Business" or B2B process or "Application to Application" or A2A, all of which could not enter the data fast and conveniently, such as job seekers have to fill in same personal information in every time in case they want to leave their information in job seeking websites in order to increase the chance in selection. In this case, data redundancy in applicant data is occurred causing wasting in data resource and job seekers are unable to leave adequate information causing decreasing of chance in selection; in addition some university or education institute are developing integrated service system for students making them get a job. Therefore, application system of university must connect with job seeking website in order to find job source for students and etc. The researchers have conducted a survey regarding general job seeking websites and found that most websites provide free-of-charge services in some parts of services and the surveyed websites do not utilize open-source technology causing inconvenience in data exchange as these websites are still based on human submitting data to the websites all the time, as well as, function and data submitting to several devices, such as pocket PC resulting in unavailability to do so. There is only a website: Jobsdb.com in Thailand providing RSS service for conducting data update in job application.

Nowadays, application development applied SOA or "Services-oriented Architecture" and web services technology utilizing SOA model and web service technology utilizing SOA model. The word: service-oriented means small dedicated function or application but as sub-software waiting for assembly not large package software. As for the word: architecture means system design architecture of organization stating the needs to utilize system of organization and the design will be done in the form of sub-function possessing an ability in specific function and waiting for function assembly. SOA model makes a change in development models running with internet network creating SaaS or "Software as a Service" [2] which is a system development utilizing service assembly via network and service users do not need to develop their service for use by themselves as they could request for service or lease. At the present time, this type of service is called as "Cloud Computing".

In this way, the researchers have selected web services technology to utilize in job and personnel-seeking system development from the advantages of web services possessing distributed computing resulting in electronic data exchange between application and application via SOAP or "Simple Object Access Protocol" utilized XML language to be able to exchange and transfer in case of different operating system (OS) and developing language, as well as, data exchange in different devices

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conveniently and high flexible in display. From this technology, it increases chance rate in job and personnel discovery and decreases resource usage in data storage from network and data exchange and advantage in other application development related to job and personnel seeking as the change in job seeking atmosphere via new online media in order to be able to support application for rapider communication and more efficient data exchange.

II. OBJECTIVES

- To systems analysis and design prototype for Recruitment Agency System based on SOA and XML Web Services include assessment prototype developed by experts in human resources and information technology specialists.
- Implementation of a software according to the prototype of Recruitment Agency System based on SOA and XML Web Services.
- To measurement and evaluation systems Recruitment Agency System based on SOA and XML Web Services developed by Black Box Testing methods used by professionals, human resources and information technology specialists.

III. LITERATURE REVIEW

Recruitment agency system based on SOA and XML web services has a main objective as to make human resource data exchange convenient and fast by decreasing human involvement and to be able to use shared data from other source automatically increasing chance in job and personnel discovery, as well as, to increase efficiency and decrease working procedure in job application.

In order to obtain the data to utilize in web services development to be able to provide efficient service, the researchers have conducted a study and research development model, theory and relevant technology related to system development as follows:

A. Web Services Technology

Applications as web services are able to function in program language standard using in development or its platform; however, it can "communicate" with or sending message with other applications or web services not based on standards and technologies of other platform (Platform Independence) for the benefits in data exchange and shared services not to depend on human to decode such communication, as well as, requesting for implementing function application of programs called RPC or "Remote Procedure Call" making computer to communicate and exchange in the way of data and process [3].

Web services utilizes architecture model of SOA which means small dedicated function or application but as sub-software or sub-function waiting for assembly not large package software. SOA model makes a change in the ways how models running with internet network will be developed by SOA as Fig. 1.

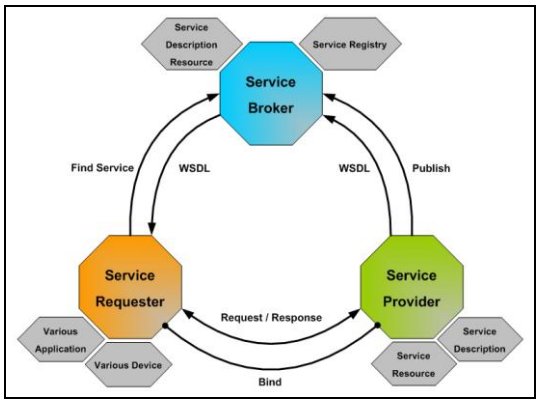

Figure 1. Service-Oriented architecture: SOA.

