Towards The Modeling of a Personnel Management Information System for Employee Recruitment Process

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ABSTRACT

Computerization is the trend in modern business circle since it has proved most effective in many fields to generate maximum output, and perform hitherto difficult tasks. We conceptualize a software solution that automates the manual staff recruitment system using the Nigerian Institute of Social and Economic Research (NISER) as a reference base. The system is targeted at reducing the time wastage on keeping applicants' records, filling of the recruited applicants records for certain period and to reduce bias on the selection process based on recommendation and references. Each step in the designing phase is carefully documented up to the stage of implementation. The conceptualized human resource management system is expected to optimize the selection process.

Keywords: Modeling, Human Resources Management, Information Systems, Applicants, Recruitment

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1. BACKGROUND TO THE STUDY

Management has been called the art of getting things done through people (Kirkbride et al 2019). Management is that and more. Management is the process of planning, organizing, leading and controlling the efforts of an organizational members and using all other organizational resources to achieve stated organizational goals. The term management has to be explained in terms of what it is specifically because it is the keyword in Human Resource Management System. Personnel Management (PM) involves the establishment and execution of policies, programs, and procedures that influences the performance, capabilities, and loyalty of the employees of an organization (Ahammad et al, 2017). Through these policies and procedures, individuals are attracted, retained, motivated, and developed to perform the work of the organization.

It is through these policies and procedures that the organization seeks to mold and shape the actions of its employees to operate successfully, comply with various public policies, provide satisfactory quality of employment, and improve its reaction in the market place through strengthened ability to compete and serve. Personnel Management is then the process of coordinating an organization's human resources or employees, to meet organizations goals (Ahammad et al 2017).

Personnel Management can also be referred to "the policies, practices and systems that influences employee's behaviour, attitudes and performance". As such, it incorporates management functions such as forecasting, recruiting, selecting, training, evaluating, compensation, and of course, facilitating employee/employer relations. In a spirit of quasi-codification under the label of "Management", these functions have been categorized into the following seven "steps"; determining human resource needs; attracting potential employees; choosing employees; teaching/preparing; rewarding; evaluating performance; and creating a positive work environment. Accordingly, strategic Human Resource Management is said to be "a pattern of planned human resource deployments and activities intended to enable an organization to achieve its goals; and is presumably part of a broader organizational or strategic plan for an agency.

Personnel Management System (PMS) in its definition will not be complete without stating clearly the role information plays in it. This is because all the raw data that is fed into the system when delivered will be worked upon and delivered out as information for the use of the management in carrying out their functions which includes recruitment/benefit plans and performance appraisal. So an in-depth knowledge is needed about what an information system is, and the role it plays in Personnel Management. First of all, information is the collection of facts organized in such a way that they have additional value beyond the value of the facts themselves (Avison et al, 2006). An information system is then a system that provides information to people in an organization. It is a system that assembles, stores, processes and delivers information relevant to an organization in such a way that the information is accessible and useful to those who wish to use it.

Information As Relevant To PMS

The term Information System can be defined as the effective design, delivery, use and impact of information technology in an organization. Information systems in Human Resource Department provide facts useful to its member and clients, which should help it operate effectively. This information put together should influence employee's behavior, attitudes, and performance. It will aid in the execution of policies, recruitment/selection of staff's, payments and benefit plans for the staffs, and help in appraising the staffs of the department.

1.1 Types of Information Systems

Although many information systems are unique to particular types of organization, such as a system for placing and paying out bets in a betting office, a ticket reservation system for an airline or a decision support system to aid decision making of management in relation to the Human Resource Department of that organization. But before we go into the information system used in a Personnel Management Department, a brief discussion of three or more of information systems available out of the numerous that exists would be of great advantage.

