

# An Evaluation of Knowledge Discovery Techniques for Talent Forecasting in Human Resource Application

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**Abstract**— Nowadays, in HRM field, among the challenges of HR professionals are organization's talent, especially to ensure the right person for the right job at the right time. It is a continuous process that involves sourcing, hiring, developing, retaining and promoting them while meeting the organization's requirements simultaneously. These tasks involve a lot of managerial decision, which is sometime very uncertain and difficult to make an appropriate decision. This paper is an attempt to evaluate various knowledge discovery techniques available for talent forecasting in HR application. Knowledge discovery techniques plays vital role in talent forecasting. In talent management, to identify the existing talent is one of the top HR management challenges. This challenge can be manage by using Data Mining technique in order to predict the suitable talent based on their performance.

**Keywords**— KDD, KDT, KDD Process, Talent Forecasting

## I. INTRODUCTION

Human Resource (HR) applications can be used to provide fair and consistent decisions, and to improve the effectiveness of decision making processes. Besides that, among the challenge for HR professionals is to manage organization talents, especially to ensure the right person for the right job at the right time. Talent consists of those individuals who can make a difference to organisational performance, either through their immediate contribution or in the longer term by demonstrating the highest levels of potential.

### Talent Management

A conscious, deliberate approach undertaken to attract, develop and retain people with the aptitude and abilities to meet current and future organisational needs.

TALENT=COMPETENCE+COMMITMENT+CONTRIBUTION

The benefits of talent management includes right person in the right job, retaining the top talent, better hiring, understanding employees better and better professional development decisions etc. The focuses on talent management approaches are: (i) Recruitment - ensuring the right people are attracted to the organisation, (ii) Retention - developing and implementing practices that reward and support employees, (iii) Employee development - ensuring continuous informal and formal learning and development, (iv) Performance management- specific processes that nurture and support performance, including feedback/measurement, (v) Workforce planning- planning

for business and general changes, including the older workforce and current/future skills shortages and (vi) Culture- development of a positive, progressive and high performance "way of operating".

For the said reason, we attempt to discuss the potential to implement one of the talent management tasks i.e. identifying existing talent by predicting their performance as one of HR application for talent management. This study suggests the evaluation of knowledge discovery techniques for talent forecasting by using past experience knowledge known as Knowledge Discovery in Database (KDD) or Data Mining. Knowledge Discovery in Database (KDD) or Data Mining is one of AI technology that has been developed for exploration and analysis in large quantities of data to discover meaningful patterns and rules. In this study, we attempt to use this approach to handle the issue in managing talent i.e. to identify existing talent by predicting their performance using the past experience knowledge. Knowledge Discovery Database (KDD) is the automatic extraction of non-obvious hidden knowledge from large volumes of data. KDD is the process of finding useful information and patterns of data. Frequently the term *data mining* is used to refer to KDD.

Basically, HRM is a comprehensive set of managerial activities and tasks concerned with developing and maintaining a competent workforce-human resource. HRM aims to facilitate organizational competitiveness; enhance productivity and quality; promote individual growth and development; and complying with legal and social obligation [2]. Besides that, in any organizations, they need to compete effectively in term of cost, quality, service or innovation. All these depend on having enough right people, with the right skills, deployed in the appropriate locations at appropriate points in time.

## II. KDD PROCESS

Data mining refers to *extracting or "mining" knowledge from large amounts of data*. The term is actually a misnomer. Remember that the mining of gold from rocks or sand is referred to as *gold mining* rather than rock or sand mining. Thus, data mining should have been more appropriately named "knowledge mining from data," which is unfortunately somewhat long. "Knowledge mining," a shorter term may not reflect the emphasis on mining from large amounts of data. Nevertheless, mining is a vivid term characterizing the process that finds a small set of precious

nuggets from a great deal of raw material. Thus, such a misnomer that carries both “data” and “mining” became a popular choice. Many other terms carry a similar or slightly different meaning to data mining, such as knowledge mining from data, knowledge extraction, data/pattern analysis, data archaeology, and data dredging. Many people treat data mining as a synonym for another popularly used term, Knowledge Discovery from Data, or KDD. Alternatively, others view data mining as simply an essential step in the process of knowledge discovery. Knowledge discovery consists of an iterative sequence of the following steps:

1. **Data cleaning** (to remove noise and inconsistent data)
2. **Data integration** (where multiple data sources may be combined)
3. **Data selection** (where data relevant to the analysis task are retrieved from the database)
4. **Data transformation** (where data are transformed or consolidated into forms appropriate for mining by performing summary or aggregation operations, for instance)
5. **Data mining** (an essential process where intelligent methods are applied in order to extract data patterns)
6. **Pattern evaluation** (to identify the truly interesting patterns representing knowledge based on some interestingness measures)
7. **Knowledge presentation** (where visualization and knowledge representation techniques are used to present the mined knowledge to the user)

