Web-Based Career Path Model for Human Resource Management

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***Abstract*—Career path modeling and management are essential for building appropriate business strategies to attract and maintain valuable human assets in an organization. The increase of data volume due to globalized employment has increased the challenge to utilize scattered and abundant data which are collected from time to time. In order to ensure efficient top to bottom communication in an organization, this paper proposes a web-based software tool for career path modeling. It aims to assist employees from different departments to seek advice in terms of their career advancement opportunities, and support managerial decision from the human resource professionals. The proposed model is developed with the consideration of several aspects, i.e., change of job position, department, gender, attended training courses, available mentor, as well as professional and academic qualifications. The concept of cloud computing is adopted to ensure the accessibility of the model from different web-browsers so that employees have the flexibility to obtain career advancement information anytime and anywhere.**

***Index Terms*—Career Path Model; Cloud Computing; Human Resource.**

I. INTRODUCTION

Career path modeling (CPM) is an essential component in modern human resource management system. The model outlines the common trend of job or position changes within and across the organizational departments to facilitate career advancement. With CPM, an employer is able to collect and analyze information that could identify general employee behaviors and establish suitable developmental efforts that would align with the organizational needs. Moreover, employees are able to have self-accessibility on career patterns and select the career option that best matches their ultimate goals based on their current job positions.

According to Cook [1], the provision of development opportunities from employers and responsibility of employees for own career planning are both important to overcome the barriers to career progression. Failure to do so could entail failure in employee retention and loss of possible career opportunities. Therefore, career path modeling and analysis is crucial to maintaining valuable human resource asset in an organization. Moreover, it is always important to provide clear guideline and vision to employees for their career advancement.

The development of CPM is highly challenging due to diversified job requirements, huge employee databases across multiple platforms, and complicated job routes and options. With the exponential increase of data volumes in information-driven economy, organizations face the issue of effective data governance. The Harvard Business Review Analytic Services [2] published a report on analytics revolution of human resource in 2014. From the report, reliance on workforce analytics is expected to be increased in many enterprises. According to Zang and Ye [3], employee career management is one of the Big Data applications in human resource management.

Building a decision support system for career path planning and analysis has become one of the business strategies to stay competent in human resource management [4]. According to Jantan et al. [5], application of information technology (IT) to human resource management brings benefits such as ease of information delivery from the top to the bottom, communication convenience to the employees, and creation of an easy platform for HR professionals to devise managerial decisions. As such, a high quality human resource management system needs a system or model that is able to help effective decision making and provide knowledgeable feedback on career path pattern analysis.

Cloud computing has emerged as a significant platform to deal with the evolution of information and communication technologies for business efficiency such as big data management and analytics [6-8]. The benefits brought by cloud computing include scalability, ease of implementation, flexible accessibility, reduction of hardware and maintenance costs, and reduction of capital expenditure for physical hosting on site. With reference to IDC report [9] and Chen and Wu [8], the worldwide spending on public IT cloud services are estimated to be increased from $47.4 billion in 2013 to $107 billion in 2017. Cloud computing offers organizations a choice of off-premise computing platform where computing resources can be accessed remotely through the internet with lower expenditures where users only pay for the resources used [10].

Some recent developments in the literature pertaining to human resource management systems are as follows. Bhadani [7] claimed that cloud computing as a new dimension of human resource management is able to enhance the performance, innovativeness, and intellectual capital of an organization. Chen [6] developed a cloud-based human resource information management according to the characteristic of colleges and universities. Jantan et al. [5] proposed a framework for human

resource decision support system and identified the potential intelligent techniques that can be used for decision support. Chang and Wang [4] developed a case-based reasoning collaborative management design for career planning. On the other hand, Chen and Wu [8] conducted an empirical investigation to understand the status of cloud-related human resource development in Taiwan. Low et al. [11] investigate the effect of determinant factors such as competitive pressure, complexity, top management support, firm size, technology readiness, and etc on the adoption of cloud computing in high-tech industries.

Motivated by the analytical revolution required by human resource department, a web-based software tool for CPM, namely MyFuture, is developed as the kick-start of data analytics to provide insight to managerial decisions and, at the same time, support employees to make appropriate and beneficial decisions for career progression. A cloud-based repository is developed for storing and accessing employee records electronically to develop inference for career path progression, allowing self-accessibility among employees to plan and develop skills and qualification for career advancement.

The paper structure is organized as follows. Section 2 reveals the related information and parameters involved for CPM. Section 3 describes three possible career paths from MyFuture based on user's input. Section 4 discusses the implementation of MyFuture and finally Section 5 concludes the proposed CPM tool together with suggestions for future works.

