DEVELOPMENT OF A HUMAN RESOURCE INFORMATION SYSTEM (HRIS) IN BANGLADESH JUTE RESEARCH INSTITUTE

BY

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ABSTRACT

The New Economy is driving a worldwide economic shift that will have a profound impact on our lives. Two confluent forces have triggered this phenomenon - the globalization of business, and the Information Technology (IT). IT is creating new opportunities for businesses, countries and people by leveling the playing field for everyone. Information Technology can play a major role to modernize the HR management of an organization. In today's business environment, HR must become a leader in identifying new business opportunities, defining business strategy and corporate priorities, and preparing the organization for continuous and often disruptive changes.

To harness the benefit of Human Resources in full potential, an organization can adopt a computerized system known as Human Resource Information System (HRIS). HRIS is designed to support the planning, administration, decision-making, and control activities of human resources. Applications such as employee selection and placement, payroll, pension, benefits management, training projections, career progress, equity monitoring, and productivity evaluation are supported by this information system.
Managing human resources has many forms and manifestations. Invariably it boils down to taking decisions concerning the employment, non-employment or terms of employment of the human resources such that the organizational goals are met. But decision-making is difficult under conditions of uncertainty. To reduce the level of uncertainty, the Human Resource Management (HRM) specialist requires information and data in the particular environment in which he/she has to function. Such information and data is provided to HR manager by the HRIS function.

Bangladesh Jute Research Institute (BJRI) is an autonomous government organization. Like other government organization, traditional (i.e. manual) system of HR transaction occurs in this institute. Valuable time and manpower are not being used in an effective manner because of the traditional system. Automation is the most appropriate way to reduce the repetitive tasks of HR department and it also reduces the manpower cost in the long run.

First phase of this study is to investigate the existing HR system of BJRI. The second phase of the study is to develop an HR information system for the organization. Development of such a software needs thorough system analysis and design as well as extensive evaluation and testing before actually implementation. After investigating the current system of BJRI, a software has been developed name as HR Assistant Plus. The developed software can replace the traditional HR system of BJRI. The detail system analysis of the software is covered in the study. A relevant overview of the literature is also incorporated to make the study comprehensive. The benefits and the challenges involved in implementing such automation are discussed extensively in the study.

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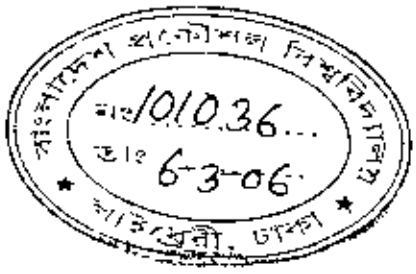
CHAPTER 1

INTRODUCTION



1.1 OVERVIEW

The Human Resources (HR) department in an organization manages a variety of activities associated with employees like recruiting, training, promoting, terminating, record keeping, and meeting various legal requirements. In addition, it supports an organization's effort to develop and utilize its work force HR department is also responsible for maintaining an environment conducive to full participation, continuous improvement, and organizational growth. In the past, human resource function within an organization did not have the same priorities as other functions. But in the last few years, management of human resources has been acknowledged as an important factor in developing a sustainable competitive advantage. Organizations that use technology effectively to manage the human resource function will have a tremendous advantage over those that do not.

As technology becomes more complex and the need to make quick decisions increases, manual maintenance of manpower records becomes more counter-productive. In traditional way of managing HR, too much manpower is used to keep the data and too much time is used to retrieve and analyze it. Hence, organizations are increasingly computerizing the HR function.

HRIS stands for Human Resource Information Systems. It is the sum total of all systems that store data, classify data and make it easily available to the decision maker in so far as the human resource is concerned. It could range from records kept in personal files, to cabinets to simple database management and finally to highly developed mathematical packages that are computerized.

Computerization makes information sharing easy and possible over large areas. If there are many computers within one location, they are linked through LAN (Local Area Network). If there are computers in multiple physical locations, they are linked through WAN (Wide Area Network). It thus reduces the time taken to make decisions and this positively affects company costs. Until 1990, mainframe computers were used mainly for recording wages, PF, gratuity and payroll work and for the filing of regular statutory returns to government bodies

under labor law. However, with the advent of personal computers, other decisions regarding various aspects of Human Resources Department (HRD), Human Resources Planning (HRP) and Human Resources Administration (HRA) are being made with the use of computers. This is because of five things:

I. Storage of data is orderly and easy;
II. Data can be updated with ease;
III. Data can be categorized and re-categorized as per the need of the manager when certain decisions are required;
IV. Analyzing data generated by surveys becomes easy; and
V. Mathematical manpower planning and manpower development is facilitated.

As time goes by more and more organization will computerize their HRIS and manual records will very soon be a thing of the past. This will change the nature of employment and the skills needed by employees involved in record keeping and record maintenance.

In Bangladesh, the concept of HRIS is very new. Only a handful of big organizations in the private sector of Bangladesh follow HRIS. HRIS is almost non existent in public sector of Bangladesh, though government here is the biggest employer. By installing and using appropriate HRIS, productivity of the HR/Establishment department in the government organization can be increased significantly. This study represents an effort in developing an HRIS for a government organization name Bangladesh Jute Research Institute (BJRI). At present, there is no HRIS practiced at BJRI The HRIS presented in this study has been developed in such a way so that it can be practically used in future at BJRI.

1.2 OBJECTIVES

The prime objective of the study was to develop an HR information system for BJRI. To facilitate achieving the prime objective, this study aims at attaining the following specific objectives.

- To study and investigate the current organization structure and management inventory.
- To study and investigate transactional processes and other management systems related to HR management.
- Job identifications and descriptions.
- Development of HRIS.

1.3 METHODOLOGY

Both primary and secondary sources of information have been used for the study. Primary data and information were collected through in-depth interviews of the concerned people. Such people include HR related personnel and some general employees of BJRI. To supplement the primary information, secondary information was also used. Sources of secondary information include the Internet, relevant books, and journals. Data and information collected had been organized systematically in order to discuss and analyze the relevant issues of Human Resource Information System in perspective of the BJRI.

1.4 LIMITATIONS

There is a severe dearth of secondary information regarding HRIS in public sector of Bangladesh. There are lots of articles/papers on HRIS in general. But there is hardly any paper, which deals with the issues of HRIS in context of Bangladesh.. Consequently, the author had to rely mostly on the primary source of information collected through in-depth interviews of the concerned people.

In BJRI, there is no particular department which deals with the issues of HR. Some of the HR issues are supervised by the Ministry of Agriculture, where as the other HR functions are designated to BJRI. Such segregation of HR tasks made it difficult for the author to design a single integrated system of HR. It is also difficult to gather correct information because of such segregation of tasks.