In the application functions regarding web services, the service or service function must be described by XML language will be coded in the form of WSDL or "Web Services Description Language" to be able to understand such web services. It will utilize XML language to communicate on existed HTTP protocol infrastructure by the assembly of XML language and HTTP protocol or SOAP or "Simple Object Access Protocol" and when web services development is occurred for usage, then such web services have to distributed for partners or users to be able to log in for using service [4]. As for distribution, it will be done in 2 standards such as UDDI or "Universal Description Discovery and Integration" and DISCO or "Discovery". An overview of web services function technology is as Fig. 2.

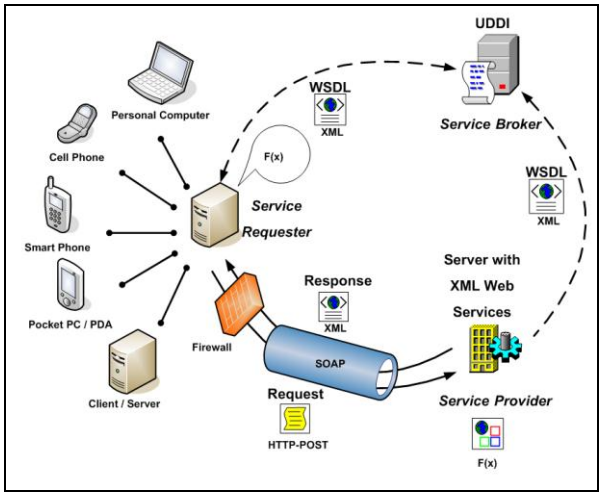

Figure 2. Web services technology.

B. XML Language

XML Language is a programming language for define data that makes users to able to create and keep documents. XML language is the language that has document structure created by XML language (structured documents). Plain text is contained within the document resulting in possibility for rending in several forms. The main purpose of XML is a data section for the benefits in usage with development or programs or other applications [5]. Main structure of XML language is divided into 3 parts as follows [6][7]:

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1) Prolog is a head in declaration divided into 2 parts, that is a version of XML language for correct decoding according to this language and document type declaration which could include rule in documents with XML language or call DTD or "Document Type Definition" as well.

2) Body is a part of actual content and tag as in this part will be contained with tagged data to define such data which use document structure according to principle and grammar of XML language.

3) Epilog is a part acting as a review or comment and PI or "Processing Instruction". As in this part, it is not necessary to be at the end of document as it could be included in body part.

From the description of document created by XML language, it could be demonstrated as Fig. 3.

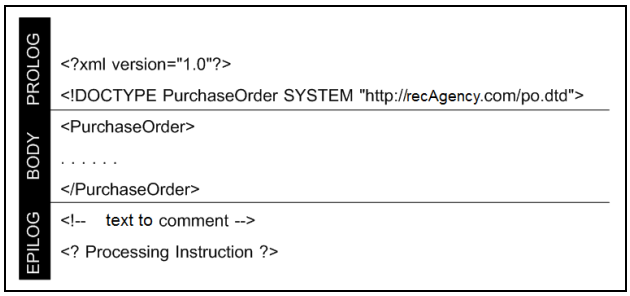

Figure 3. Main structure of XML language.

IV. Research Methodology

Research methodology is for conducting a study and developing efficient recruitment agency based on SOA and XML web services. The researchers have selected "Object-Oriented Model: OO" and UML language or "Unified Modeling Language" in system design. The research methodology is divided into 4 steps in details as follows:

A. Study and Former System

In research methodology and recruitment agency system development based on SOA architecture and XML web services technology, the researchers have conducted a study and analysis in relevant system related to job application via internet network.