Management Information Systems (MIS)

Management information system is a computer-based system that makes information available to users with similar needs. The users are usually composed of a formal organizational entity-the firm or a subsidiary subunit (Ahammad et al, 2017). The information describes the firm or one of its major systems in terms of what has happened in the past, what is happening now, and what is likely to happen in the future. The information is made available in the form of periodic reports, special reports and outputs of mathematical simulations. Both managers and non-managers in the firm use the information output as they make decisions to solve problems.

Decision Support Systems (DSS)

Decision support system aids the decision making of management. Such systems may use the whole range of facts about the organization, or part of the organization, or sometimes relate to aspects external to the organization, that is, its environment, to promote information to aid the decision maker. (okoli et al, 2021). The system is designed to enable managers to retrieve information which will help them make decision about for example in a human resource department to know about the type and skills of employees needed to fill a vacant space, performance appraisal techniques for the employees and so on.

Expert Systems

Expert system attempts to simulate the role of the human expert. Their usefulness is derived from the reasoning ability of the system to use its knowledge base of that particular domain to provide solutions or guidance to problem solvers in particular situations (okoli et al, 2021). An expert system consists of four main parts: a user interface, a knowledge base, an inference engine, and a development engine (Lussier, R. 2021). Expert system also known as a knowledge-based system is a computer program that attempts to represent the knowledge of human expert in the form of heuristics.

Office Automation System

Office automation system includes all the formal and informal electronic systems primarily concerned with the communication of information to and from persons both inside and outside the firm (Lussier, R. 2021). These systems include the various application found in offices such as word processing, electronic mail, voice mail, meeting management, facsimile transmission and the like. All the people who work in the offices use office automation, which includes the managers, professionals, secretariats, and clerical employees. Today's OA Systems facilitate communications not only among people inside the firm but also between people and others in the firm's environment.

Transaction Processing System

These are probably the most common information system, process the individual transactions in a business, such as the employee data that is used in a payroll system, the data stack replenishment in a stack control system, or the customer order data which is used in a sales order processing system. Very often, the concern is based on the day-to-day operations of the organization (okoli et al, 2021). With a review of some of the information systems available and their functions in business organizations, one can say that an information system specific to the Human Resource Department of an organization should exist in that department to aid the efficient management of the resources in the organization. The information system would also act as a decision-making system as it would enable top-level management make quick and appropriate decisions for the organization's growth. Every organization must have a system for gathering and maintaining the data that describes the Human Resources, transforming the data into "information", and reporting the information to users. This system has been named the Human Resource Management Information System.

Personnel Management System (PMS)

All large firms have a Personnel management function that handles much of the specialized processing concerning the firms personnel. The conceptual system that is used in managing the personnel and resources is called Human Resource Management Information System (HRMS). A Personnel Management System or termed Human Resource Information System (HRIS) in some other organization is such a system that provides the necessary information for coordinating an

organization's human resources, or employees, to, meet organizational goals. The information will be used for the establishment and executions of policies, programs and procedures which the Human Resource Department engage in for the smooth running of the company The organizational structure of most firms includes a unit that has responsibility for many of the activities related to the personnel resource. The term personnel was originally given to these units but the practice today is to use the name Human Resource (HR), recognizing that personnel is a valuable resource. HR can be a department or a division within a functioning area, or it can have a functional status equal to marketing, manufacturing and finance. The manager of HR can be a Vice President, but the director role is more popular. The title HR Director is used to describe the person in charge of HR. The HR director can be a member of the executive committee.

2. PRIMARY HUMAN RESOURCE ACTIVITIES

Human Resource Department support the other functional areas by assisting in obtaining new personnel, preparing personnel to do their jobs and handling much of the recordkeeping that is related to employees and former employees. Some of the activities of HRD are mentioned below:

Recruitment and Hiring

HRD helps brings new employees into the firm, by running help wanted ads in newspapers, providing position requests to both governmental and private employment agencies, performing screening interviews on the attracted applicants, and administrating employment tests. HRD stays current on governmental legislation affecting employment practices and counsels management on the proper policies to establish. The process of recruitment and hiring can also be termed as attraction and selection.

