Computerised human resource planning and management system (HRPMS) for water services institutions

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Abstract The aim of this project was the development of computerised management systems for water utilities that can facilitate an increase in productivity while compensating to a certain degree for shortages of middle and high-level manpower. These are common requirements in developing countries.

The enhancement of knowledge using a computerised human resource planning system specifically for water services institutions can be achieved through the incorporation of human resource modeling techniques. The first phase of the project involved an extensive literature survey and development of version 1 of the software after limited exposure of the demonstration software to various stakeholders. An enhanced version 2 of the software was developed from the feedback received from various users through pilot studies and presentations. The development of the computerised Human Resource Planning and Management System (HRPMS) assists managers to undertake human resource planning of water services institutions.
Keywords Computerised; human; management; planning; resources; utility

Introduction

Water services institutions are dynamic organisations due to the fact that there is a growth in the demand for their services as well as a continuous movement of staff into and out of the organisations. A dynamic computerised human resource planning system is required to meet the challenges resulting from this dynamism.

The human resource and organisational structure requirements of a water service institution is related to the specific water infrastructure, population served, financial resources and the production capacity of the water service institutions. This relation between human resources and other resources is achieved through the establishment of performance indicators. The planning of human resource requirements is then facilitated through the comparison of these performance indicators with benchmarks.

A computerised human resource management system can also assist with the preparation of annual business plans with specific reference to those sections dealing with human resources and human resource development.

Computerised management systems are technologies that lessen the need to depend on direct supervision. Their effect on water institutions is that the organisational structures can become flatter and more organic without loss of control. An organic organisational structure is characterised by having low complexity, low formalisation and opportunities for decentralisation.

Computer-based information systems allow managers to handle more subordinates, leading to wider spans of supervision and, therefore, flatter organisations. Management systems rapidly inform managers of the consequences of critical decisions and allow them to take corrective action. Therefore, there is an appearance of decentralisation without any commensurate loss of control (Robbins, 1991).

Computerised management systems can, therefore, facilitate an increase in productivity as well as compensate to a certain degree for the shortage of middle and high-level skills.

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The value of the benching process introduced by these computerised management systems is that it provides a substitute for the efficiency-boosting effect of market forces in organisations (or business units) that are not normally exposed to market economies (Karlöf and Östblom, 1993).

The emphasis of the South African Water Research Commission's project (undertaken by Stewart Scott between 1999 and 2001) was to develop a computer program to assist with human resource planning and management within water services institutions (Water Research Commission, 2001).

This paper provides a brief review of the project, focusing on human resource planning as well as the computerised Human Resources Planning and Management System (HRPMS) developed for Water Services Institutions consisting of the following five main modules:

- Organisational Details
- Job Analysis
- Employee Profiles
- Resources
- Employment Equity.

Human resources planning

Human resources planning implies a broad spectrum of activities touching many parts of an organisation. The focus of human resources planning is on decision support and policy making. It is concerned with aggregate flows of people into, within, and out of the organisation and with co-ordination of persons and jobs on an individual level (Niehaus, 1979).

Hercus (1993) summarises human resources planning by stating that it is a management process involving the following elements:

- forecasting human resource requirements for an organisation to execute its business plan;
- forecasting human resources available for meeting these needs and undertaking a scan of the internal and external environments of the organisation;
- identifying the gaps between what will be needed and what will be available and developing the necessary action plans to bridge the gaps;
- implementing and monitoring these actions plans.

There are three major types of computer-based human resources systems, viz. electronic data processing (EDP), management information systems (MIS) and decision support systems (DSS). These three types of systems can be located on a continuum, as illustrated in Figure 1, of relative activity by users ranging from the storage of files at the one end to interactive decision systems at the other (Carrel *et al*., 1998). The computerised HRPMS developed for this project includes aspects of both a MIS and a DSS.

All these computerised HR systems are described by the generic title of Human Resources Information Systems (HRIS). Modern personnel administration has brought with it a profusion of planning requirements and employee benefit and development programs. These computerised HR systems take a major supporting role in ensuring that these activities make a positive and measurable contribution to organisational effectiveness (Beatty *et al*., 1985).