As researchers has planned and collected data of former system used in the present time. The study and analysis leaded to problem acknowledgment and needs to implement web services for improvement and increasing function efficiency of job and recruitment agency system.

From Fig. 4, it demonstrates a comparison between former system utilizing only web application and new system utilizing web services technology in data exchange function between partner websites as the former one has to be left with personal information large enough to be an advantage for increasing chance in job and personnel discovery; however, in the new one, data exchange with other system is occurred making convenience and high chance for users efficiently.

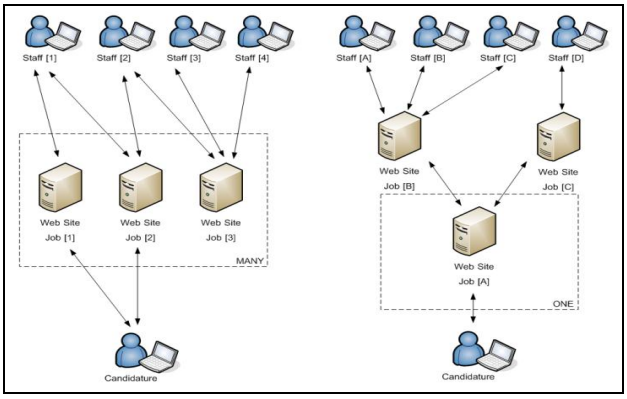

Figure 4. A comparison of legacy systems with a new system concept.

B. New System Design

When conducting a study, problem and need analysis of former system, understanding has been obtained as those one are initial points in inventing and develop new system for the research. The researchers have selected web services technology possessing a connectivity for distributed computing and data exchange on internet network.

The new system will be designed to be in conformity with the problems and needs but still be based on former service providing, that is to say, some part of web application for managing data in job and personnel recruitment via internet network but this new system will add prepared function for web services technology for job and personnel recruitment to support distributed computing and data exchange, as well as, data management by architecture of system as designed as Fig. 5.

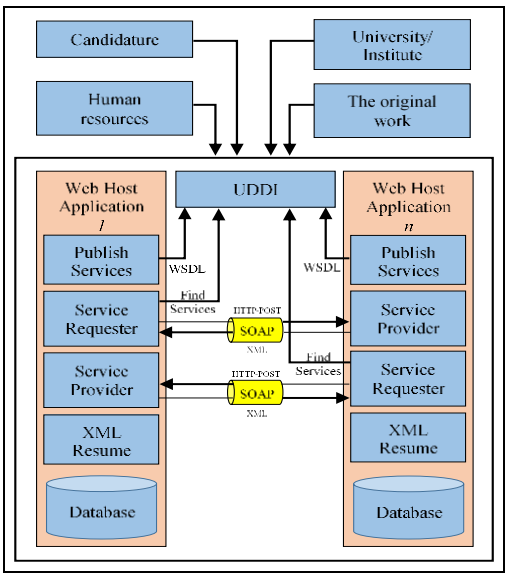

Figure 5. Recruitment Agency based on SOA and XML Web Services.

From Fig. 5, it demonstrates recruitment agency system architecture as job seekers possessing personal characteristics and organizations could log in to system for use via internet network as the system will exchange and inspect data from relevant database and the recruitment agency system could be open for application

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when recruitment is needed via the system, it is unnecessary to do a recruitment notification as there will be an inspection system of a vacant making flexibility and preparedness to fill in personnel in time and will increase the chance for success in application.

When the architecture system design had done, "Use Case Diagram" was designed demonstrating function scope of the system as actors will be service calling. Use case diagram of the new system will include with use case as Fig. 6 and Class Diagram as Fig. 7.