II. Information Required for Career Path Planning

According to Cao and Thomas [12], the key steps for the development of career path are: career roadmap, position profile, expected competency, training, and accountability. On the other hand, gender, age, race, and time in current position have been listed as the characteristics of survey respondents in the NACAC Admission Officer Career Path Survey [13]. In order to ensure significant information for career path planning is covered in a general way, this research considers the historical data records on job movement, academic qualification profile required by the position, training and development courses attended by the employee, gender, mentor, department, and time in the current position for the delivery of information related to career path. The overall framework of the proposed CPM tool i.e., MyFuture, is illustrated in Figure 1.

First of all, users (employees) are prompted for inputs on their current job position and targeted job position. These two inputs are used to retrieve information from the huge historical databases, in which information pertaining to job movement history, successful/ unsuccessful applications, gender, mentor, department, academic qualification, training and development as well as time at current position is extracted for career path analysis. Based on the information, analytics are conducted to show the types of career route towards the targeted position, the probability of success in the same department and cross departments, average duration taken to move to the targeted position, and gender distribution.

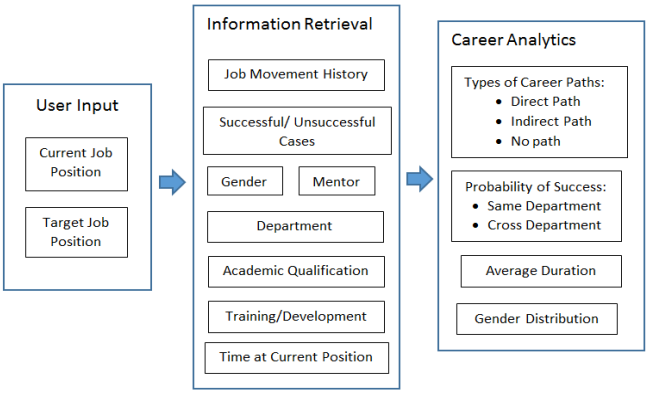

Figure 1: Framework for MyFuture

III. Types of Career Path in MyFuture

From the user's input on the current and target job positions, an analysis of employment databases is conducted in MyFuture to identify three possible job routes, i.e., (i) direct path, (ii) indirect path, and (iii) no direct/indirect path.

In the event that there is a direct path from the current Job ID to the targeted Job ID, e.g. Job ID 2 to Job ID 3, historical data of employees who have experienced the path from Job ID 2 to Job ID 3 is analyzed. The probability of success from Job ID 2 to Job ID 3, gender distribution and duration taken to obtain the targeted job are calculated and shown to the user. Figure 2 shows an example of the results found for direct path from Job ID 2 to Job ID 3.

In addition to information such as probability of success, total number of applications, gender distribution and duration in current position, the user can sort the department of interest by clicking on the sorting icon in the department column. Moreover, the user can also identify whether a particular employee is interested to be a mentor by referring to the tick icon in the Mentor column.

In the event that there is no direct path from the current Job ID to the targeted Job ID, but there is an indirect path, e.g. there is no direct path from Job ID 2→23, but there are multiple indirect paths such as: 2→3→23 and 2→3→4→23, historical data of the employees who have experienced the shortest indirect path from Job ID 2 to Job ID 23 are considered.

For indirect paths, two types of evaluation are conducted, i.e., the same department and the shortest path. In the evaluation for the same department, if the current Job ID exists in the selected department, the probability of success based on the shortest indirect path is shown. Otherwise, no information of employee data and the probability of success, gender distribution as well as duration of experiences are shown. On the other hand, for the shortest path evaluation, the historical data on employees who have experienced the same shortest path (cross departments) are retrieved. Gender distributions based on successful applications as well as duration of experience are depicted too. Figure 3 shows a test case example of indirect paths when the current Job ID is available in the selected department whereas Figure 4 shows a test case example of indirect paths when the current Job ID is not available in the selected department.

