

Title	An Agent based Human Resource Management Information System
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Citation	
Issue Date	2005-11
Type	Conference Paper
Text version	publisher
URL	http://hdl.handle.net/10119/3817
Rights	2005 JAIST Press
Description	The original publication is available at JAIST Press http://www.jaist.ac.jp/library/jaist-press/index.html , IFSR 2005 : Proceedings of the First World Congress of the International Federation for Systems Research : The New Roles of Systems Sciences For a Knowledge-based Society : Nov. 14-17, 2007, Kobe, Japan, Symposium 3, Session 1 : Intelligent Information Technology and Applications Men and Computing

An Agent based Human Resource Management Information System*

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ABSTRACT

Human resource means the most to an organization, even the organization is small or large. Human resource management is a critical type of management in the organization. In this paper, we propose an agent based human resource management information system. It comprises a web service and three kinds of agents. The web service provides functions for human resource routine management, such as maintaining basic data, checking on working attendance, calculating salaries and so on. Three kinds of agents are information gathering agent (IGA), personnel evaluating agent (PEA) and decision supporting agent (DSA). When a new employee is recruited in the organization, the IGA will create his website. Three types of persons can visit his webpage, these are himself, colleagues in the same branch and relative management staffers. For himself visiting, he can update his personal information and progress of his work. For colleagues visiting of his webpage, they can make comments on his attitude, capability, effect and efficiency of the work he is doing or has done. And for relative management staff, they can also express their viewpoints about him. All information about him can be gathered by the IGA. The PEA can mine the information gathered by the IGA for specified purposes such as capability evaluation and pre-examination of promotion. The PEA uses the information and evaluation models to perform evaluating tasks. The DSA can help the manager to plan the human resource, including right person at right position, personnel training, employee recruiting and employee dismissing.

Keywords: human resource, information system, agent

1 INTRODUCTION

As the development of information technology (IT) for the past decades, people have been tried to using the computer based support systems in the

organization management. Employee data were first automated by using electronic data processing (EDP). The EDPs were competent for the tremendous amounts of record keeping and reporting associated with personnel administration. Transaction processing systems (TPSs) for administering payrolls and benefits followed afterwards. Then management information systems were successfully developed and broadly applied in many organizations. With the subsequent evolution of these activities into human resource management, various human resource management information systems (HRMIS) were also planned, developed and successfully implemented.

With progress in artificial intelligence, HRMIS combined with the knowledge based systems (KBS) for manpower planning, recruiting, management development and performance appraisal was studied by Martinsons [7]. This system has the function of the decision support system (DSS), which is a kind of computer based support system. The DSS was studied to help us in decision making for unstructured or semi-structured problems. A DSS uses data and models, provides easy user interface, and can incorporate the decision maker's own insights. Architecture of a DSS typically includes: data management subsystem, model management subsystem, knowledge management subsystem and user interface subsystem. The knowledge management subsystem includes knowledge database and reasoning module using artificial intelligent technology [2].

The academic term of agent was first proposed in the research field of artificial intelligence. Recent years, as for the technologies of computer and network develop rapidly and be widely applied in every field, many researchers are interested in studying on the theories, architectures and languages.

The software agent, as a special kind of agents [4], actually is a computer program that can accomplish specific tasks on behalf of a user, independently or with little guidance. It is considered as an

*Supported by National Nature Science Foundation of China (No.70450001)

autonomous assistant to the users. In order to accomplish its tasks, it should possess task processing method, knowledge, and the following capabilities of task processing, learning, reasoning, decision-making, communication and cooperation, etc. In the software development engineering, we all well know the object oriented programming (OOP). As for the software agent appearance, a new paradigm of developing application software - agent oriented programming (AOP) was proposed by Shoham [4].

A multiagent system (MAS) is a system composed of some agents, all the agents can communicate with each other and form cooperation in procedure of performing tasks. According to whether the MAS pursuing a specific goal or not, we classify the multi-agent systems as two types: specific goal MAS and Non-specific goal MAS [3].