Data Management

HRD maintains a database of employee-related data, and processes that data to meet user's information needs.

Education And Training

During the period of employment, HRD can administer educational and training programs that are required to cultivate the employee's job-related knowledge and skills. For example, members of the HR staff can assist systems analysts' in training users during the implementation phase of the Systems Life Cycle. The activities of the HRD also includes as training for the staffs development a performance appraising system and moral surveys. When the term training used in Human Resource Management, references is usually being made to the provision of essential skills and services for new employees in an organization in order to help that employee meet job requirements. However, some also use the term to refer to the notion of furthering the skills of existing employees.

Training is often approached in terms of:

1) conducting a "needs" assessment;
2) Ensuring employees readiness (attitude and motivation);
3) Identifying learning objectives and training outcomes;
4) Ensuring the transfer of training, i.e. management support;
5) Selecting training methods; and
6) Evaluating training programs.

Termination And Benefit Administration

During the time that persons are employed by the firm, they receive package of such benefits as hospitalization, dental insurance etc to retain the staff and boost their performance. In addition, when employees terminate their employment, HRD processes the necessary paperwork and often conduct exit interviews. One purpose of the interview is to learn how the firm can better serve its employees in the future. After termination, HRD administrates the firm's retirement program to former employees who are eligible. Thus the four Human Resources function/activities facilitate the flow of the personnel resources, which is shown below:

Problem Definition

Running any HR processes manually and keeping track of organization workforce information by hand can be considerably tiresome, expensive and inaccurate. With a PMS software solution, you can help reduce cost, provide accurate information consistently and make it easier for your HR group. Personnel Management System (PMS) can be used to streamline HR processes and to provide a single source of all associated employee and organizational data. Today's HR software offers increasingly sophisticated functionality giving companies the opportunity to automate labour intensive processes and devolve routine transactions to line management and in some cases, to employee themselves. Thus, the main task of this project is to computerize the activities of the personnel department of Nigerian Institute of Social and Economic Research (NISER), Ibadan, under which the Human Resource department can be located. This is to facilitate the efficient management of records and to facilitate speedy processing of the activities of the personnel department.

The project is to be called "Personnel Management System". Computerization of the personnel department will bring a formal and consistent way of doing things. Computerization will not necessarily involve a total change in the mode of operation of the department. This is because the present system has a predetermined consistent formal of operating. In this system, the main task will be divided into modules. A module representing each unit of task identified e.g. updating which includes adding and deleting records, determining those applicants to be recruited, those due for benefits and compensation as they have qualified for it through the performance evaluation system of the institute, and of course generating reports.

Research Direction

The aim of this project is to develop a software solution that will streamline HR processes of any small or big organization of which NISER is one, and provide a user-friendly environment for the organization's HR group. HRMS software can manage an entire life cycle of a work force and help in reducing overhead costs. The project aim will be achieved by or through the following objectives:
Development of a HRMS which would entail:

- A full input of employee recruitment and selection.
- Performance evaluation for the appraising of staffs.
- Compensation and benefits.

Justification

Computerization will enhance the overall efficiency of the Personnel Department, because some of the challenges today in Personnel Management are maintaining a diverse workforce, dealing with major technological changes, keeping up with governmental regulations, and handling corporate restructuring and downsizing. The developed system will be devoid of human errors such as omission, favouritism, nepotism and reduce cost to the organization.

3. RESEARCH APPROACH

The research will be carried out studying the existing system used in the chosen organization. We will carry out an interview by constructing an interview guide. These entail interviewing the staffs of the Personnel Department. Among them were the Director and Head of the Personnel Department and the Head of Computer Section. An interview guide was constructed to ensure that the interview is carried out in an organized manner.

Questions asked on some major functions identified:

1. How do the departments keep staff records?
2. How is the recruitment and compensation of staffs done?
3. The kind of report generated and the form it takes.