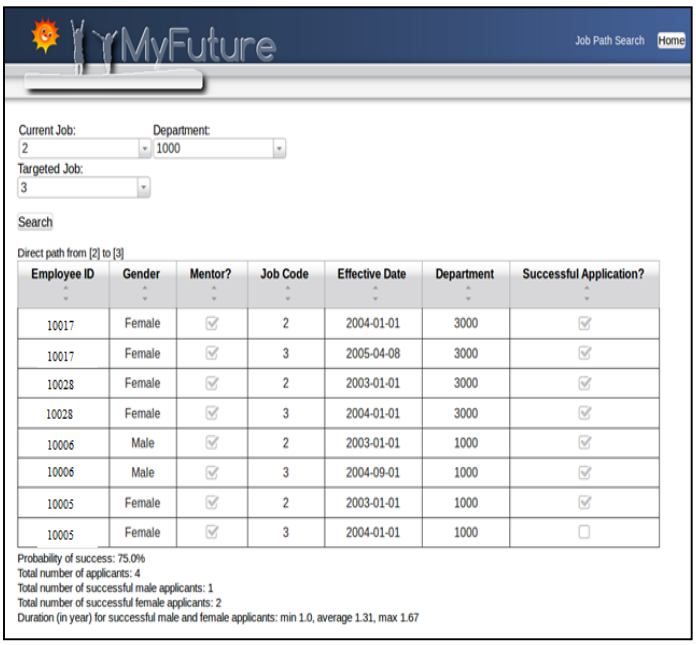

Figure 2: Example of a direct path analysis

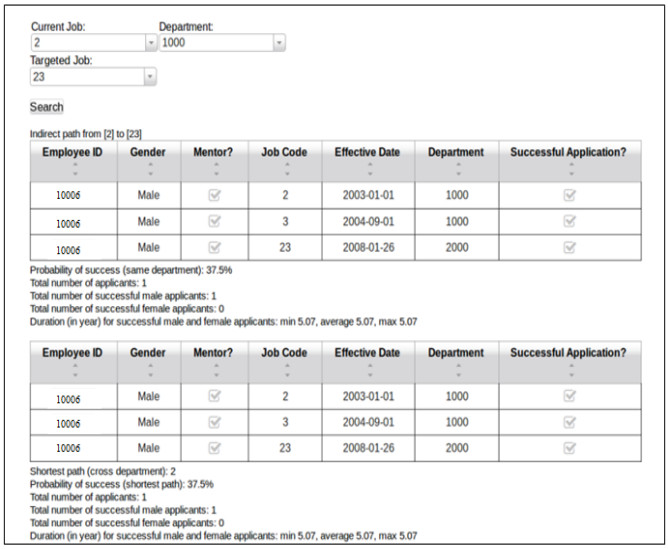

Figure 3: Indirect path evaluation when the current Job ID is available in the selected department

In the event that there is no direct or indirect path from the current Job to the targeted Job ID, MyFuture searches all direct paths that are linked to the target Job ID and displays the path with the highest success rate.

Besides the types of career path, MyFuture enables users to access the background information of the other employees who adopt the same career path. Users are able to learn the required qualification, training, and other related information for successful advancement to the target Job ID. As shown in Figure 5, the background details of an employee are depicted by clicking on the employee ID.

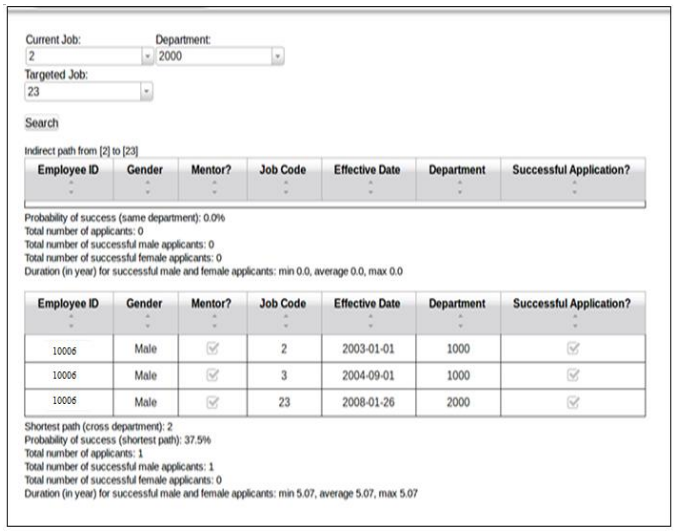

Figure 4: Indirect path evaluation when the current Job ID is not available in the selected department