Agent based DSS [1] and agent based hall of workshop for metasynthetic engineering [3] have been explored. In this paper we propose an agent based human resource management information system (AHRMIS). The AHRMIS not only has the functions of management the routine of human resource, but also has the abilities of supporting manager to make decision for personnel affairs. The paper is organized as follows: In section 2, we design the functions and architecture of the AHRMIS. In section 3, we study the HR management decision supporting process of the AHRMIS. In section 4, we describe the implementation technology for developing the AHRMIS. And in section 5, we give conclusions and further research task.

2 FUNCATIONS AND ARCHITECTURE OF THE AHRMIS

Users of the AHRMIS are HR staffers and HR manager or general manager. HR staffers are responsible for the HR routine management affairs and the HR manager is responsible for HR decisions. Functions of the AHRMIS are described as figure 1.

There are payroll integration, world-wide tax administration, employee recruiting , expatriate administration, career and succession planning, health and safety monitoring, global assignments tracking, compensation and benefits administration, training and development administration, promotion administration, competency databases, and so on.[5,6,7,8]

The architecture of the AHRMIS is showed as figure 2. It comprises two subsystems: A web service based basic HRMIS and an agent based HR management decision support system.

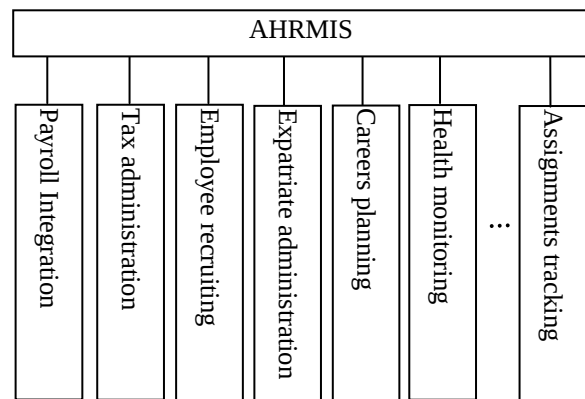


Fig.1 Functions of the AHRMIS

- (1) Web service based basic HRMIS: At present, many organizations have their management information system (MIS) which includes HR management information subsystem (HRMIS), financial management information subsystem (FMIS) and other operational management information subsystem (OMIS). We propose the MIS is designed as a web service based system and functions of the subsystems are integrated into office automation (OA) interface for all persons in the organization. Each person can use his OA interface to do his work. HRMIS has the basic functions of HR management which the HR department is responsible.
- (2) Agent based HR management decision support system. Its functions are designed for helping manager make decision for HR management. It is composed of three kinds of software agents:
 - a) Information gathering agents (IGAgents): The IGAgents are responsible for searching the relative information the manager required in the process of decision making. It can not only gather information from the web based basic MIS includes HRMIS, OA and other operational management systems, but also can gather information from Internet.
 - b) Personnel evaluating agents (PEAgents): The PEAgents have evaluating models, methods and criteria built in to execute personnel evaluation by using the information gathered by IGAgents.
 - c) Decision supporting agents (DSAgents): The DSAgents help HR manager or general manager to make decision of HR management according to the evaluation results from the PEAgents and other information. There are the main interfaces

for managers.