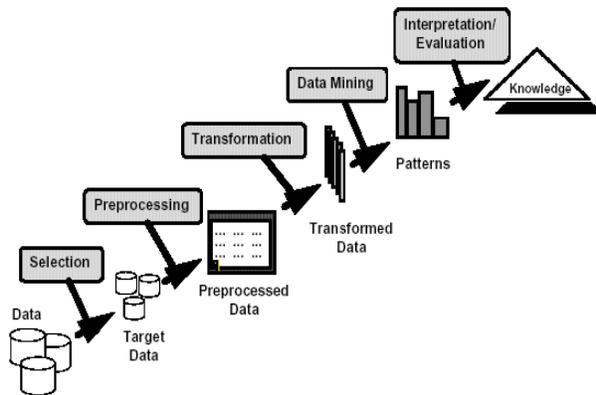


Fig.1 KDD Process

Steps 1 to 4 are different forms of data preprocessing, where the data are prepared for mining. The data mining step may interact with the user or a knowledge base.

**Database or data warehouse server:** The database or data warehouse server is responsible for fetching the relevant data, based on the user’s data mining request. **Knowledge base:** This is the domain knowledge that is used to guide the search or evaluate the interestingness of resulting patterns.

**Data mining engine:** This is essential to the data mining system and ideally consists of a set of functional modules for tasks such as characterization, association and correlation analysis, classification, prediction, cluster analysis, outlier analysis, and evolution analysis.

**Pattern evaluation module:** This component typically employs interestingness measures and interacts with the data mining modules so as to focus the search toward interesting patterns.

**User interface:** This module communicates between users and the data mining system, allowing the user to interact with the system by specifying a data mining query or task, providing information to help focus the search, and performing exploratory data mining based on the intermediate data mining results. In addition, this component allows the user to browse database and data warehouse schemas or data structures, evaluate mined patterns, and visualize the patterns in different forms.

### III. RELATED WORK

Anitha Mary Florence and Ms. Savithri et.al in [1] describes an approach which ensures talent knowledge acquisition by using employee’s performance records. This has been done by identifying talent patterns from existing data in HR databases as useful and valuable knowledge. The study ensures talent knowledge acquisition by using employee’s performance records. This has been done by identifying talent patterns from existing data in HR databases as useful and valuable knowledge. Anitha Mary Florence and Ms. Savithri et.al in [8] describes the potential classification techniques for academic talent forecasting in higher education institutions. The study attempts to determine the potential classification techniques for academic talent forecasting in higher education institutions. Hamidah Jantan, Abdul Razak Hamdan and Zulaiha Ali Othman et.al in [9] describes the Potential HR System architecture for talent forecasting by using KDD. Jayanthi Ranjan, D.P. Goyal, and S. I. Ahson et.al in [10] describes the role of data mining in Human Resource Management Systems (HRMS). A deep understanding of the knowledge hidden in Human Resource (HR) data is vital to a firm’s competitive position and organizational decision making. Analyzing the patterns and relationships in HR data is quite rare. The HR data is usually treated to answer queries because HR data primarily concerns transactional processing. It is necessary for HRMS to become more concerned with the quantifiable data. We show how data mining discovers and extracts useful patterns from this large data set to find observable patterns in HR. The study demonstrates the ability of data mining in improving the quality of the decision-making process in HRMS and gives propositions regarding whether data-mining capabilities should lead to increased performance to sustain competitive advantage. Shu-hsien Liao et.al in [22] attempts knowledge management (KM) development classifies KM technologies using the seven categories as: KM framework, knowledge-based systems, data mining, information and communication technology, artificial intelligence/expert systems, database technology, and modeling, together with their applications for different research and problem domains. Some discussion is presented, indicating future development for knowledge management technologies and applications as the followings: (i) KM technologies tend to develop towards expert orientation and KM applications development is a problem-oriented domain. (ii) Different social studies methodologies,

such as statistical method, are suggested to implement in KM as another kind of technology. (iii) Integration of qualitative and quantitative methods and integration of KM technologies. (iv) The ability to continually change and obtain new understanding is the power of KM technologies and will be the application of future works.

IV. OBJECTIVES OF THE STUDY

The objectives of my study are as follows:

- To study various Knowledge Discovery Techniques (KDT) available for talent forecasting in HR application.
- To study various factors affecting in forecasting HR applications.
- To design knowledge discovery techniques for talent forecasting in HR application.
- To study the Performance Evaluation of Knowledge Discovery Techniques in forecasting HR applications.