CHAPTER 2

LITERATURE REVIEW

2.1 ELEMENTS NEEDED FOR AN R&D ORGANIZATION

The basic elements required for an R&D organization are (1) people, (2) ideas, (3) funds, and (4) cultural elements. These four basic ingredients have to be coordinated with skill by the management of R&D organizations in order to achieve high productivity and excellence.

It is obvious that the most important element is creative people. Such people have the bright ideas and skills to do research and then translate research results into useful products. However, these people must be organized into structures that permit effective cooperation In doing so it is important to keep in mind that certain mixes of people work better than others. To ensure a smoothly functioning organization one needs unstated assumption, beliefs, norms, and values. in other words, an organizational culture that will favor creativity and innovation. Last, but not least, one needs funds.

2.1.1 People

The kinds of people who are most likely to succeed in an R&D organization are those who are analytical, curious, independent, intellectual, introverted, and who enjoy scientific and mathematical activities. Such people tend to be complex, flexible, self-sufficient, task-oriented, and tolerant of ambiguity, and have high needs for autonomy and change and a low need for deference. However, success in an R&D organization requires joint action; people should not be loners. So, the extreme introvert may simply not fit.

People with internal standards and self-confidence are highly desirable, because in many cases research can be very discouraging. The person who is not easily discouraged and is sure his goals and how to reach them is more likely to persist. Interaction with peers is also essential, since most new ideas are generated not by reading the literature but by talking with others who are working on similar problems. Finally, and this is admittedly cynical, a successful scientist needs to be able to tolerate what he might consider "bad management". The kind of person who gets upset too easily if the manager is insensitive to his needs may not be able to deal with a research environment. Most managers are technical people,

interested in research rather than in managing others, so they are likely to do a less than optimal job

Another desirable attribute is internal locus of control. This is the tendency to think that the causes of events are internal (e.g., ability, hard work) rather than external (e.g , help from others, luck). Research has shown that internals are better at collecting information, and deciding for themselves about the correct course of action.

Creativity is, of course, highly desirable. Unfortunately there are few reliable and valid tests for this attribute. However, previous creativity is a good predictor of future inventiveness.

2.1.2 Ideas

For idea generating, the personnel need to be technically component in one or more fields and have the ability to conceptualize. They must be comfortable with abstract and have a real interest in R&D.

In an R&D organization one finds that some people are particularly good at projecting beyond the obvious and thus generating ideas. To foster an idea-generating environment it is important to allow new ideas to be presented without immediately making judgments about their soundness. A group of researchers was once asked to present its ideas regarding some new research initiatives. After listening to the ideas, the manager quickly gave their comments and told the participants why the ideas were not particularly sound and thus could not be considered further. Participation in presenting new research decreased rapidly and after the initial two or three research presentations no one had anything more to offer. The research team finally disbanded because of low morale. Managers should not be too hasty to relegate ideas to the wastebasket.

Creative people are likely to have good research ideas, but good ideas also come from communication with others. There is considerable research suggesting that communication patterns should be structured so that people can be stimulated by others who do similar work.

2.1.3 Funds

Funds are needed for personnel, equipment, office, and laboratory space, libraries, computers, travel, supplies, and so on. It is important to emphasize the fact that conducting research requires considerable resources It is indeed an expensive activity. To maintain research excellence, it is necessary to attract talented scientists and have well equipped laboratory

facilities. None of this is probable without sufficient funding support. Organizations that are successful in the technology transfer of their research outputs are more likely to generate customer support for future research. This is particularly true for applied research and development projects.

2.1.4 Cultural Elements

Culture is the human-made part of the environment. It consists of objective elements (e.g., research laboratories, equipment, office buildings, office furnishings, etc.) and subjective elements (rules, laws, values, norms). Some organizational cultures are more effective than others. For example, one experiment compared competitive (the highest producer gets all the reward), individualistic (to each according to the contribution), and cooperative (equal share of the reward) conditions for building a tower. Participants randomly assigned to these three conditions had building blocks of different colors, so their contributions could be identified. Dependent variables included number of blocks placed, number of falls of the towers (often due to sabotage), and so on. The major finding: the highest productivity occurred in the cooperative condition. Of course, we do not know whether a team in a research lab working on some project behaves like a group of college students building a tower. Nevertheless, for at least some situations these findings must be applicable. Competitiveness is certainly an aspect of some organizational cultures and this experiment questions its desirability. Other aspects of organizational culture worth noting are hard work, people emphasis, status emphasis, participative climate, tolerance for disagreement, and frequent rewards.

2.2 THE PURPOSE OF HUMAN RESOURCE MANAGEMENT (HRM)

The purpose of human resource management is to improve the productive contribution of people to the organization in ways that are strategically, ethically, and socially responsible. This purpose guides the study and practice of HRM, which is also commonly called personnel management. The study of HRM describes the HR-related efforts of operating managers and shows how personnel professionals contribute to those efforts.

Human resources determine every organization's success. Improving the human contribution is so ambitious and important, however, that all but the smallest firms create a specialized personnel or HR department. It is ambitious because HR department do not control many of the factors that shape the employee's contribution, such as capital, materials, and procedures. The department decides neither strategy nor a supervisor's treatment of employee,

although it strongly influences both. Simply but, the HR department exists to support managers and employees as they pursue the organization's strategies. However, to guide its many activities and support the managers who operate other parts of the organization. HR departments must have objectives.

2.3 OBJECTIVES OF HUMAN RESOURCE MANAGEMENT

Managers and HR departments achieve their purpose by meeting objectives. Objectives are benchmarks against which action are evaluated. Sometimes they are carefully thought out and expressed in writing. More often objectives are not formally stated. Either way, they guide the HR function in practice.

Human resource objectives not only need to reflect the intention of senior management, they also must balance challenges from the organization, the HR function, society, and the people who are affected. Failure to do so can harm the firm's performance, profits, and even survival These challenges spotlight four objectives that are common to HR management and form a framework.

2.3.1 Organizational Objective

To recognize that HR management exists to contribute to organizational effectiveness. Even when a formal HR department is created to help managers, the managers remain responsible for employee performance. The HR department exists to help managers achieve the objectives of the organization. HR management is not an end in itself; it is only a means of assisting managers with their human resource issues.

2.3.2 Functional Objective

To maintain the department's contribution at a level appropriate to the organization's needs. Resources are wasted when HR management is more or less sophisticated than organization demands.

2.3.3 Societal Objective

To be ethically and socially responsive to the needs and challenges of society while minimizing the negative impact of such demands on the organization. The failure of organizations to use their resources for society's benefit in ethical ways may result in

restrictions. For example, society may limit HR decisions through laws that address discrimination, safety, and other areas of societal concern.

2.3.4 Personal Objective

To assist employees in achieving their personal goals, at least insofar as those goals enhance the individual's contribution to the organization. The personal objectives of employees must be met if workers are to be maintained, retained, and motivated. Otherwise, employee performance and satisfaction may decline and employees may leave the organization.