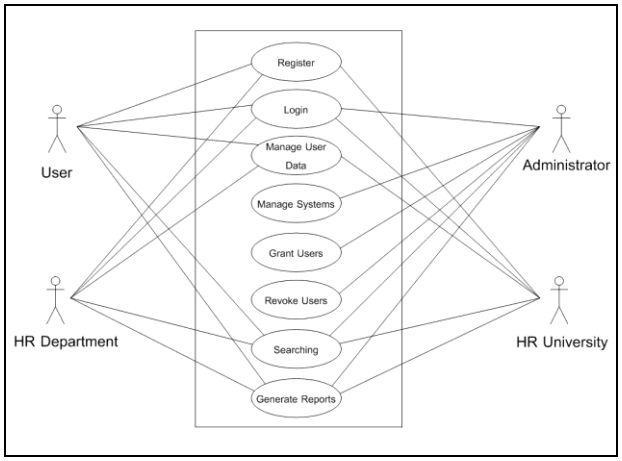

Figure 6. The Use Case Diagram of Recruitment Agency based on SOA and XML Web Services.

C. System Development Procedure

The researchers have developed a system by this procedure

1) Develop application and database for job and recruitment agency system via web services. The researchers use Visual Studio .Net as a tools using ASP .Net with C# language and Microsoft SQL Server as a database management system.

2) Develop web services for function and data exchange, as well as, implementation with web application. As researchers developed web services in a part of data exchange of job seeker and details of job with partner website and web services for data exchange of education profile, education level and education result checking, all of which will utilize XML language as common language for communication and data exchange.

3) Questionnaire development to evaluate system efficiency from two sample groups as for the first one is computer and human resource management experts and second one is general users.

4) Efficiency Test, The development of recruitment agency system based on SOA and XML web services technology utilize black-box testing as the researchers divided the test procedure into 2 steps as follows:

- A test conducted by developers themselves by implementing black-box testing which is the test of input and output of data. Functions of all systems will be tested to search for defaults in the program, then improvement shall be done.
- A test of system efficiency by experts and general users by computer experts and human resource management with not less than 3 year experiences for 5 persons and general users for 15 persons, this sample selection implement a purposive sampling.