- Documenting the rules, reading and analyzing the various facts on the existing system.

By reading and analyzing various records forms, facts on the existing system were obtained. These two methods were the two basic ones carried when finding out the basic information needed to develop the system.

- Testing of the software solution to see its performance.
- Implementation of the program developed on a computer system.

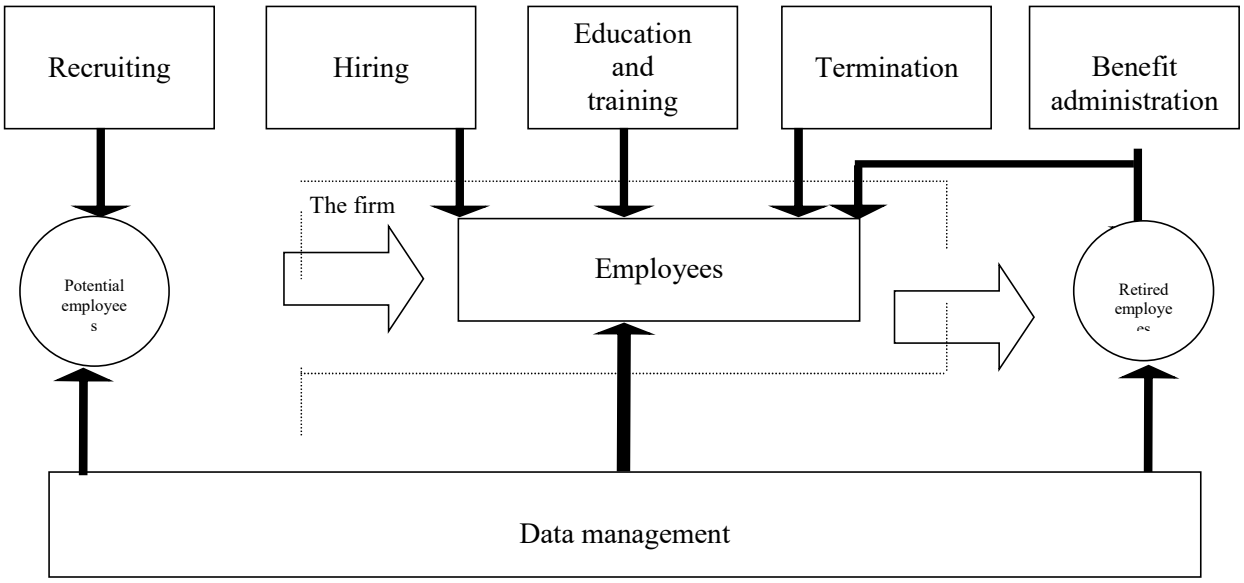

Figure 2.1: Human Resource Activities In The Personnel Department

Below is an example of a way of going about the activities of the personnel department.

Screening And Selection Methods

A very challenging aspect of Human Resource Management is selecting the best applicant when filling an employment opportunity. In the hope of doing so, an employer may rely on interviews, ability tests, personality inventories, work samples, or reference checks in attempting to determine how well a potential employee will perform in a position. In varying degrees, each of the selection techniques serve as predictive validity indicators-that is, they are independent variables used to assist an employer assess or predict how well a potential employee will function in a position. Unfortunately, such predictive validity indicators often have limited reliability when it comes to projecting performance and as such, Human Resource Managers will often acknowledge and consider their personal feelings and/or impressions towards an applicant in combination with the above noted selection means when hiring. Some components of the above selection methods are described in full details below:

Recommendations and Reference Checks

The most common techniques used to screen outside job applicants are recommendations and reference checks. They can provide four kinds of information about job applicant:

(1) Education and employment history,
(2) Character and interpersonal competence,
(3) Ability to perform the job, and
(4) The willingness of the past or current employer to rehire the applicant.