Not every HR decision can meet these organizational, functional, societal, and personal objectives every time. But these objectives serve as a check on decisions. The more these objectives are met by the department's actions, the larger its contribution will be to the organization's bottom line and the employees' needs. Moreover, by keeping these objectives in mind, HR specialists can see the reasons behind many of the department's activities.

2.4 HUMAN RESOURCE MANAGEMENT ACTIVITIES

To achieve the purpose and objectives, HR departments help managers obtain, develop, utilize, evaluate, maintain, and retain the right numbers and types of workers. The purpose of HR management is achieved through people who contribute to the organization's strategies and overall goals of effectiveness and efficiency. For these, reasons, HR executives play an increasingly important role in the governance of domestic and global companies.

Human resource activities are actions that are taken to provide and maintain an appropriate workforce for the organization Not every manager or HR department undertakes every activity. Small companies may not have an HR department, and small employers with HR departments may lack large budgets and adequate numbers of staff members. These departments simply focus on the activities that are most important for the organization. Large departments usually are "full-service" ones; they do all the activities shown in Figure 2.1.

As an organization becomes large, attempts are made to estimate its future HR needs through an activity called human resource planning With an eye toward future needs, recruitment seeks to secure job applicants to fill those needs. The result is a pool of applicants who are screened through a selection process. This process selects those people who meet the needs uncovered through HR planning.

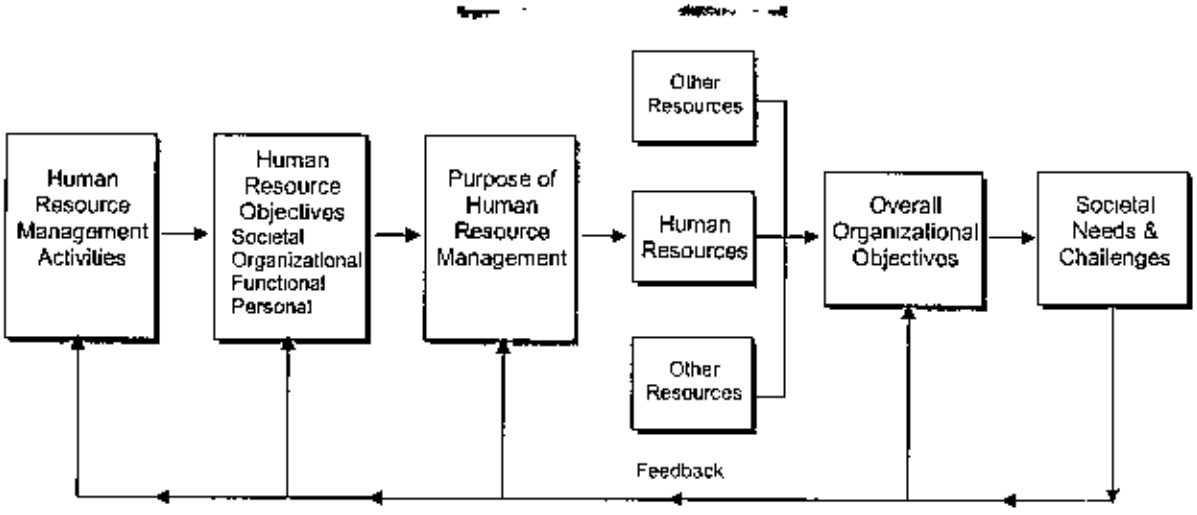


Figure 2.1: The Response of Human Resource Management to Societal Needs and Challenges.

New workers seldom meet the organization's needs exactly, and so they must be oriented and trained to perform effectively. As demands change, placement activities transfer, promote, demote, layoff, and even terminate workers. Subsequent HR plans reveal new staffing needs. These openings are filled through the recruitment of additional workers and the development of present employees Development teaches employees new knowledge, skills, and abilities, ensuring their continued usefulness to the organization and meeting their personal desires for advancement.

Then individual performance is appraised. Not only does this activity evaluate how well people perform, it also indicates how well HR activities have been done. Poor performance may mean that selection, training, or developmental activities should be revised, or there may be a problem with employee relations.

Employees also must receive compensation in the form of wages, salaries, or incentives, along with employee benefits such as insurance and vacations. Some rewards are required services dictated by law, such as social security, workers' compensation, safe working conditions, and overtime pay.

HR departments also play an important role in employer relations, usually by establishing policies and assisting managers. When employees are dissatisfied, they may band together and take collective action. Then management is confronted with a new situation: union-

management relations To respond to collective demands by employees, HR specialists may have to negotiate and administer a labor agreement.

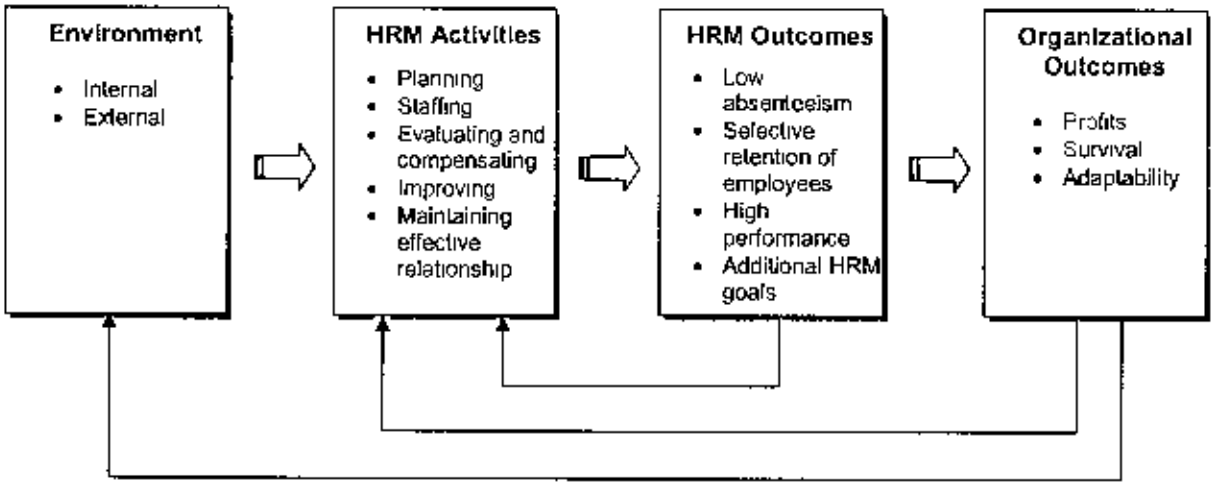


Figure 2.2: Model of Human Resource Management

Effective HR departments conduct an assessment of their effectiveness to assure their continued success. Traditional budgetary limitations are one form of control. Another means of control might be to conduct an evaluation of the effectiveness of each activity in meeting company objectives.

In summary the overall HRM activities may be divided into the following categories: planning, staffing, evaluating and compensating, improving the organization, and maintaining effective employer-employee relationships. Figure 2 2 is shown the model of HRM.

