Integrated Decision Support System for Human Resource Selection Using TOPSIS Based Models

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ABSTRACT

Human Resource Selection (HRS) is considered to be the most important aspect of HR department as it requires fishing best talents from job markets. Decision makers are involved in order to evaluate multi-alternatives with respect to multi-criteria. The data needed for the evaluation process are sometimes crisp and vague in nature. Such circumstances cause difficulty to fairly judge the alternatives based on the selected evaluation criteria. This study aims to design a framework for Integrated Decision Support System based on TOPSIS models for HRS. The IDSS model comprises of Technique for Order Preference by Similarity to Ideal Solution (TOPSIS), Fuzzy TOPSIS and Fuzzy Set theory. Successful integration of these models will provide a platform for DM’s to conduct HRS process assuring fair judgment among applicants.

Keywords:

INTRODUCTION

Human Resource Selection (HRS) is considered to be a process carried out by an organization to recruit new potential employees, thereby contributing greatly in achieving company’s objectives [1]. Every organization is defined according to the services offered and the internal operational activities is usually segmented into departments, each responsible in accomplishing a particular task which when integrated shows directions towards mission and vision of that organization. These series of activities are being handled by humans so brought the issue of human resource selection i.e process of selecting the right people for the available job.

In educational intuitions such as universities, there are several faculties each comprises of departments considering the academic perspective. On the other hand, non-academic perspective departments such as accounting department handling the financial issues, IT department, planning department, Human Resource Department and so on. Human Resource Department is the most sensitive and valued segment because workforce that co-ordinate the entire activities is been provided through this division. Also when there is a need for new recruitment, the Human Resource Department is responsible in planning the entire activity.

The first phase of HRS is vacant positions are identified and request is forwarded to the HR department upon acceptance, it will be advertised either on newspapers or official
website used by institution. Advertisement for
the vacant positions will display criteria that
candidate must fulfill before applying for a
particular position. A committee is formed to
carry out the duty of evaluating applications
and the shortlist candidates who are qualified
to proceed with the next phase. Shortlisted
candidates are invited for exams those that
reach pass mark proceeds to face-to-face
interview which involve both the presence of
applicant (interviewee) and Panels
(interviewers) in the same room. Candidates
individually enter the room for evaluation
conducted by group of panels and individual
performances are taken in order to select most
potential candidate.

Using the Traditional method, each panel will
evaluate candidate according to the criteria
agreed before commencement and write down
results for final phase of the evaluation.
Candidate’s results will be compared in order
to come up with potential candidates that will
be trusted with the organizations future. But
dealing with hundreds of applicants it is
difficult to compare individual evaluation
results using the traditional method and this
sometimes leads to unfair judgment [2].
Technology improvement plays a vital role in
simplifying organizational operational
activities especially the presence of internet
and related software applications. So make it
possible for organizations to explore the type
of technology that will be of high benefit. A
web-based technology will be explored in this
study to design a framework that DM’s can
effectively use to perform the evaluation
electronically by considering both subjective
and objective judgments.

Decision maker’s issue of judgment limitation
when preference is not clear [3] i.e crisp data
and involves exact numerical values due to
subjective consideration needs to be handled.

A Decision Support System embedded with
TOPSIS based models will be created to ease
decision making process of the panels by
allowing them to assess each candidate
despite the data fuzziness and assuring
transparency in final judgment results [4]. The
proposed framework of an integrated decision
support system for human Resource Selection
(IDSSHRS) consists of Fuzzy Set Theory,
Technique for Order Preference by Similarity
to Ideal Solution (TOPSIS) [5] and Fuzzy
Technique for Order Preference by Similarity
to Ideal Solution (FTOPSIS) [5, 6]. The
system will run as a computer-based program
which enables user interaction through a web-
based application for human resource
Selection (HRS) process.

LITERATURE REVIEW

Decision support system

Decision Support Systems are considered to
be very effective tools used by corporate,
executives, administrators and other senior
officers in making decision [7]. Early 1970’s
decision support system started to gain so
much importance due to its assistance in
simplifying making tough decisions. Business
industry has so much contribution in fast
revolution of DSS as they make use of it in
different aspect of their business decisions to
meet international challenges. DSS integrates
four components which are data management,
knowledge management, model management,
and user interface to support decision making
process [8]. An effective DSS should be user-
friendly, capable of allowing decision making
within reasonable price and less time
consuming.