A recommendation or references check will be meaningful only if the person providing it has had an adequate opportunity to observe the applicant in job relevant situations, is competent to evaluate the applicant's job performance, can express such an evaluation in a way that is meaningful to the prospective employer, and is completely candid (Dolechek et al, 2019). Reference checking is not an infringement on privacy when reference-checking practices are used. It is a sound evaluative tool that can provide objectivity for employers and fairness for job applicants.

Employment Interviews

Researchers have been studying the employment interview for more than 60 years for two purposes:

- To determine the reliability (consistency) and validity (accuracy) of the employment decisions based on assessments derived from the interview and,
- To discover the various psychological factors that influence interviewer judgments.

Interview works well when:

- The interview is limited to information that a prior job analysis indicates as important for successful job performance.
- Interviewers are trained to evaluate behaviour objectivity.
- The interview is conducted along specific set of guidelines (Dolechek et al, 2019).

Employers are therefore likely to achieve nonbiased hiring decisions if they concentrate on shaping interviewer behaviour. One way to shape interview behaviour is to establish a specific system for conducting the employment interview. A systematic interview developed along this line will minimize the uncertainty so inherent in decision making that is biased predominantly on "gut feeling".

The first step toward developing a standard interview was an analysis of each job that focuses on present as well as established future job-related Knowledge, Skills, Abilities and other characteristics (KSAOs) required from the first day of the job. Extensive involvement of upper level management throughout the design helped to assure continued support and commitment to the program. The aim of each job analysis was to identify the skills, experience and personal characteristics that workers needed to perform each job successfully. From those qualifications for each job category, the best methods of screening and selecting applicant were determined. These methods turn out to be:

(1) Structured interview;
(2) Work simulations
(3) Written tests, or some combination of the three.

No matter which screening-selection method used, they were called "certified interview" programs because the structured interview was at the core of all the programs. Interviewers were trained in an intensive 4-day workshop; they were reviewed annually to determine that they were maintaining established company standards in the screening-selection process. Those falling below company standards were required to attend 1-day refresher training sessions. The actual selection process differs slightly for external and internal candidates. External candidates undergo a screening interview, during which they receive basic information about the company and the job they are applying for, including a supplemental information form detailing exactly what the job entails. Internal candidates join the external candidates who survive this screening stage; at least one certified interviewer interviews each candidate. Interviewers record examples of behaviour elicited in an interview booklet specially designed for each job category. If additional data are required to assess applicant for a particular job, then simulations, written tests, or other selection instruments are administered after the interview by other trained individuals. Hence, candidates may see several different company people during the selection-screening promotion process. All evaluators then meet to integrate their data and to select the most suitable candidate.

Ability Tests

The major types of mental ability tests used in business today include measures of general intelligence; verbal, nonverbal, and numerical skills; spatial relations ability (the ability to visualize the effects of manipulating or changing the position of objects); motor functions (speed, coordination); mechanical information, reasoning, and comprehension; clerical aptitudes (perceptual speed tests); and inductive reasoning (the ability to draw general conclusions on the basis of specific facts presented). When job analysis shows that the abilities or aptitudes measured by such tests are important for successful job performance, the tests are among the most valid predictors currently available (Salgado & Jesus, 2017).

Work-Sample Tests

Work-sample or performance tests are standardized measures of behaviour whose primary objective is to assess the ability to do rather than the ability to know. They may be motor, involving physical manipulation of things (e.g. trade tests for carpenters, plumbers, electricians) or verbal, involving problem situations that are primarily language-oriented or people-oriented (e.g. situation tests for supervisory jobs) (Salgado & Jesus, 2017). Since work samples are miniature replicas of actual job requirements, they are difficult to fake, and they are unlikely to lead charges of discrimination or invasion of privacy (Rodrigues et al, 2009). Nevertheless, since each candidate must be tested individually, work-samples tests are probably not cost-effective when a large numbers of people must be evaluated.