2.5 THE HUMAN RESOURCE MANAGEMENT MODEL

HRM is system that consists of many interdependent activities. These activities do not occur in isolation; virtually every one affects another HR activity. When HR activities are involved as a whole, they form an organization's human resource management system. A system consists of two or more parts (or subsystem) that work together as an organized whole with identifiable boundaries.

The role of major human resource subsystems shown in Figure 2.3.Each HR activity (subsystem) relates directly to every other activity For example, the challenges faced by the

HR department affect the selection of employees The selection subsystem influences the department's development and evaluation of employees. In addition, each subsystem is affected by the department's objectives and policies and by the external environment in which HRM takes place.

A brief discussion of the components of HRM model is given below:

2.5.1 Frameworks and Challenges

Operating managers and HR experts face many challenges in dealing with people. The central challenge is to assist the organization in improving its effectiveness and efficiency in an ethical and socially responsible way. Other challenges arise from the environment in which organizations operate; changing demand of workers, international and domestic competitors, pressure groups, professional ethics, and government are just a few. Challenges also come from within the organization.

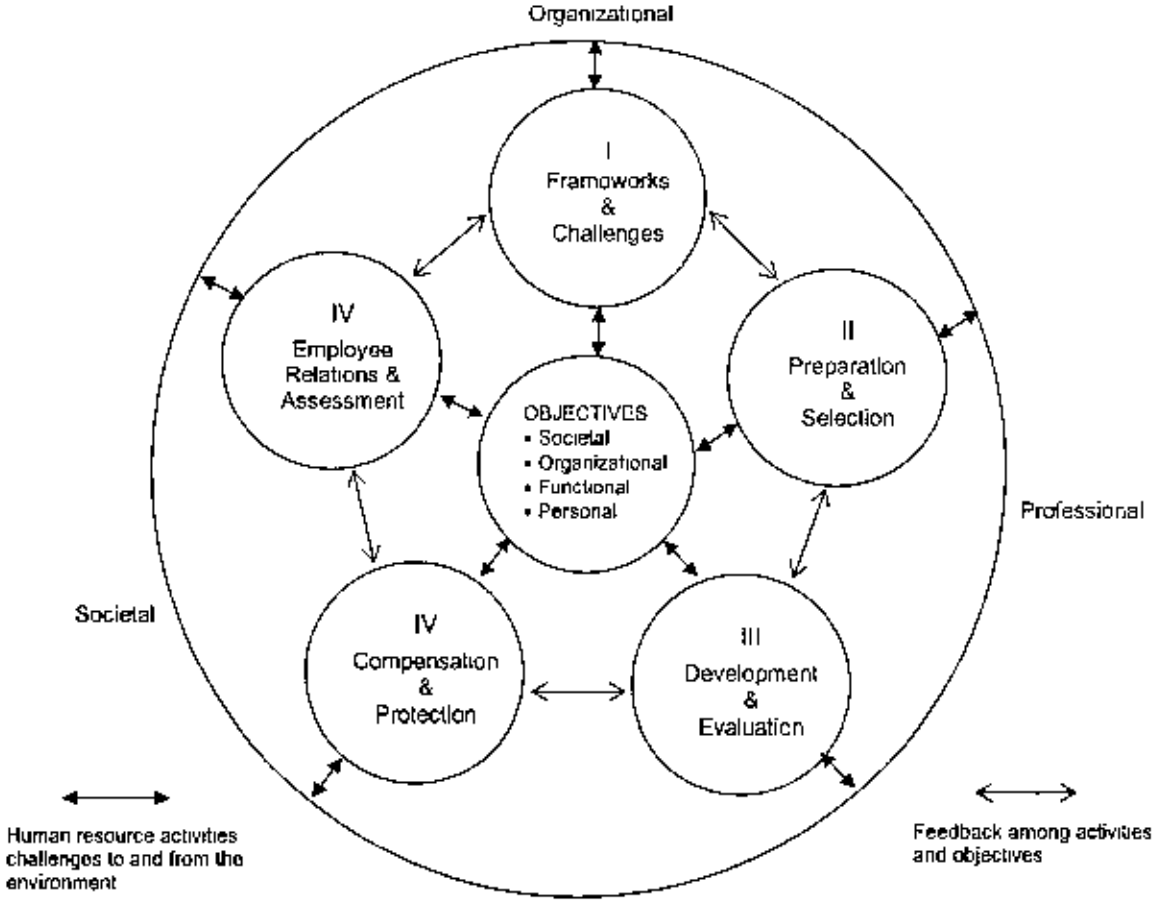


Figure 2.3: The Human Resource Management Model and Subsystems.

2.5.2 Preparation and Selection

A solid information base lies at the center of effective HRM. Without accurate and timely information, managers and HR departments are seriously limited in their ability to meet challenges. To build a human resource information system, data are gathered about each job and about the organization's future HR needs. Using this information, specialists can advise managers about the design of the jobs they supervise and find ways to make those jobs more productive and satisfying. Estimates of future HR needs allow managers and the department to become proactive in the recruitment and selection of new workers.

2.5.3 Development and Evaluation

Once hired, new employees are oriented to the company's policies and procedures. They are then placed in jobs and given the training needed to be productive. With a solid base of information, managers and HR specialists can help determine the needs for orientation, training, development, and career counseling of present employees. As a result of these activities, many job openings can be filled from within rather than by recruiting from outside the firm. The results should lead to a more effective workforce. To evaluate employees, formal performance appraisals are conducted periodically. Appraisals give workers feedback on their performance and can help the manager and the department spot weaknesses.

2.5.4 Compensation and Protection

Equitable compensation is needed to retain and maintain an effective workforce. Employees must be paid a fair wage or salary relative to their productive contribution When appropriate, incentives may be added. When compensation is too low, turnover and other problems involving employee relations are likely. If pay is too high, the company can lose its competitive position in the marketplace. But modern compensation management goes beyond pay. Benefits are an increasingly important part of every compensation package and retain its workers and remain competitive. At the same time, the organization needs to protect its workers from occupational hazards Though health and safety programs, the department not only assures a safe work environment but also keeps the employer in compliance with health and safety laws. All these concerns require specialized knowledge and are largely left to the discretion of the HR department in regard to advising line management.

2.5.5 Employee Relations and Assessment

Maintaining an effective workforce requires more than just pay, benefits, and safe working conditions Employees need to be motivated and satisfied with their jobs. Personal and job-related problems may lead to the need for counseling or discipline. Here again, HR specialists can provide effective programs or specific advice to operating managers. To increase employee satisfaction and organizational productivity, communications are used to keep people informed. When employee relations are ineffective, the employees may join together and form self-help groups called unions. When this occurs, the HR department is usually responsible for dealing with the union. As with any ongoing system, HR departments need to uncover their successes and failures through self-evaluation. Full-service departments regularly conduct audits of their performance and do research to uncover more effective ways to serve the organization. Often this research helps uncover future challenges and predict their impact on the organization and its human resources.