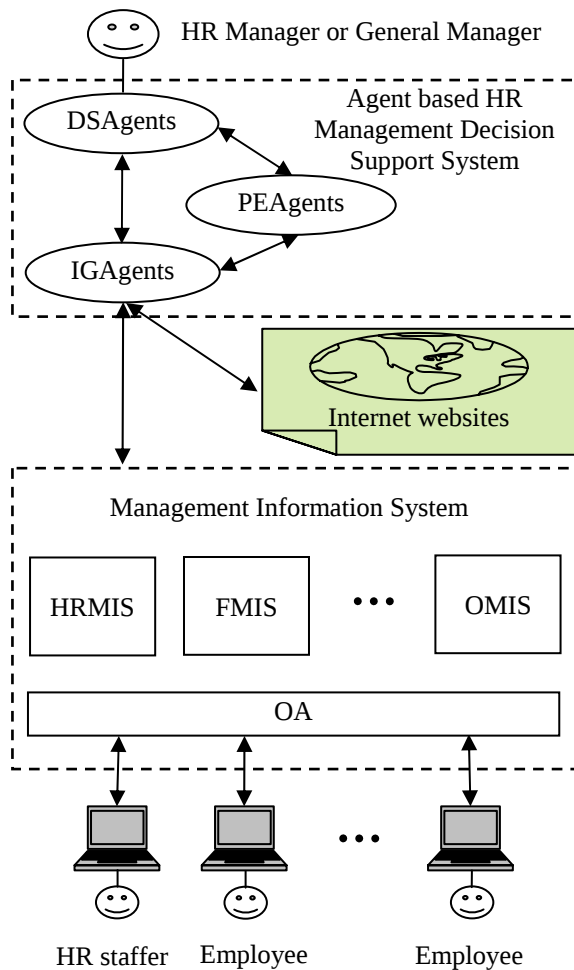


Fig.2 Architecture of the AHRMIS

A lot of HR management software packages have been developed so far. Previously, they are utilized Client/Server (C/S) structures and now most of them are designed and developed in Browser/Server (B/S) structures. We choose the B/S structure for the web service based basic HRMIS of the AHRMIS for two reasons: First, the B/S is easy for system implementation and the client is just a browser, especially for multinational enterprises. Second, B/S structure HRMIS is convenient to be integrated with other subsystems such as OA. We need that the MIS has the function of self-help website building up for each employee. Some staffers in the organization are authorized to access the employee website. They are the employee himself, relative management staffers (includes HR staff and leader of the branch or the organization) and his colleagues in the branch. See figure 3.

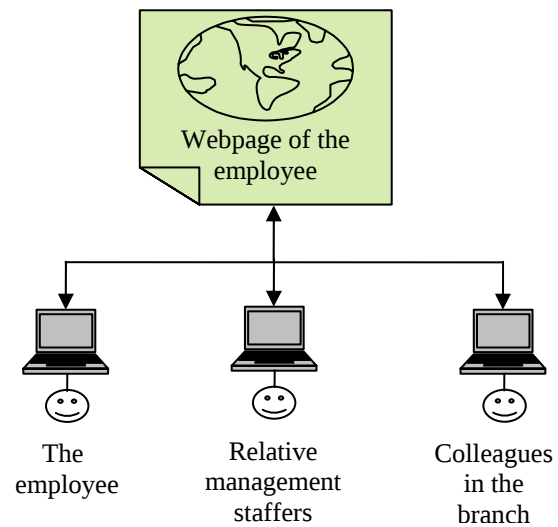


Fig.3 Relative persons who can access the webpage of employee

When an employee is recruited into the organization, A HR management staffer will input simple information of the employee and assign username and password for his login. The employee uses the username and password for login and enters himself OA main interface. It provides him the following functions:

- (1) Webpage information maintenance: He can input or update more detail information, such as phone number, address, hobbies etc.
- (2) Work attendance checking on: The system will check on his work attendance automatically as his first login on each work day in the morning.
- (3) Work schedule arrangement and task reminding: He can arrange work schedule according to the assigned tasks and the system will remind him as the schedule arrangement.
- (4) Task progress marking: When some tasks can be performed online, the system may mark the progress automatically. But other task progress should be marked manually by the employee.
- (5) Other colleagues' webpage visiting: He can visit the webpages of his colleagues especially the team members and get their information such as their work plan and work progress. He can also make comments on their work performance and attitudes or even provide some suggestion for them.
- (6) Comments information display: He can read the comments on his work he has done from

colleagues and relative leaders. This information may include evaluation and suggestion for his work.

- (7) Organization internal BBS: He can give opinions on a broad topics and discuss them with other staffers on the organization internal BBS.

The OA main interfaces may be different as the different kinds of work the employees doing. The interaction of the employees with the MIS provides more information or data for helping HR manager to make HR management decision.

3 THE HR MANAGEMENT DECISION SUPPORTING PROCESS OF THE AHRMIS

Take a software developing corporation for an example we describe the process of supporting HR manager to make decision by using the AHRMIS. Suppose the developing department needs a team leader for a software developing project. Who will be competent person for this position? Promote an employee or recruit a new person? There are decision problems of HR management involved in both promotion administration and recruiting administration.