4. SYSTEM DESIGN AND CONCEPTUALIZATION

There are many techniques and tools available for use in designing a system. The choice of technique or tool depends in part on the characteristics of the system. We say that the system is function-strong if it can be specified and implemented almost entirely in terms of the operations it performs on data. On the other hand, a system is data-strong if it can be described in terms of the data upon which it acts and the relationships among the data, rather than the operations. Many systems fall in between; we call these *hybrid systems*. The techniques and tools presented in this section are a few of the many available for designing a system. For the particular projects that you will work on, you may use one of these, a combination of several, another that your company uses, or one that you develop yourself, as long as the result high quality design is characterized by modularity, high cohesion, levels of abstraction, and so on, it does not matter which design technique is used (Umer & Muhammad, 2020).

Data Modeling

Underlying the structure of database is the data model: a collection of conceptual tools for describing data, data relationships, data semantics, and consistency constraints. The various data models that have been proposed fall into three different groups: object-based logical models, record-based logical models, and physical models.

Object-Based Logical Models

Object-based logical models are used in describing data at the logical and view levels. There are many of different models, and more are likely to come. Several of the more widely known ones are:

- The entity-relationship model
- The object-oriented model
- The semantic data model
- The functional data model

Entity-Relationship (E-R) Model

The entity-relationship (E-R) data model is based on a perception of a real world that consists of a collection of basic objects, called entities, and of relationships among these objects. An entity is a "thing" or "object£" in the real world that is distinguishable from other objects. *Entities* are described in database by a set of *attributes*. A *relationship* is an association among several entities.

Record-Based Logical Models

Record-based logical models are used in describing data at the logical and view levels. In contrast to object-based data models, they are used both to specify the overall logical structure of the database and to provide a high-level description of the implementation. The three most widely accepted record-based data models are the relational, network, and hierarchical models.

Physical Data Models

Physical data models are used to describe data at the lowest level. In contrast to logical data models, there are few physical data models in use. Two of the widely known ones are the *unifying model* and the *frame-memory model*.

Data Abstraction

There are other ways of using data to help design a modular system. If we have used data abstraction to specify requirements, we can use the composition approach to design and build system modules from data specifications. To understand the techniques, we begin by exploring the concept of abstraction. The purpose of data abstraction is to describe what data are for, regardless of how they are labeled or structured. Thus, we want to keep the level of abstraction high so as not to be distracted by extraneous information. Data abstraction when used for design, aims to eliminate extraneous information (Umer & Muhammad, 2020).

Structure Charts

When a system is not data strong, additional information must be added to the design of the data to explain control and timing decisions. Thus, to complement data flow diagrams, many design techniques use structure charts. A structure chart displays the hierarchy of the system modules. In a typical structure chart, a module is drawn as a box. When one box is placed above another and connected to it with an arrow, the first box is controlling the second. Pertaining to denoting control, when one structure chart appears above another and they are connected by an arrow, assume that the one on top controls the one below. When there is no connecting arrow, we presume that there is no relationship of control. However, the ordering of modules from left to right has no meaning in structure charts. An arrow with a filled circle is used to denote control information (such as flag). The notation enables us to show how the function of one module can be controlled by other module (Umer & Muhammad, 2020).

System Development Life Cycle (SDLC)

The system life cycle may be regarded as a "framework" upon which the work can be organized and method applied. The life cycle can be broken down into a number of separate stages. There are many ways of doing this. In this chapter we are really considering a typical life cycle rather than "the" life cycle (Umer & Muhammad, 2020). It involves the stages shown in fig 2.below;