2.6 HUMAN RESOURCE INFORMATION SYSTEMS

2.6.1 Definition

A Human Resource Information System (HRIS) is a systematic procedure for collecting, storing, maintaining, retrieving, and validating data needed by an organization about its human resources, personnel activities, and organization unit characteristics.

An HRIS need not be complex or even computerized. HRIS can be as informal as the payroll records and time cards of a small business, or as extensive and formal as the computerized human resource databases of major manufacturers, banks, and governments. HRIS can support long range planning, with information for labor force planning, and supply and demand forecasts, staffing with information on equal employment, separations, and applicant qualifications; and development with information on training program costs and trainee work performance. HRIS can also support compensation programs with information on pay increases, salary forecasts, and pay budgets; and labor/employee relations with information on contract negotiations and employee assistance needs. In every case the purpose is to provide information that is either required by human resource stakeholders or supports human resource decisions.

2.6.2 Components

It is convenient to consider these three major functional components in any HRIS:

The input function enters personnel information into the HRIS. In the past, data entry was often the only way. Today, scanning technology allows computers to scan and store the actual image off an original document, including signatures and handwritten notes.

After the data have been entered into the information system, the data maintenance function updates and adds the new data to the database. In non-computerized systems, clerks do this by hand; they file paper documents and make the appropriate entries in the files. Computerized systems accomplish this function accurately and rapidly, often making the new data available only seconds after being input. This area is growing rapidly to allow for electronic data storage and workflow management

The most visible function of a HRIS is the output generated. To generate valuable output for computer users, the HRIS must process that output, make the necessary calculations, and then format the presentation in a way that the user can understand. Non-computerized systems do this by manually compiling statistics and typing reports. However, no matter how compiling the technology, the information presented is still the heart of a system's value. So, it is important to consider the users, and how many they employ the information system.

In many of today's organizations, employees, line managers, and a variety of human resource and other staff use the information in the HRIS directly through their PCs, telephones, or in written form. This trend is likely to continue with users demanding a more active role in the input, maintenance, and output functions of the HRIS.

The use of expert systems in programming the questions, logic, and decision rules are an additional feature of a HRIS that is gaining popularity. Such systems can be applied to the decision of whether to reprimand an employee, what pay level to assign to a job, which skill to look for in a new team member, or which benefit choices are best for an employee. Computer programs can capture some of the experts' question patterns and decision rules. The user of an expert system gives honest answers to the questions, receives and carefully considers the system's recommendations, and can sometimes use a summary of the system's

logic to learn how to be more expert. It is this type of logic that is rapidly utilizing the interactive voice response (IVR) technology to become the next link in HRIS. The use of IVR allows fewer employees to provide information to a larger audience faster and at a lower cost.

2.6.3 Applications

Some information is gathered for the purpose of satisfying an external stakeholder's requirement. Other information is gathered because it is required to fulfill the employment relationship. Most HRIS begin with this required information. Many of the computerized enhancements to information systems are designed to produce this required information faster or at a lower cost. The benefits of the information are obvious-the organization would not be allowed to continue in business if it didn't use the information to produce the required reports or payments. So, attention focuses on producing the information and completing the reports at the lower cost. These kinds of applications emphasize doing administrative tasks faster, with less paper, or with fewer people. They are by far the most common HRIS applications, because their value is relatively easy to calculate. One can readily see, based on activities of a number of public and private sector organizations, that the use of HRIS has been a mainstay in their efforts to downsize and reengineer their human resource functions. Two very prominent examples of this type of application are the Department of Defense's conversion to an "off the shelf" software package (Oracle HR) and Hewlett Packard's use of People Soft to assist in their reengineering of how human resource functional services are provided in a global environment. In each organization, substantial reductions in staff were possible through the use of value added process reviews and the use of human resource information systems.

While automation can cut administrative costs, such applications are based on the basic assumption that the administrative activity should be continued. Many organizations are finding that the most fundamental value of technology is its ability to encourage new thinking that removes the need for layers of administration. This kind of fundamental change is called reengineering.

Many organizations are utilizing automated systems that have reengineered processes by using interactive employee information kiosks or Internet-based web applications. Fed Express (courier service provider) uses a system called OLIVER, and system like it have been utilized by the office of personnel management to collect data on employees who use

computers to answer their own questions, test the implications of certain decisions, and even change their enrollment in benefits. By reengineering benefits information this way organization not only reduce the staff needed to answer questions, but also create a new and more direct relationship with employees. Many similar systems are being utilized to provide employees and managers the opportunity to interact with the organization's databases to apply for jobs, review organizational regulations, and to facilitate communications between employees, managers, and labor unions. Some organizations such as Hewlett Packard and the various defense agencies are utilizing a HRIS that have expanded beyond the local area network to include the use of the Internet or an Intranet to disseminate information to employees.

Another way to reengineer HR process through the use of a HRIS is to focus on how information is used by HR managers. While much administrative is gathered and used because government agencies or other require it, a large amount of the HR information gathered by organizations is not required. Presumably, it is gathered because someone in the organization looks at it, uses it, and makes better decisions because of it. The value of such information is based on two factors:

1. How many decisions will be improved by having the information?
2. How much value will each improved decision produce?

The value of information must be weighed against the cost of the information to determine whether the information represents a good investment.

HRIS is also an investment. Even moderately functional software packages can be very expensive, and that does not include the costs of hardware, training, and maintenance costs, which can total up to 16 percent of total cost. Because an infinite variety of information can be gathered and tracked about employees, human resource managers must carefully consider the likely value of the information they include in the HRIS. The savings are compared to the investment necessary to acquire and use the computer system. A computer system may enhance value by making it easier to get and use information. It can also reduce information value by intimidating information users, or requiring so much expertise that it is impractical to use.

Managing human resources has many forms and manifestations. Invariably it boils down to taking decisions concerning the employment, non-employment or terms of employment of the human resources such that the organizational goals are met. But decision-making is

difficult under conditions of uncertainty. To reduce the level of uncertainty, the HRM specialist requires information and data regarding the human resources in the particular environment in which HR manager has to function. This information and data is provided to HR manager by the HRIS function.

Management is the science of decision-making and the art of decision executing. Neither the science nor the art of management can be performed effectively unless there is adequate and correct information about the various factors that go into the making of that decision. HRIS provides the storage, retrieval and analysis of that information and data. Having good HRIS enhances the accuracy and effectiveness of managerial decision-making and hence its presence is always an important asset for a company Indeed it is the lifeline of Human Resource Planning (HRP), Human Resource Development (HRD) and Human Resource Administration (HRA) functions within the purview of Human Resource Management (HRM). It has three main functions that in general it is meant to perform:

- Store data and information of each individual employee and keep it updated.
- Make the data available to the administrative decision maker so that leave, promotion, PF, increments and incentives are granted in a systematic manner.
- Permit the company to file returns to government bodies as required by various labor laws.