Some of the general and specific elements/aspects of a computerised human resources planning system identified from literature are as follows:

- as a management tool in the alignment or integration of the human resources department's goals with goals of long-term corporate strategy (Carrell *et al*, 1998);
- to collect, record, store, analyse and retrieve data concerning an organisation's human resources (Carrel *et al*., 1998);

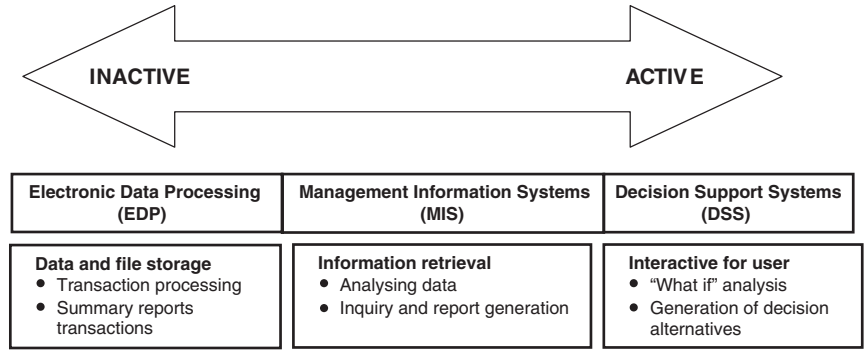

Figure 1 Types of computer-based human resources systems (Carrel *et al.*, 1998)

- to produce reports for both accountability and planning purposes (Whitman and Hyde, 1985);
- to apply computer-assisted human resources techniques for equal employment opportunity planning (Niehaus, 1979);

A truly intelligent design of HRIS mandates a multi-disciplinary approach that combines knowledge in job design, MIS, strategic planning and industrial relations (Huo and Kearns, 1992).

HRPMS development

The HRPMS was developed as part of a two phase project for the South Africa's Water Research Commission. The first phase included an extensive literature survey, development of version 1 of the software and limited exposure of the HRPMS to various stakeholders. The second phase included pilot studies, presentations and feedback from various users in order to identify potential enhancements. The result of this latter phase was the development of version 2 of the software incorporating those enhancements that could be accommodated within the project's budget. HRPMS version 2 is a pragmatic and flexible computer program that will assist human resource practitioners in water institutions to manage and plan their human resources.

The emphasis of the HRPMS's development was towards aspects relating to MIS and DSS. The program is of particular relevance to water institutions that have limited human and financial resources to manage and plan their own human resources. Each module and some of the features of the HRPMS are described briefly below.

Organisational details

This module allows for the identification of the water institution, inclusion of details of its organisational structure, as well as input of the basic demographics, infrastructure, financials and production output associated with that particular institution.

Job analysis

This job analysis module provides details of the criteria for generic positions within the water service institution.

Job analysis is the process of developing job-related information and can serve as the cornerstone of an integrated human resources programme. It is a process by which management systemically investigates the tasks, duties and responsibilities of the jobs within an organisation. Job analysis comprises both job descriptions and job specifications. The specific position within the organisation is also identified.

The most common element of job descriptions is some form of identification and a brief job summary. Job specifications present the qualifications and attributes job applicants must possess to be considered for a job. These requirements are grouped into the following categories: abilities, knowledge and competencies, language abilities and formal qualifications, for each post within the water service institution.

A pro-forma or template has been designed for this module so that reference databases, known as pick lists, can be used and updated as new job analysis information becomes available.

Employee profile

The purpose of the employee profile module is to provide a pro-forma or template for the entry and storage of actual employee information. The difference between the job analysis module and this module is that the former holds a database of the ideal criteria for a particular position while this module is a database of an employee's actual attributes. This module could be regarded as a standardised résumé or curriculum vitae. Details such as organisational position, education, employment history and experience are stored.

The outputs of the various modules are combined through a matching process, which facilitates the determination of human resource and training requirements.

Four screens/folders are available which include a summary, the organisational position in relation to the organogram, education and employment history/experience.

Resources

The purpose of this module is to assist with the planning process via performance indicators that link human resources to other resources of the water services institution.

The human resources required from indicators are determined and compared with the current resources. The percentage difference between current and required human resources is displayed on this screen.

Provision is allowed for the input of forecasted production capacities, kilometres of piping and connections for a particular year from other strategic exercises in order to calculate future human resource requirements. The facility is applicable to institutions involved in the provision, supply and distribution of potable water as well as in the collection and treatment of wastewater.

