

MODELING THE EMPLOYEES' ACTIVITIES OF PUBLIC SERVICE SECTOR USING PRODUCTION RULES

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ABSTRACT: In every organization, effective Human Resource Management (HRM) is vital in order to meet the increasing market demands with well-qualified employees at all times. The research is aimed at providing personnel activity recording model that assists both records managers and non-records staff, including line managers and personnel staff, to manage personnel records in support of corporate accountability and good governance. Production rules technique was employed to model the decision engine of the system. The implementation machines are configured with Windows 8 operating system, Java programming language and My Structured Query Language as the backend machine. The result showed that electronic activity record system is cheaper to run and yield better returns on personnel investment than the conventional method of record keeping.

KEYWORDS: Human Resource Management, Production Rules, Backward Chaining, Forward Chaining.

1. INTRODUCTION

The head of every organisation needs to know how many people work for him or her, who they are, where they are, what responsibilities they have and how effective they are. Good personnel records are necessary to allow the best use of available staff and promote efficiency in the organisation ([IEG15]). The records also help the organisation make good use of scarce resources and help provide an accurate source of data, which can be used in other information systems throughout the organisation. Typically the public service maintains very large volumes of personnel records and the majority of these continue to be held on paper ([Ogu05]). The failure to manage these records will lead to significant wastage of office space and have major implications in terms of cost and staff time. The role of the Human Resource (HR) strategist is now squarely focused on mechanisms to streamline the HR function in order to contribute to the overall organization's success ([EAO15]).

In today's business scenario, HR managers are facing numerous challenges. Some of these challenges are globalization, workforce diversity, technological advances as well as changes in the political and legal environment. Indeed, the pressure on HR managers to attract, retain and nurture talented employees has

been on the increase. There is therefore a serious need for HR professionals to design and execute strategies, innovative mechanisms all geared towards capacity building of the workers as well as equipping them with necessary skills and competencies required for coping with emerging challenges ([EN12]).

2. REVIEW OF RELATED WORKS

This section reviews several related research works on this subject matter.

In ([AU99]), a Prototype of Information Technology Based Human Resources System was presented. No decision framework was however considered.

The authors in ([JA11]) noted that in many developing countries, human resources data are limited, inconsistent, out-dated, or even unavailable. Consequently, policy-makers are unable to use reliable data to make informed decisions about the health workforce. In the literature, an electronic mechanism record system was developed for more efficient search, update, and verification of prospective employee's training qualification. Attempts were however not made at considering employees' activities at their workplace.

([DH07]) identified that the best practices for supervising Information Technology (IT) personnel is derived from data gathering techniques. However, no specific data gathering method was proposed.

The issues relating to continuous poor record keeping, delayed personal data aggregation, poor talent management and poor staff file management continue to hinder human resource service delivery in many organisations. The unreliable nature of the HR manual systems could be the reason why significant decisions are not based on accurate and timely information. This compromises the performance of employees.

However, with the appropriate information tools, managers, employees and customers can quickly respond to market change, and control risk cost. To reveal the adding value of IT application in HRM, it is necessary to clarify how IT can advocate the HR function, for example, in strategic task or administrative task, and how IT can advocate its

transformation. In ([Has09]), three major challenges to the effective management of human resource training and development were identified. These include a shortage of intellectual human resource development professionals to manage human resource training and development activities, coping with the demand for knowledge workers and fostering learning and development in the workplace. New modes of organizational flexibility, the levelling power of information technology and relentless cost pressures have undermined occupational structures, middle management positions and functional roles, allowing managers to increasingly assume tasks once performed by the personnel function or to outsource them to external consultants. In addition, the emergence of ‘HRM’ as a panacea for integrating business strategy and people management has exposed personnel practitioners to a new set of role demands, professional challenges and managerial expectations that have underscored the gaps between HR rhetoric and reality ([Ray03]).

It was observed from available related literatures that consideration was not really given to modelling employees’ arrival time, activities during working hours as well as departure (exit) times. These three are very crucial to improved productivity of employees and the organisation at large. Moreover, no reliable and evidence-based data generation mechanism was demonstrated in any of the reviewed related works. Production rules and its logical data execution advantages if employed, can provide HR professionals with firsthand evidence-based information necessary for improved decision-making and subsequently boost productivity. This work therefore adopts production rules for modelling employees’ arrival time, exit time and working activities.

3. SYSTEM DESIGN

Events around us have shown that employees are no longer sincere in recording their time of arrival when they resume beyond schedule, therefore this model is advocated for which will help guide against false entries. Moreover, keeping log of personnel arrival and exit time is a big business for informed decisions to be taken when the need arises.

3.1 MODELING DUTY POSITION OF EMPLOYEES

The model for monitoring workers on duty post is as shown below. In the algorithm, P_i is the duty positions of workers in any public sector, where $i=1, 2, 3, \dots n$. TT_i is the total time a worker Y_T is

expected to work in a month. D_p is the duty position assigned to Y_T .

$$P_t = Y_T \left[\frac{TT_i P_i}{D_m} \right] \tag{3.1}$$

$$D_p = \begin{cases} O & P_t = d_t \\ N & P_t \neq d_t \end{cases} \tag{3.2}$$

O and N indicate that a worker is on duty and not on duty respectively. P_t is the required time duration for a worker to be on duty for any particular day, and d_t is the precise time of the day the worker is expected to be on duty. A worker is said to be on duty when the required time duration the worker is expected to be on duty is the same as the precise time of the day the worker is expected to be on duty, otherwise the worker is said not to be on duty.