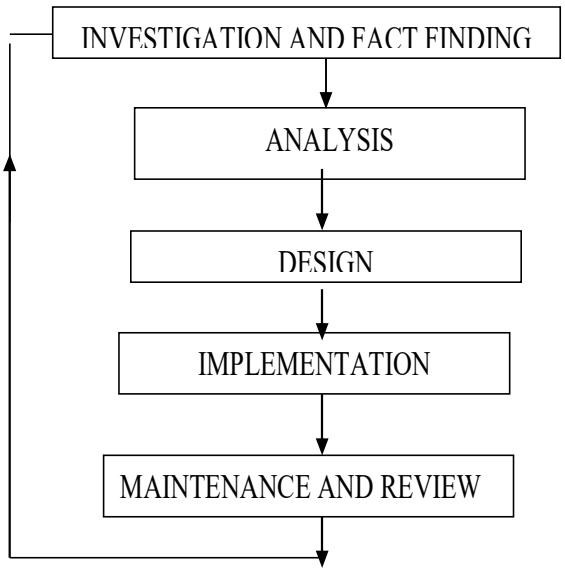

Fig 2: Systems Development Life Cycle

Investigation and fact finding. At this stage in the life cycle, a detail study is conducted which requires a contribution from the users both of the existing system and of the proposed system.

- Analysis (also called Requirements Analysis). Analysis of the full description of the existing system and of the objectives of the proposed system should lead to a full specification of the user's requirements. The requirement specification (also sometimes called a requirements definition) can be examined and approved before system design is embarked upon.
- Design. The analysis may lead to a number of possible alternative designs. For example, different combinations of manual and computerized elements may be considered. Once one alternative has been selected the purpose of the design stage is to work from the requirements specification to produce a system specification. The system specification will be a detailed set of documents that provides details of all features of the system.
- Implementation. Implementation involves following the details set out in the system specification. Three particularly important tasks are hardware provision, programming and staffing. It is worth observing in passing that the programming task has its own "life cycle" in the form of the various stages in the programming, i.e. analysis and design occur at many different levels. The implementation stage is sometimes split into a "build phase" and "test phase".
- Maintenance and review. Once a system is implemented and in full operation it is examined to see if it has met the objectives set out in the original specification. Unforeseen problems may need to be overcome and that may involve returning to earlier stages in the cycle to take corrective action. From time to time the requirements of the organization will change and the system will have to be examined to see if it can cope with the changes. At some stage the system life cycle will be repeated again and yet again (Umer & Muhammad, 2020).

Programming Approach - Visual Basic 16.0

One very nice feature of Visual Basic is the fact that you can use it to create a solid application very quickly. It makes short work of what would normally be very time-consuming programming tasks. This frees up the programmer to spend his time developing the application's functionality, rather than spending time on mundane, repetitive programming tasks. The main reason why Visual Basic is so popular and powerful is the same reason behind the success of Windows. Microsoft took a complex technology (writing computer programs) and made it easier to use through a graphical interface. Another key concept of Visual Basic is the ability to create and use self-contained components, or objects. One type of object is VB control. Controls are elements used when designing a use interface. VB controls enable you to add features to your programs without you having to be involved in the details of how these features work. For example receiving input from a user of your program is as simple as drawing control that accepts input.

SQL

Structure Query Language (SQL) is a specialized set of programming commands that enable the developer (or end user) to do the following kinds of tasks:

- Retrieve data from one or more tables in one or more databases
- Manipulation data in tables by inserting, deleting, or updating records
- Obtaining summary information about the data in tables, such as totals; record counts; and minimum, maximum, and average values.
- Create, modify, or delete tables in a database (Access databases only).
- Create or delete indexes for a table (Access databases only).

SQL statements enable the developer to perform functions in one line or a few lines of code that would take 50 or 100 lines of standard BASIC code to perform. As the name implies, Structured Query Language statements create a query that is processed by the database engine. The query defines the fields to be processed, the tables containing the fields, the range of records to be included, and, for record retrieval, the order in which the returned records are to be presented.

When retrieving records, a SQL statement usually returns the requested records in a *dynaset*. Recall that a dynaset is an updatable record set that actually contains a collection of pointers to the base data. Dynasets are temporary and are no longer accessible after they are closed. SQL does have provision for the times when permanent storage of retrieved records is required.