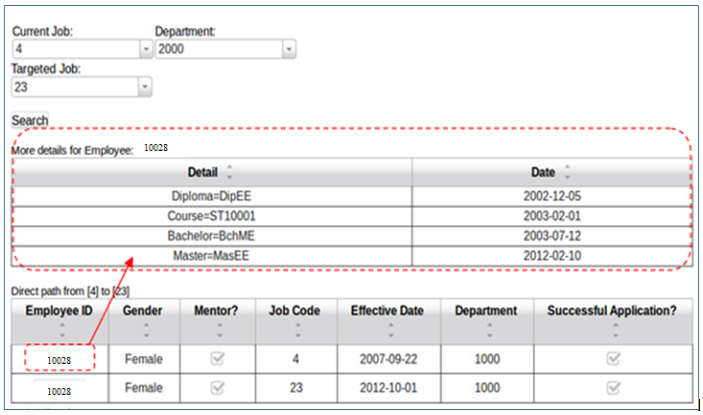

Figure 5: Access to background information

IV. MyFuture Implementation

Motivated by the growing needs of cloud computing, a web-based CPM tool, MyFuture, is developed as a cloud-based repository for storing and accessing employee records electronically. As a web application, MyFuture needs to be hosted in a server/machine with IP address for remote/local user and administrator access. A server with a minimum Duo-core Intel-based processor, 4GB RAM and 20Gb free hardisk space is required for the execution of MyFuture.

In this research, the Java based cloud image is deployed in a 3-tier architecture platform, as shown in Figure 6. In the secure network zone, data are kept in a relational database server (MySQL). The developed Graphical User Interface (GUI) and its business logics are hosted in a web application server. In our work, Apache Tomcat is chosen as the preferred web application server owing to open source listing. Both data and web application servers are resided in the secure network zone in the data farm. Communications between secure users and administrator with the servers are filtered with a Firewall, in which Apache HTTPD web server is adopted as the middleman, intercepting the HTTP protocol in the human-server communications. Note that the HTTPD server is located at the

demilitarized zone (DMZ) which acts as an additional layer of security to the deployment platform.

Insecure or public users are allowed to access the deployed MyFuture remotely through a Wide Area Network, e.g. Internet. Web services are served using the HTTP protocol through the HTTPD web server at DMZ zone. MyFuture is made accessible through different browsers such as Mozilla Firefox, Apple Saferi, Google Chrome, and Internet Explorer. Figure 7 shows an example of accessing MyFuture through Internet Explorer where the IP address (indicated by the red dash square) is entered to the URL.

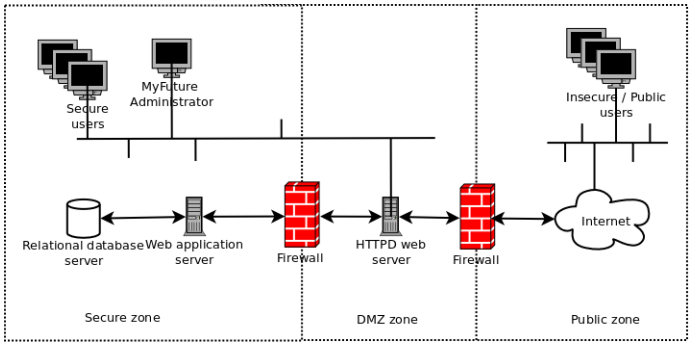

Figure 6: Network Architecture for MyFuture Deployment

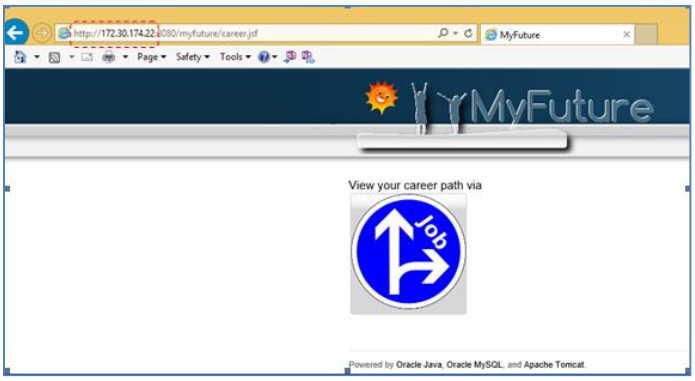

Figure 7: Access to MyFuture through Internet Explorer

V. Conclusion

Moving towards the era of big data, insights created from human resource data analytics play significant roles to business intelligence. Cloud computing has been the revolution for human resource analytics that reduce the IT cost and permits accessibility in the world-wide platforms. In order to survive in the global market, sustain talents, and deliver organization strategic plan, a cloud-based CPM tool, MyFuture, has been developed to assist employees in career path planning. Besides providing understanding on the historical job movements and requirements for a particular career of interest, the tool helps to reduce the communication gap owing to diverse human resource locations. The web-based tool enables employees to access career path information through different web browsers anytime and anywhere. Meanwhile, HR professionals are able to monitor the system in an easier manner for strategic planning.

The proposed CPM tool will be further extended to include intelligent techniques for capturing employee mobility patterns towards specific business strategies. In addition, variables such as geographical factors and age factors on the direction of career advancement will also be taken into consideration.

Acknowledgment

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