3.2 MODELING OF PERSONNEL ARRIVAL AND EXIT TIME USING PRODUCTION RULES

The production rule technique was employed to model the arrival and exit time of personnel. Production (or "production rule") is a system which consists of a set of rules, working memory that stores temporary data, and a chaining (backward or forward) inference engine. Production rules make use of connectives such as **AND**, **OR**, and **NOT**

Rules can be evaluated by:

- (1). backward chaining
- (2). forward chaining

3.3.1 Backward chaining

- (1). To determine if a decision should be made, work backwards looking for justifications for the decision.
- (2). Eventually, a decision must be justified by facts.

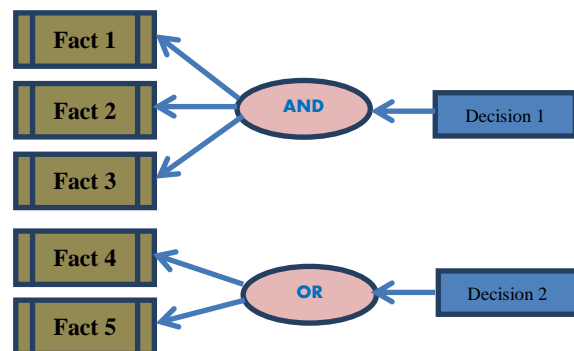


Figure 3.1 Backward chaining rule evaluation

3.3.2 Forward chaining

- (1). Given some facts, work forward through inference net.
- (2). Discovers what conclusions can be derived from data.

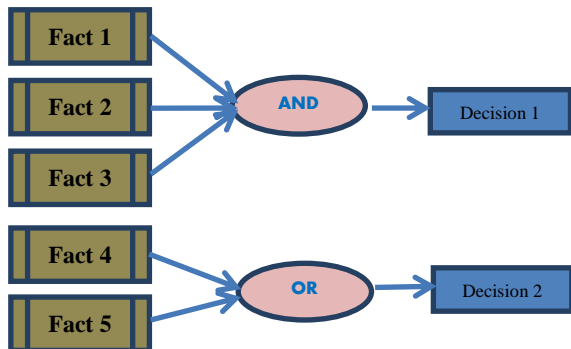


Figure 3.2 Forward chaining rule evaluation

Forward chaining will be applied to duty position, arrival/departure time and activities of employees. Forward chaining is a means of utilizing a set of condition/action_rules. In this mode of operation, a rule-based system is data-driven. The data is used to decide which rules can fire.

The production rule for arrival time for worker will be:

If $\{T_i = d_t\}$ **then**
Normal arrival
Else if $\{T_i \geq (d_t + 10)\}$ **then**
Late arrival
Else if $\{T_i = 0\}$ **then**
Absent

where T_i is the sign in time and d_t is the precise time of the day the worker is expected to be on duty. The production rule for managing time of departure of employees is given as:

If $\{T_o = d_t + P_t\}$ **then**
Normal Departure
Else if $\{T_o \geq (d_t + P_t)\}$ **then**
Late Departure
Else if $\{T_o \leq (d_t + P_t)\}$ **then**
Early Departure

where T_o is the sign out time and P_t is the required time for a worker to be on duty in a particular day.

3.3.3 Modeling employees' activities

The activities of the employees' are expressed as:

$$L = P_i\{A_{j,k}\} \quad 3.3$$

$$Lg = Y_T\{L\} \quad 3.4$$

L is performed activity from A_j which represents all the activities for a particular duty position P_i on day k , Lg is the saved log of performed activities carried out by a worker Y_T .

4. DISCUSSION

The results shows that the forward and backward chaining approaches when properly formulated in a closed loop will yield high performance with negligible difference. In this way, the monitoring system provides an information-rich picture of the system and its performance. The aim of the presented employees' monitoring system is to assess access and provide information necessary for the planning and management of authorize and unauthorized users of the public service facilities. The model provides a holistic information that are useful for the explanation of observed phenomena.

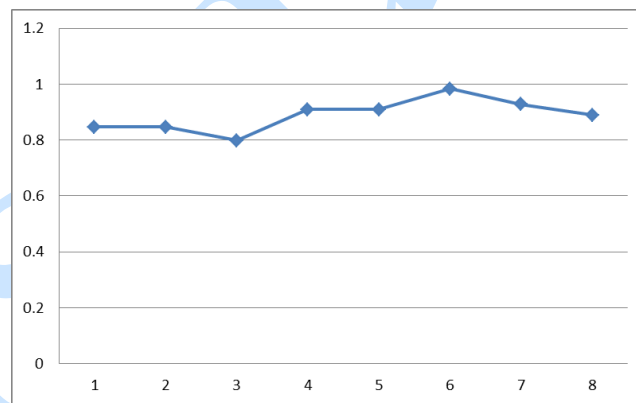


Figure 4.1 Graph of authorized/unauthorized access rate

CONCLUSION

A substantial approach to monitoring can reduce accountability risks. IT offers many ways to improve the quality of service, help staff to make better use of their time and expertise and promote greater efficiency. What you don't monitor, you can't evaluate. This study provides an evaluation monitoring framework for human resources assessors. The critical challenge is to create a well-designed, effective, low-cost system by sharing resources, learning from each other's experience and evaluating work.

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