In designing of DSS, model base and database
gain more priority because data’s entered via
the interface needs to be processed and saved
for future reference. Access to the database is
through Graphical User Interface (GUI) using web-based platform. Standard design with user friendly features and accessible regardless of the user’s location is important [9]. The previously mentioned features enable decision makers (DMs) or panels to successfully conduct HRS evaluation process with minimal mistakes. Data can be retrieved any time and presented in a structured manner which can be used to finalize decisions.

**Web-based application**

Earlier Websites were mainly used to share information across millions users, Hypertext Markup Language (HTML) has limitation in its functions but advancement in technologies enhances the varieties of ways that users can derive benefits from internet. These technologies are PHP and ASP, Java, C#, JavaScript and ActiveX all Known as server-side languages when combined overcome HTML limitations in developing web Applications [10]. The simplicity of using web-based application, low developing and maintenance cost has sky rocket its usage worldwide by different sectors [10].

Decision Support System (DSS) model based on web-based environment for evaluation and strategic planning tool to improve higher education management based on International Organization Standards (ISO9000) has been used in Vietnam [11]. Also Noraziah et al. [12] developed a DSS that support smart evaluation for job vacancy application system using rule-based approach. Instant Messaging (IM), has been applied in web-based applications to not only used for communication tool but also for supporting decision making during HRS process [13]. These works show the benefits that can be derived from web-based application technology in supporting decision making activities.

**Human Resource Selection**

Zero mistake tolerance is always adopted when it comes to hiring new talent because the organizations future totally depends on perfect workforce. Academic institutions give special attention to the process of recruiting new staff both for academic and non-academic. Quality of education given by these institutions has always been a major concern to the government, so raises the issue of implementing policies to protect institutions from acquiring unqualified human resource. These mistakes are easy to be made but can consume many years before the problem could be solved. In Malaysia the government has policies that guide the civil service and being monitored by the Ministry for Higher Education and Public Service Department of Malaysia which every organization must adhere during the HRS. Poor execution of HRS in any academic intuition tends to reduce reputation in academic sector.

This study intends to develop a DSS for HRS by adopting TOPSIS based models. In order to gather the requirements for the system, experts who are involved in the HRS from University Sultan ZainalAbidin (UniSZA) and University Malaysia Terengganu (UMT) were interviewed. The criteria used in the HRS are identified and compared to the one used by University of Melbourne resulting in four standardized criteria [14].

These criteria are Qualification, Qualities (Intelligent Quotient, IQ and Emotional Quotient, EQ), Skills (soft skills and technical skills) and Knowledge by which each applicant will be evaluated on. Traditionally, HRS is conducted by panels each has to evaluate individual candidate according to his expertise. The process of selection by both institutions is that, if there is a need for recruitment in a department a faculty Dean
will identify positions, proceeds with defining the job description and forward request to the Human Resource (HR) department.

The HR department will then review the request and identify the selection criteria followed by advertisement for the vacant positions. Usually, the advertisement is done via new papers, electronic media or official website by clearly mentioning the requirements for the vacant positions and emphasizing on the application closing date. After this stage, normally, hundreds of applicants will apply which then, will be evaluated based on the agreed criteria. A committee is formed to conduct the evaluation process.

After each panel (member of the committee) has reviewed the applications and rate them according to the evaluation criteria, the applicants who satisfy the criteria will be shortlisted. Shortlisted applicants are then, invited for interview which will determine the selection of best applicant that suit the job.

Many studies have been carried out in the field of HRS aiming to find solutions to the problems faced by the panels (DMs) during the recruitment process [2,13,15,16].

![Diagram of Integrated Decision Support System for Human Resource Selection Model]
There are two main processes in HRS; shortlisting of applicants and evaluating them through oral interview. [12] applied rule-based expert system technique for the shortlisting of applicants guided by a set of criteria. Junalux et al. [15] also works on facilitating Job recruitment process through job application support system. Three components were used in the system [15] which are electronic application form, electronic telephone interview and electronic interview but did not give much consideration to aptitude test.