Although default performance indicators are provided, users can define their own specific indicators through the definition of variables that are relevant to requirements of the specific institution.

Employment equity

This module assists the user to comply with the reporting requirements of the South African Employment Equity (EE) Act as well as allows for the storage of data that will facilitate the analysis of conditions external to the institution as required for planning purposes.

The purpose of the EE Act is to achieve equity in the workplace by promoting equal opportunity and fair treatment in employment through the elimination of unfair discrimination; and implementing affirmative action measures to redress the disadvantages in employment experienced by designated groups in order to ensure their equitable representation in all occupational categories and levels in the workforce (Employment Equity Act, 1998).

Data describing the distribution of the economically active population as well as financial indicators for the various racial groups on a national and regional basis can be entered. The respective data for the organisation is automatically extracted from the database and displayed on this screen.

Data pertaining to distribution of designated groups on a national and regional basis. Similar data for the organisation as well as statistics on vacancies and turnover are displayed on this screen. Provision is made for the statistics on the designated groups' distribution for each occupational category within the organisation.

Competency profile definition

Whitman and Hyde (1985) proposed scoring matrices to effect the position-person matching process that provided a rank-order lists of candidates for a position.

HRMS has in its Competency Profile Definition the feature to set up comparative ratings for scoring matrices related to abilities, competencies, knowledge, language ability and qualifications. An example of the latter is illustrated in Table 1, where the vertical column indicates the qualification required in the Job Analysis (JA) and the horizontal row indicates the qualification held by the candidate/employee.

This technique can assist with the selection process of new employees and with the identification of training/education requirements of existing employees.

This Comparative Profile Definition is applied in conjunction with a Weight and Minimum Score fields allowed for in the Job Analysis. The weight indicates the importance of a particular competency relevant to other competencies for a particular position. The minimum score is the minimum acceptable score as compared to the previously mentioned comparative competency rating and facilitates the matching process.

The application of these weights and scores is undertaken in a reporting function which matches the selected employee/applicant with a selected post. A simplified example of this matching process is given in Table 2.

The matching percentage of the candidate is therefore (74% (i.e. (170/230) × 100). Where the product of W × S is less than the weight a potential training need for the employee is also identified.

Reporting facilities

HRPMS has a flexible multi-dimensional reporting matrix that facilitates the determination of the number of employees for 14 categories as required for Governmental Employment and Training reporting requirements. These categories include age group, department, gender, occupational category, education, service type and team.

Table 1 Example of a comparative competency rating matrix

Qualification required by JA	Qualifications of candidate/employee			
	None	BA	MA	PhD
None	1.0	0.9	0.8	0.4
BA	0.5	1.0	0.9	0.8
MA	0.1	0.7	1.0	0.9
PhD	0	0.4	0.8	1.0

Table 2 Example of a matching process

Competency group	Area	Required item	Match Item	Weight (W) (e.g. Table 1)	Score (S)	Product (W) × (S)	Minimum score
Qualifications	Formal	MA	BA	80	0.7	56	0.5
Language	English	Excellent	Good	90	0.6	54	0.4
Knowledge	Technical	MS Excel	MS Excel	60	1.0	60	0.6
			Totals	230		170	

Other reports that can be generated include the following:

- List of employees sorted by surname or employee number
- List of job titles sorted by department or post number
- List of vacancies
- List of terminations

Graphic reports can also be generated in the form of pie and bar graphs showing staff turnover statistics and period employed/age distribution.

Conclusion

The computerised HRPMS developed for water services institutions can be categorised within a continuum describing aspects of both a management information system as well as a decision support system.

The management component of the HRPMS includes portions of the job analysis and employee profile modules. The planning (decision support system) component includes the employment equity, resources (benchmarking), forecasting human resource requirements and provision of data required for business plans as dictated by the South African Water Services Act.

The need for the HRPMS has been expressed by several members attending the Project Steering Committee meetings, Pilot Studies and Stakeholder Workshops related to the development of the software.

The HRPMS has considerable potential for expansion as both a management and planning system. However, there is an urgent need for the application of this type of computerised HR system by water service institutions that currently do not have the financial and human resources nor the expertise to implement more sophisticated systems.

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