More specifically HRIS provides the following facilities to the three main sub-functions of HRM:

HRIS for HRP

- Inventory of manpower demand (needs)
- Inventory of manpower supply (available resources)
- Location, allocation and utilization details of the human resource
- Matching the right man for the right job at the right time
- Providing measures for proper recruitment and selection of manpower
- Assess the costs involved in employing manpower (wages)

HRIS for HRD

- Measurement of performance and potential of employees
- Matching training needs on the job and individual skills and aspirations
- Matching organizational goals and individual needs

- Calculating cost and benefits of training
- Career planning and succession planning
- Analyzing various diagnostic indicators of organizational health HRIS for HRA
- Providing linkages between productivity, profits and wages (payroll and wages)
- Determining the impact of monetary benefit on morale and performance (incentive)
- Analyzing the costs of turnover and the frequency of separations
- Deriving effective value added (EVA) by each employee through productive input
- Diagnosing the work climate of the organization
- Preparing for ISO 9000 series certification.

HRIS for Information Retrieval (IR)

- Wage and salary structure as well as personal positioning
- Fitment chart and records
- Incentive scheme and production data
- Productivity norms and benchmarks set
- Details of the last negotiated settlement and its activation
- Targets set and achieved
- Small group activity, formation, targets and results.

So, HRIS is the sum total of all systems that store data, classify data and make it easily available to the decision maker in so far as the human resource is concerned. It could range from establishment records kept in personal files or cabinets to simple data base management and finally to highly developed mathematical packages that are computerized.

2.7 HUMAN RESOURCE INFORMATION SYSTEMS IN ORGANIZATIONS

2.7.1 Development of HRIS

Human resource information system is the composite of databases, computer applications, and hardware and software that are used to collect/record, store, manage, deliver, present, and manipulate data for Human Resources (HR). HRIS can be define in another way: a human resource information system is a system used to acquire, store, manipulate, analyze, retrieve, and distribute pertinent information about an organization's human resources.

Employee data were first automated in the 1960s. The first systems were made to store the tremendous amounts of record keeping and reporting associated with personnel administration. Payroll and benefit systems followed after the administration. From the evolution of these activities into human resource activities, various computer-based human resource information systems were planned, developed and successfully implemented. Earlier, HRIS was used in HRM to support transaction processing and maintain management control. Later, HRIS and technology improve decision-making and support competitiveness.

HRIS has brought big help to handle and count different data of personnel. Salary payments, statistics and basic information have been calculated and used more effectively. However, HRIS has brought at the same time many changes to HRM, and not only to everyday processes but also to skills of HR professionals and the managers. Firstly, they had to understand what is an information system and what does it take to plan, accomplice and implement a human resource information system. Secondly, database management skills help the HR professionals understand what data is to be stored and why and how that data can be manipulated to develop reports for decision-making purposes. Thirdly, managers and HR professionals have to be aware how to specify the data technically and what are the changes to the old systems. Which data is overlapping in different systems and can now be linked together? Technology is a never-ending process and organization can lose a big mount of money and resources if they do not realize it. Just because a task has always been done a certain way does not mean that it is the best way. Technology changes processes, job specifications and collaboration of employees.

2.7.2 HRIS as a Phenomenon in Organizations

HRIS in an organization can be seen in two ways by the personnel. Because the data is in one system and managers are more responsible about the data, they may think that now it is on their shoulders to update the administrative information. HR people are doing nothing. On the contrary, HR professionals who want to maintain control are not pleased with the change that employees and managers do more of HR's administrative work. But the question is not there who is doing the administrative work, because the system can be so easy to use that it takes very little time to store the data. The question is what tasks the system is serving? How it helps the managers improve their personnel, and employees to take care of their own information in the system? HR professional has now more time to develop the human

resource strategy work in organization. Human resources have become more of a business partner. In this role HR activities meet financial and strategic objectives instead of having only the role of decision support and information broker.

However, HR professionals work mostly with management, because human resource management is a part of the job of the managers. They are directly responsible and committed to lead the personnel not HR department. Therefore, HRIS is created to produce data that the decision-makers of organization can manage better. What data managers expect from the HRIS? The key issues are: How does the HRIS serve corporate needs and expectations? Does the HRIS support strategic initiatives? Does the HRIS provide information (and not just row data) to support decisions? There is also the other side of the coin. Although the technology is present and HRIS is developed, HR department and HRM are often seen as less of a priority than sales, marketing or finance. Human resources is a business function, but has been lagged behind in technological change. Consequently, personnel have been one of the last functions to benefit from the IT development.

HR is concerned whether the organizational process is effective. On the other hand, information system (IS) are aimed at making an organizational process more efficient. Those who are constructing a HRIS should understand both sides. They do not have to have programming background, but the understanding of systems. Today, most HRIS projects are run by cross-functional teams. The implementation of a system is finally seen as a process. On the other hand there is discussion about, who is in charge of HRIS. Should HR be responsible for the structure, table maintenance, security systems and data itself, thus IT delivers productive and friendly tools to get the job done? Or should IT be in charge of the technology and HR has the most at stake in the data itself?

With the growth of computerized HRIS since 1960s, HR managers and professionals began to spend a significant amount of time establishing, maintaining and using the database. HR needs to identify which employees need certain technical skills, which need supervisory skills, management skills or leadership skills. Today HRM is supported by IS that can help you notice the needs and will allow you to track for example the suitable training. HR people spend now less time in day-to-day administrative tasks and have more time on strategic decision making and planning. HRIS have become sophisticated so that some people say it is now ready to assume a far greater enterprise role. The HRIS is a tool that supports the HR

management function and assists managers in managing their human resources more effectively.

These developed and sophisticated HR systems should not only reduce overall HR costs but also help to simplify the way customers, managers and employees, access and use HR around the world Not only HRIS is developing management locally, but also globally. In this case the organization must be aware which parts of HRIS are similar in every unit regardless of the country. At the same time, the organization must be familiar with the cultural differences that are noticed in HRIS. Globally integrated human resource information systems should have an impact to develop leadership in the increasingly competitive multinational global market

The purpose of any HRIS is to store, manipulate and provide data from employees of the organization This has been justified many times in the previous text. However, this means also that data is available differently than earlier Who can access and what data in the system? How the system and data is protected? What kind of security system has been implemented? On the other hand, what private or semi-private data has been stored from employees in the system? What legal and ethical issues should be considered in data specifications? These are big issues to the organization from the planning to the maintenance of HRIS.