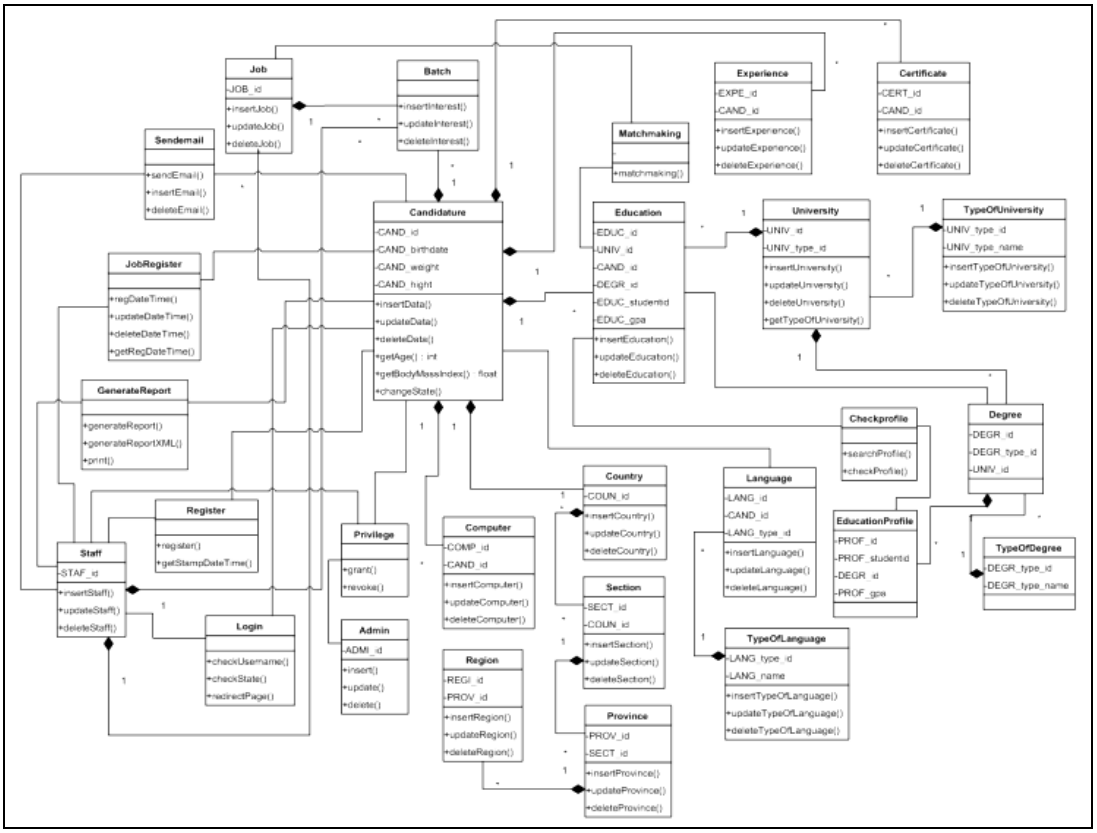

Figure 7. The Class Diagram of Recruitment Agency based on SOA and XML Web Services.

V. RESULTS

From the research methodology, the researchers have developed and conducted the efficiency test of recruitment agency system based on SOA and XML web services technology. The results are as follows:

A. System Development Results

After implementing the designed part to develop system, the results are as follows:

1) Regarding part of web host application utilized in communicating with job seekers and recruitment agency via XML web services technology as Fig. 8, web application in this part has functions of member registration, search, data exchange, application document creation in the form of XML document, the system communicates and calls service from developed web services in order to use in retrieval and data inspection in compliance with prepared conditions.

Figure 8. The Web Host Application.

2) Regarding of web services utilized in retrieval and data inspection between web application and web application of partner websites for data exchange, there are 14 functions as Fig. 9 and XML documents for describing web services or WSDL as Fig. 10 and in part of web services communicating between web application and web application of education institute for data inspection of programs and education results. As calling web services for education institute will be done to web services of university or terminal education institute web services before returning value.

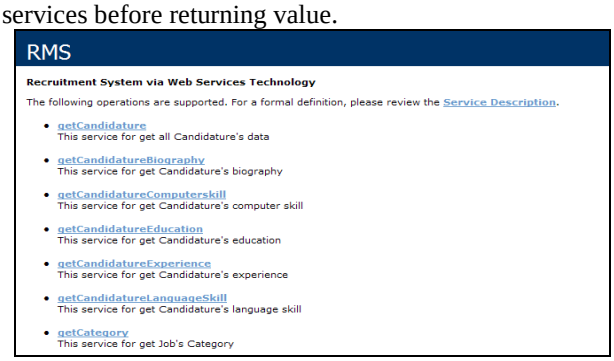

Figure 9. Example of Services on UDDI.

Figure 10. Web Services Description Language WSDL.

B. Evaluation Results

After the development, the system and questionnaires have been brought to ask with 2 groups of testers. The results of system efficiency from experts and end users are as Table I.

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TABLE I. THE RESULTS OF SYSTEM EVALUATION

Indicator	system efficiency					
	Experts			End-User		
	$\bar{x}$	S.D.	Result	$\bar{x}$	S.D.	Result
System performance in compliance with the needs of users	4.07	0.38	good	4.47	0.62	good
Function test	4.05	0.36	good	4.53	0.58	good
Convenience and ease in system usage.	4.03	0.57	good	4.14	0.60	good
Security	3.95	0.51	good	4.34	0.67	good
Total	4.04	0.43	good	4.40	0.63	good

The evaluation results of computer technology and human resource management experts have mean as 4.04, standard deviation is 0.43. This could be summarized that experts give an evaluation results in good level as overview and the evaluation results of general users have mean as 4.40 and standard deviation as 0.63. This could be summarized as the general users give an overall evaluation results in good level. These demonstrate that the developed system has the system efficiency evaluation in good level.

VI. SUGGESTION

Nowadays, information systems for business managements are changed from general website to be web services for more efficient performance as recruitment agency system based on SOA and XML web services is a one of example of business information systems developed for fast and convenient job and personnel recruitment and for decreasing human involvement in the system. As for this research, it develops body system; however, there is no development or researches in part of XML resume to be a standard of Thailand. If there will be any research for developing XML resume, this could make job recruitment system to be much smoother as job seekers do not need to enter personal information and could be able to carry around or use as online reference as the information system for job application could access data meaning in XML resume rapidly.

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