5. CONCLUDING REMARKS

The various aspects of Personnel Management are worth consideration. In its most basic form, Human Resource planning includes attempts to forecast organizational demand and labour force supply of potential employees. In strategic Human Resource Management, this type of planning also includes allocating financial resources and determining Human Resource priorities in such a way that an organization's vision and strategic plan are refined and met. This paper sets out a research agenda to conceptualize and model a HRM that supports staff recruitment and management. Future work will look at the implementation of the model.

REFERENCES

1. Ahammad, Taslim. (2017). Personnel Management to Human Resource Management (HRM): How HRM Functions?. Journal of Modern Accounting and Auditing. 13. 10.17265/1548-6583/2017.09.004.
2 Aho O.W., Lloyd R.A. (2019) The Origins of Robust Supply Chain Management and Logistics in the Caribbean: Spanish Silver and Gold in the New World (1492–1700).
3 Avison, David & Fitzgerald, Guy. (2006). Methodologies for Developing Information Systems: A Historical Perspective. 10.1007/978-0-387-34732-5_3.
4 Avison, D.E & Fitzgerald, G (2015) "Information System Development Methodologies Techniques and Tools", 12th Edition, McGraw-HILL Company.
5 Arvey, R.D., Miller, H.E., Gould, R., 7 Burch, P., (2010), "Personnel Psychology", McGraw-Hill Company, Inc.
6 Asher, J.J., 7 Sciarrino, J.A., (2004), "Personnel Psychology".
7 Bateman, T., & Snell, S. (2013). *M: Management (3rd ed)*. McGraw Hill / Irwin: New York, NY
8 Cascio, W.F., (2009)," Managing Human Resources" 9th Edition, McGraw-Hill Publishing Company, U.S.
9 Cascio, W.F., 7 Phillips, N., (2009)," Personnel Psychology", Washington, DC, National Academic Press.
10 Dolechek, R., Lippert, T., Vengrouskie, E. F., & Lloyd, R. A. (2019). Solving a whale of a problem: Introducing the four functions of management in a management principles course. *International Forum of Teaching Studies, 15*(2), 29-35.
11 Gorry, G.A & Scott Morton, M (2005), "A Framework for management information systems", Sloan Management Review.
12 Lussier, R. (2021). *Management Fundamentals: Concepts, Applications, Skill Development. (9th Ed).* Sage Publications: Thousand Oaks, CA.
14 McCormick, E.J., 7 Ilgen, D.R, (2005), "Industrial Psychology", 20th Edition, Eaglewood Cliffs, NJ, Prentice-Hall.
15 Miller, E.C, (2010), "Personnel Administrator", 20th Edition McGraw-Hill, Inc.
16 Nathan, R. (2018). The Grapevine Creek Buffalo Jump Complex: Interdisciplinary Research on the Crow Reservation, Montana (Doctor of Anthropology, dissertation). Indiana University.
17 Okolie, Ugo & Omole, Osahon & Yakubu, Abdulfatai. (2021). Leadership and Effective Human Resource Management in Organization. RUDN Journal of Public Administration. 8. 277-296. 10.22363/2312-8313-2021-8-3-277-296.
16 Rodrigues, Nuno & Rebelo, Teresa. (2009). Work Sample Tests: Their Relationship with Job Performance and Job Experience. Revistade Psicologiadel Trabajoydelas Organizaciones. 25. 10.4321/S15765962200900010006.
17 Salgado, Jesus. (2017). Using Ability Tests in Selection. 10.1002/9781118972472.ch7.

18 Shari Lawrence Pfleeger, (2001)" Software Engineering the Product of Quality Software", 12th edition, Macmillan Publishing Company, New York.
19 Shermerhorn, J. (2013). *Management (12th Ed)*. Wiley and Sons: Hoboken, NJ
20 Siberschatz, A., (2010), "Database System Concepts", 15th Edition, The McGraw-Hill Companies, Inc.
21 Umer, Muhammad. (2020). System Design and Implementation.