- (1) The HR manager interacts with the DSAgent to input the decision problem of finding a team leader for the project. Promote an employee or recruit a new person will be the question for HR manager to answer. Suppose he permit using the both ways.
- (2) DSAgent will query the information about the project and requirements of the team leader. Then it will perform two tasks: one is which employee is most competent and the other is who outside the corporation is most competent. Those tasks can be doing simultaneously.
- (3) In the process of recommending a candidate for promotion, the DSAgent will check all developers in the corporation. For each developer, it will ask the IGAgent to query his all information such as background, work experience, work performance, colleague comments, communication with others, and so on.
- (4) DSAgent sends evaluation tasks to PEAgents. With information of IGAgents, the PEAgents will evaluate capabilities of each person by using their models, methods or criteria. Those capabilities may include organizing ability, communication ability, management ability and

software development ability etc. And the evaluation results will return to the DSAgents.

- (5) DSAgent receives the evaluation results of all candidates, and use decision methods to recommend one or two excellent candidates for manager.

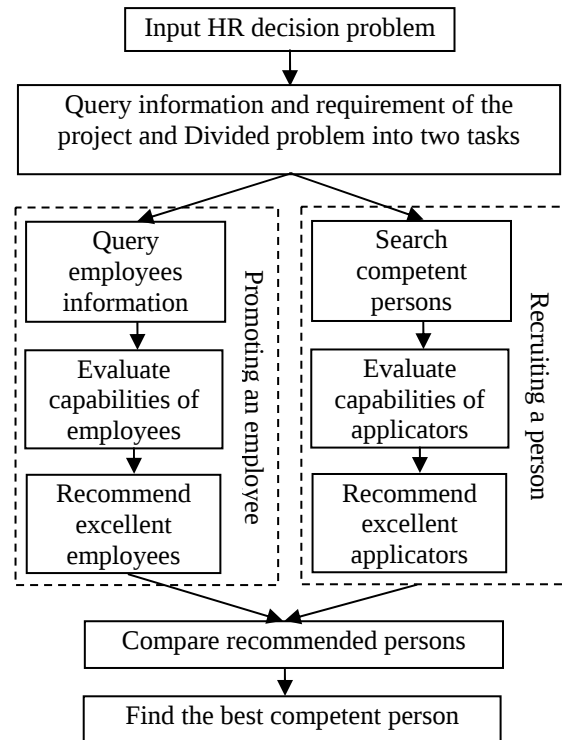


Fig.4 HR management decision support process of the AHRMIS

- (6) In the process of recommending a candidate for recruiting, the DSAgent will ask a HR staffer to issue a HR want advertisement or ask persons in the corporation to recommend or let IGAgents search competent persons in the HR websites in Internet and send message to them. Candidates are invited to appoint to this position. DSAgent will get information of all applicators and need the HR manager to organize interview for them. Then DSAgent requests the PEAgents to do evaluation work.
- (7) The PEAgents evaluate the capabilities of each applicator and return evaluation results.
- (8) DSAgent gets the results of all applicators and recommend one or two excellent persons for manager.
- (9) DSAgent helps manager compare the recommended persons and find the best competent person. It may need IGAgents to

search more information and may need PEAgents to do further evaluation.

4 METHODS FOR IMPLEMENTATION OF THE AHRMIS

The web service based MIS include HRMIS can be developed by using very mature technology like JSP + Java running on Tomcat server or ASP running on Microsoft Internet Information Services (Ms IIS). We choose JSP + Java.

The implementation of the agent based HR management decision support subsystem. We are required to implement all the agents: IGAgents, PEAgents and DSAgents. Shoham proposed the methodology of the agent oriented programming (AOP) and developed an AOP prototype language [4]. A software agent can be implemented through AOP languages. But up to now, there is not a sophisticated, popular agent oriented programming language like the object oriented programming (OOP) such as the C++ or Java. Besides OOP capability, Java is more competent for network programming. We can implement all the agents in the AHRMIS by using the Java language and utilize the improved agent structure [3] derived from Shoham [4].

5 CONCLUSIONS

In this paper we propose an agent based HR management information system (AHRMIS) aiming to function of supporting HR management decision making. The AHRMIS includes a web service based basic HRMIS and an agent based HR management decision support subsystem. The first subsystem is responsible for routine management of HR affairs and the second subsystem is competent for help managers to make HR management decision. Now, we are developing the AHRMIS and will finish the prototype system.

For the further research, we are considering integrating knowledge management into the AHRMIS. Then the AHRMIS can provide a platform for employees in knowledge creating and sharing. That will be helpful in improving the working effect and efficiency of employees including HR staffers.

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