In our study, we propose TOPSIS based models and Fuzzy set theory which will be embedded in the Integrated Decision Support System for Human Resource Selection (IDSSHRS) to support decision making process.

FRAMEWORK FOR IDSSHRS

The proposed system applies the concepts of TOPSIS, Fuzzy TOPSIS (FTOPSIS) and Fuzzy set theory to facilitate the evaluation process in a number of phases.

IDSSHRS consists of four phases which each have to be given special consideration as to ensure right decisions are made without fear of misjudgment. Figure 2 shows the phases of the framework for the IDSSHRS. They are described as follows:

Phase 1: This phase requires the system administrator to determine the positions that are available. The selection criteria that will be used to shortlist candidates can also be identified during this stage. Also, the determinations of panels interviewer who are to participate in the HRS process are performed.

Criteria weights can be assigned by the administrator using a customized scale derived from fuzzy set theory. Zadeh introduces fuzzy sets theory in 1965 aiming to represent uncertainty, vagueness and provide tools that can be used in dealing with imprecise problems [16]. Fuzzy sets where extended to fuzzy logic providing a theory that clearly shows its mathematical strength in capturing uncertainties associated with human thinking and reasoning [16]. Since then, fuzzy set theory has been applied in different fields such as computer science, artificial intelligence, pattern recognition, expert systems, and robotics [17].

On the side of applicants, they will access the system and select the job title which they are interested to apply. They need to fill in their particulars in the on-line form provided by the system.

An applicant has to provide personal information, educational background, work experience, and the skills in which the system will automatically generate identification number (ID) to be used throughout the evaluation process. Access to the system will be blocked after the closing date. Based on the job ID, the system will categorized the applicants according to applied positions.

Phase 2: Technique for Order Preference by Similarity to an ideal solution (TOPSIS) introduced by Hwang and Yoon (1981) [3] is adopted in this phase to automatically evaluate and shortlist the applicants who fulfill the selection criteria. In TOPSIS method, positive ideal solution maximizes benefit criteria and minimizes cost criteria, negative ideal solution maximizes cost criteria and minimizes benefit criteria [5, 20]. Hence, alternatives should have shortest distance from positive ideal solution and farthest from negative ideal solution [19, 20].
Figure 2. A framework for IDSSHRS
Phase 3: Shortlisted Applicants identified during Phase 2 will be invited to seat for examination known as aptitude test. The test is basically divided into two categories; speed test and powered test designed to assess the capabilities of a candidate in terms of various aspects such as verbal and numeric ability, abstract reasoning, technical reasoning, and fault diagnosis. Certain amount of time is given in which applicants must complete the main key test questions within certain speed at which a candidate is able to reach correct answers.

The aptitude result shows candidate level of competency to perform a certain type of task. Candidates are shortlisted again according to the passing marks defined earlier and are invited for the final phase, that is interview session based on face-to-face with the panels.

Phase 4: In this phase, the evaluation criteria can be updated by the panels then, followed by assigning weight to the criteria.

Due to subjective nature of some of the criteria, Fuzzy set theory will be used to determine their relative importance. FTOPSIS, an extension of TOPSIS coined by Chen will be deployed to deal with fuzziness of data values for the evaluation of applicants against the multi-criteria [5,20,21]. Lastly, FTOPSIS assures aggregation of results for ranking of candidates, in ascending order with the highest marks proves potentiality. Decision makers can conclude final decision for hiring the most potential human resource.

CONCLUSION

The evaluation of applicants in HRS is a very vital process to any organization willing to offer jobs. IDSSHRS is a web-based application that allows DMs to easily evaluate applicants without stress and assuring proper judgment in the potential candidate selection. Traditional method used in HRS tends to be tiring, time consuming and at the end poor judgment can occur. Hiring the wrong candidate results in disaster; time and resources are wasted, and the entire procedure has to be repeated for better evaluation.

The proposed system will fully utilize TOPSIS, FTOPSIS and fuzzy set theory concepts to enable decision makers to perform their duties successfully within limited time and resources. Evaluation results are saved in the database which can be retrieved when there is a need for references of the actions taken by DMs during the selection process.

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REFERENCES