V. DISCUSSION

HR application is a key component of Decision Support System (DSS) which is used to support decision making process. Nowadays, the advancement of Artificial Intelligent technologies has contributes to new DSS application which is commonly known as Intelligent Decision Support System (IDSS). A knowledge-based expert system use human knowledge to solve problems that normally would require human intelligence. It is developed to help decision makers during different phases of decision making by integrating modeling tools and human knowledge. IDSSs are tools for helping decision making process where uncertainty or incomplete information exists and where decisions involving risk must be made using human judgment and preferences. Data mining is among the best approach to analyze records in databases. The analyzed results can be use for future planning. This can be done by identifying generated patterns from the existing data in HR databases as useful knowledge.

TABLE I  
INTELLIGENT TECHNIQUES USED IN HR APPLICATIONS

Intelligent Techniques	HR DSS Applications
Knowledge-based System/ Expert System	Web-based Training Expert System [17], Job applicants selection [18] Personnel selection [7],E-training [19]
Data Mining	Job Attitudes [20], Recruit and Retain Talents [21],Personnel selection [12] & [10], Project Assignment [22]
Software agent	Meeting Scheduler [23]
Fuzzy set/logic	Prioritization of Human Capital [24]
Artificial Neural Network	Personnel selection [12]

Basically, most of them use expert system or Knowledge-based system (KBS) approach and some of them use Data mining approach. KBS benefits are more permanent, easier

to duplicate, less expensive and automatically documented. Most of the current HR applications use other intelligent techniques to advance the capabilities of the applications. In this study, we have found researches that use AI techniques in HR field are very limited. Besides, the problem domains that they try to solve are also limited to the specific problem domains especially in personnel selection and training.

Prediction is a process to gain knowledge about uncertain events that are important to present decisions [17]. Besides that, prediction methodology can be categorized into two approaches; statistical and intelligent techniques. In this study, we focus on intelligent techniques approaches. Some of intelligent techniques used in prediction application are listed in Table II.

TABLE II  
PREDICTION TECHNIQUES AND APPLICATION

Techniques used	Applications
Decision Tree	Electricity energy consumption [28] Medicine [29] Accident frequency [30]
Artificial Neural Network	Electricity energy consumption [28] Country investment risk [31] Stock market returns [32] Medicine [29] Interest rates [33] Disease [34] Corporate failure[35]
Bayesian Belief Networks (BBN)	Student performance [26] & [25]
Fuzzy Clustering	Newspaper demand [36]

The most popular intelligent techniques for prediction are Artificial Neural Network, Decision Tree, Case-based Reasoning, Genetic Algorithm, Rough Set, Soft Computing (known as Hybrid Intelligent System), Operational Research and others techniques such as SVM, Fuzzy logic and etc. [18]. Basically, most of the prediction applications in Table 1 are used to predict stock, demand, rate, risk, event and etc., and a few apply on human or people.

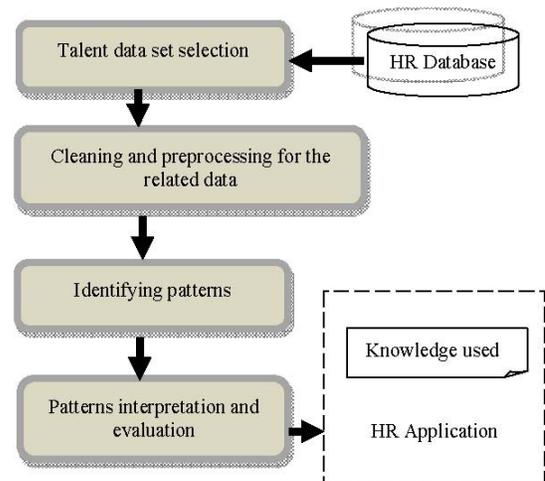


Fig. 2 Data Mining for Talent Management Tasks

Data mining is among the best approach to analyse records in databases. The analysed results can be use for future planning. Data mining method also implemented in HR problem domains and most of researches in HR problems domain are focused on personnel selection task and few apply in other activities such as planning, training, managing talent and etc.

## VI. CONCLUSIONS

The Knowledge Discovery Techniques are very useful in forecasting HR applications as these are very important for finding useful information and patterns of data. In this study, we attempt to use this approach to handle the issue in managing talent i.e. to identify existing talent by predicting their performance using the past experience knowledge. Knowledge Discovery Database (KDD) is the automatic extraction of non-obvious hidden knowledge from large volumes of data.

## VII. SCOPE OF THE STUDY

Human Resource (HR) applications can be used to provide fair and consistent decisions, and to improve the effectiveness of decision making processes. Besides that, among the challenge for HR professionals is to manage organization talents, especially to ensure the right person for the right job at the right time. For that reason, this study is an attempt to evaluate the knowledge discovery techniques for forecasting HR applications.

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