2.7.3 Pillars of Organizational Character for Effective HRIS

Traditionally HRIS was used to solicit and collate information in order to control the organization processes Hence HRIS was synonymous with HRCS (human resource control systems) and we could speak of the two jointly as HRMS (human resource management systems) The three Ts' Trust, Transparency and Teamwork, are the three pillars of organizational character that form the bedrock of an efficient HRIS

- **Trust for Effective HRIS**

To a large extent efficient and effective HRIS depends on the manager's ability to communicate with others about statistical data in a non-defensive, trustworthy and constructive manner. Effective usage of HRIS requires that managers must have the self-confidence to accept negative results and focus on the resolution of problems rather than on denial and blame.

- **Transparency for Effective HRIS**

Information is power in many organizations and managers are motivated to hoard information rather than to share it widely. For example, managers may hide information about their own organizational performance but are keen to have the performance details of their peers. A properly designed HRIS promotes transparency in information sharing throughout the organization. Peers have access to information about each other's domain; subordinates have information about how their performance contributes to overall organizational performance An organization that is comfortable with such transparency develops a set of 'good manners' for dealing with this broad access of information sharing. thereby strengthening organizational character.

- **Teamwork for Effective HRIS**

Effective HRIS is prevalent in organizations that are familiar with work teams, matrix managed projects and other forms of interaction outside the chain of command. Senior managers in such organizations have learned when micromanagement is appropriate and when it is not. Middle managers have learned that most interactions between their superiors and their subordinates are not threatening to their position Workers are at ease with senior managers when working in teams and know the expectations of their supervisors from such interactions

HRIS has the potential to drastically alter the pattern of organizational communication and this typically brings about some amount of resistance. Some of this resistance is due to lack of knowledge but basically it is rooted in the feelings of fear, cynicism and insecurity experienced by the employees. Such attitudes can be changed by a strong organizational character through ethical leadership. which consistently reinforces the purpose of the system and directs the attention of the employees away from unproductive and punitive behaviors.

2.7.4 HR Competencies for Effective HRIS

In addition to the afore-mentioned components of a strong organizational character. an effective and successful HRIS requires the following competencies of an HR practitioner:

- Knowledge of the business, which implies how markets function, how finances are managed and how products are sold

- Delivery of HR Practices, which implies the ability to design and implement strategies for staffing, compensation, training, organizational design and industrial relations
- Management of change, which means the ability to make change happen, to manage data, lead and influence change
- Fostering a climate for the learning organization to flourish and a vibrant value based corporate culture to blossom
- Acting as the guardian of core beliefs and values, promotes core competencies and ensures compliance through good governance.

In short, to fulfill each and all of these five competencies, the HR practitioner needs data and information that is Recordable, Reliable and Retrievable. These three 'R's are the key constituents for successful documentation of information, which is fundamentally important for the success of HRIS.

- **Record ability for effective HRIS**

Information should be specifically tailored to meet the information needs of the management. Ideally, it should have a navigable format that is specifically designed to suit individuals with limited time

- **Reliability for effective HRIS**

Technical problems are frequently reported as a significant barrier to HRIS success. The most difficult problem lies in integration of data from a wide range of sources both inside and outside the organization. Therefore, reliability of the data collected is very important for the success of HRIS. Moreover, managers should be aware of the dangers of statistical data and should be skilled at interpreting and using data in an effective manner

- **Retrievability for effective HRIS**

Effective HRIS provides good instantaneous knowledge of what the human potential of the organization represents in terms of skills, capacity to respond to needs and the consistency between individual aspirations and missions entrusted to people. Thus timely access and retrieval of information is an important key to the success of HRIS.

2.8 THE ARCHITECTURE OF HR INFORMATION SYSTEM

HRIS is a computer-based technique of collecting, storing, maintaining data, and retrieving information about employees and their jobs. The generic architecture of HRIS is illustrated in Figure 2.4.

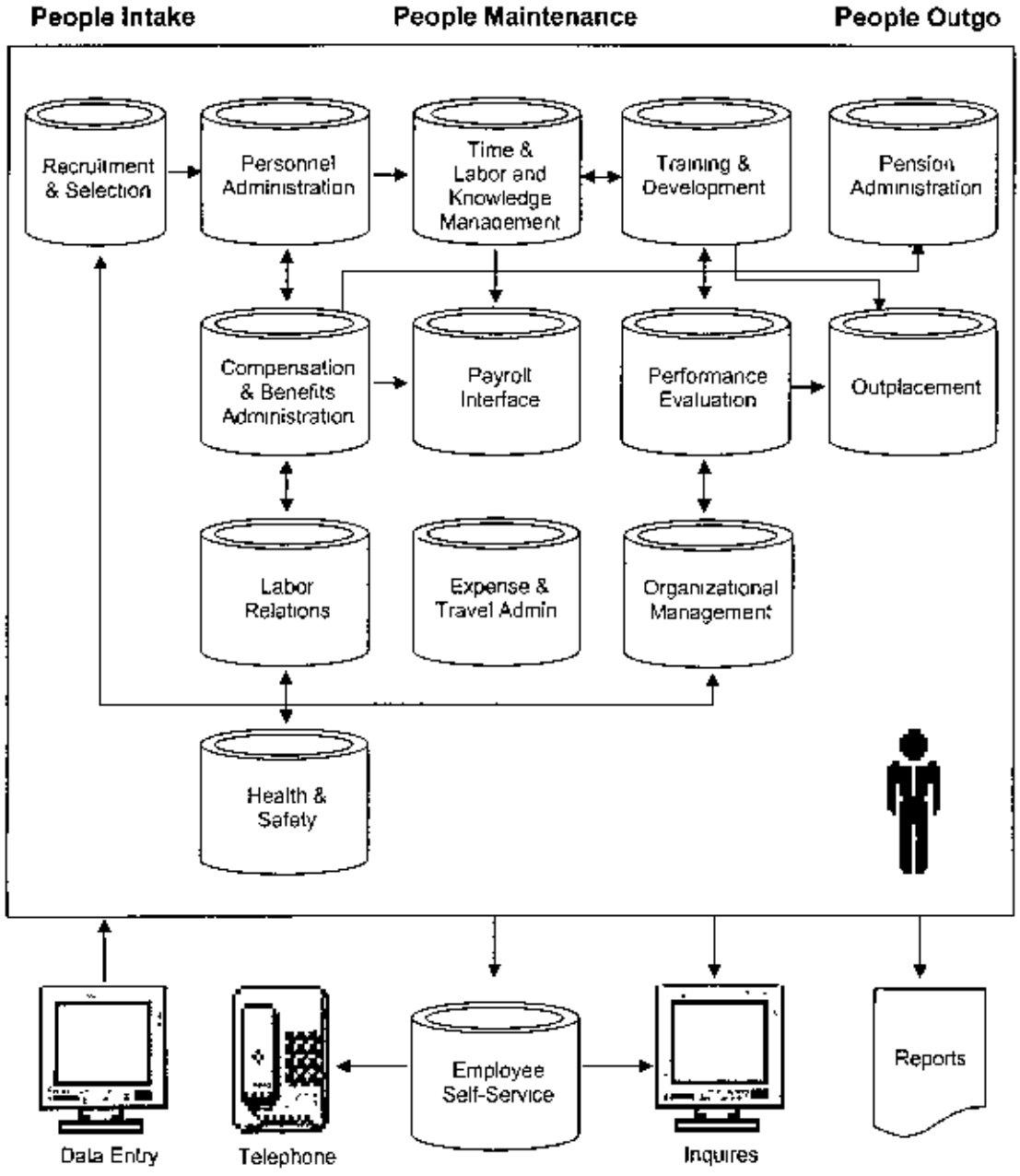


Figure 2.4: The Generic Architecture of HR Information Systems

A brief discussion of some of the important human resource information subsystems are given below:

2.8.1 Recruitment and Selection

Recruitment ensures that the selection process has a large applicant pool to select the most suitable candidate. Information systems can help the recruitment and selection process in many ways. First, advanced computerized position inventory system (list of vacancies) ensures that the list is current all the time and can be viewed by a prospective applicant anytime. The system can also be used to generate various statistics like jobs with high turnover and the average time it takes to fill a vacancy. Companies can also use expert systems to speed up the selection process and ensure that it is consistent. Resumes sent through the Internet and by mail can be scanned for keywords identifying required knowledge, skills, competencies, and experience. This information can then be stored in the system for immediate or future use. Expert systems can be used to test and evaluate candidates' personality, knowledge, and skills at different company locations. This improves selection accuracy and reduces manual processing and error. Applicants that do not meet the minimum qualification or fail a test can automatically be sent rejection letters by the system.

2.8.2 Personnel Administration

A company's human resource population data needs to be stored securely and updated as and when required. Typical information stored by a company includes an employee's name, birth date, service dates, race, sex, salary, department code, job code, location code, and whatever classification codes are necessary to establish an employee's status (exempt, active). The subsystem tracks every phase of an employee's job history, so it always possible to get the big picture.

2.8.3 Time, Labor, and Knowledge Management

Anything involving time, labor skills and knowledge can be audited and reconciled with this subsystem's single repository of information. Systems can be developed to track and identify work schedule patterns, absenteeism, tardiness, allocate resources, and determine procedures to administer either time-related and knowledge-related tasks and functions based upon an employee knowledge profile. This subsystem tries to track and optimizes the distribution of

In addition, a generic employee knowledge management (EKM) information subsystem should have the following components:

- Mentor interface for an advisor who coordinates Personal Development Plans and reviews and approves a training request.
- Learner interface for an employee who wants to track his or her own progress and development.

2.8.4 Training and Development

Information technology can help training and development in two ways. First, technology can be used to provide programmed instructions and self-paced training to employees. This can be done on-line or at various locations within the company. Information technology can also be used to plan classes, set up training schedules, organize training courses' activities, collect fees, and chart trainees' progress and return on investment. In addition, the subsystem can be used to track developmental plan of each employee within the company and their learning progress.

2.8.5 Pension Administration

This subsystem streamlines activities from plan set-up and record keeping to pension calculations and retiree payments and statements. The subsystem monitors pension fund performance and supports decisions on premiums and asset allocations.

2.8.6 Compensation and Benefits Administration

Compensation and benefit plans can vary form company to company. They include various plans like flexible and non-flexible healthcare plans, short and long-term disability plans, saving plans, retirement plans, pension plans, and flexible spending accounts (FSA's). The management of these plans is no longer a time and labor-intensive chore. This subsystem handles every aspect of the plan's management including employee status changes, calculation of flexible credits, automated processing of open enrollment, incorporation of voice response for hands-free updating, automatic calculation of leave time, and online procedures to ensure compliance with all before and after tax regulations.

2.8.7 Payroll Interface

This subsystem automatically gathers data on salary, wages, and benefits to streamline input to the payroll (accounting) application. It also provides an access to the subsystem's panels so an employee can review salary breakup and deductions and accumulated balance information.

2.8.8 Performance Evaluation

Employees within an organization are typically evaluated at a regular interval. This can be done by one or more sources like supervisors, peers, self, customers, and subordinates. These evaluations can be scanned or keyed into expert systems. The employee performance management (EPM) subsystem should perform the following functions:

- Audit and analyze competency level so management knows which employee has or lacks the right skills for positions and project teams.
- Analyze whether employee's activities and outcomes are congruent with the organization's objectives. Based upon this data, this subsystem can identify training needs, layoff candidates, and promotion potential of employees.
- Measuring the learner's return on investment through a variety of formats to deliver both customized or standardized assessments.
- Monitoring the learner's progress in learning and job tasks accomplishments.

2.8.9 Outplacement

This subsystem helps companies assist their discharged or displaced employees in finding equal or better employment. This can be done by providing links to self help books, career counselors, and in-house outplacement resources like training programs on job search techniques, resume development, interviewing strategies, and negotiating salary. In addition, link can also be provided to web sites that provide the former employees tips, tools, and information needed to conduct a productive and successful job search.

2.8.10 Labor Relations

This subsystem provides information that managers can use to ensure good labor relations. This can include employee work rules, policies and documentation on issues like privacy, sexual harassment, and workforce diversity. It can also provide benchmarks for issue support cost, headcount ratios, and employee productivity.

2.8.11 Expense and Travel Administration

This subsystem automates the way employees are reimbursed for business expenditures like travel, entertainment, supplies, and other company-related purchases. Once submitted, managers can review and approve expenses. This information can, then, be automatically be sent into a company's accounts payable and general ledger systems.

2.8.12 Organizational Management

This subsystem supports the integration of the business strategic plan with the HR strategic plan. This subsystem identifies all job positions in a company, their hierarchy, and job descriptions, and links them with employed workers. The subsystem evaluates levels of HR needs and generates decisions on hiring, promoting, transferring, retiring and firing employees. All jobs are analyzed to verify that a company complies with various provisions and record-keeping and reporting requirements of various employment laws

2.8.13 Health and Safety

This subsystem provides information on various federal, state, and local health and safety regulations applicable at the workplace It also provides information on the company's safety record, injury/illness prevention plan, safety compliance procedures, and state-specific workmen's compensation and occupational safety and health act (OSHA) forms

2.9 THE IT INFRASTRUCTURE FOR THE NEW HR

Corporations have put a great deal of new technology in place over the last decade to "enable" transformations like the one we're advocating For example, the fact that almost all employees are, by now, connected by computer or telephone permits the savings that will come from self-service transactions and inquiries. Networks, voice-response on the telephone, mobile computing, and home access to the Internet all come into play here, as they do with many new ideas for using IT competitively.

But there is a small set of technologies that is key to actually providing the functionality required to transform HR. The three "core" technologies that constitute the new infrastructure

for HR systems are the HR Information Systems (HRIS), a special-purpose HR data warehouse, and an HR knowledge system (Figure 2.5).

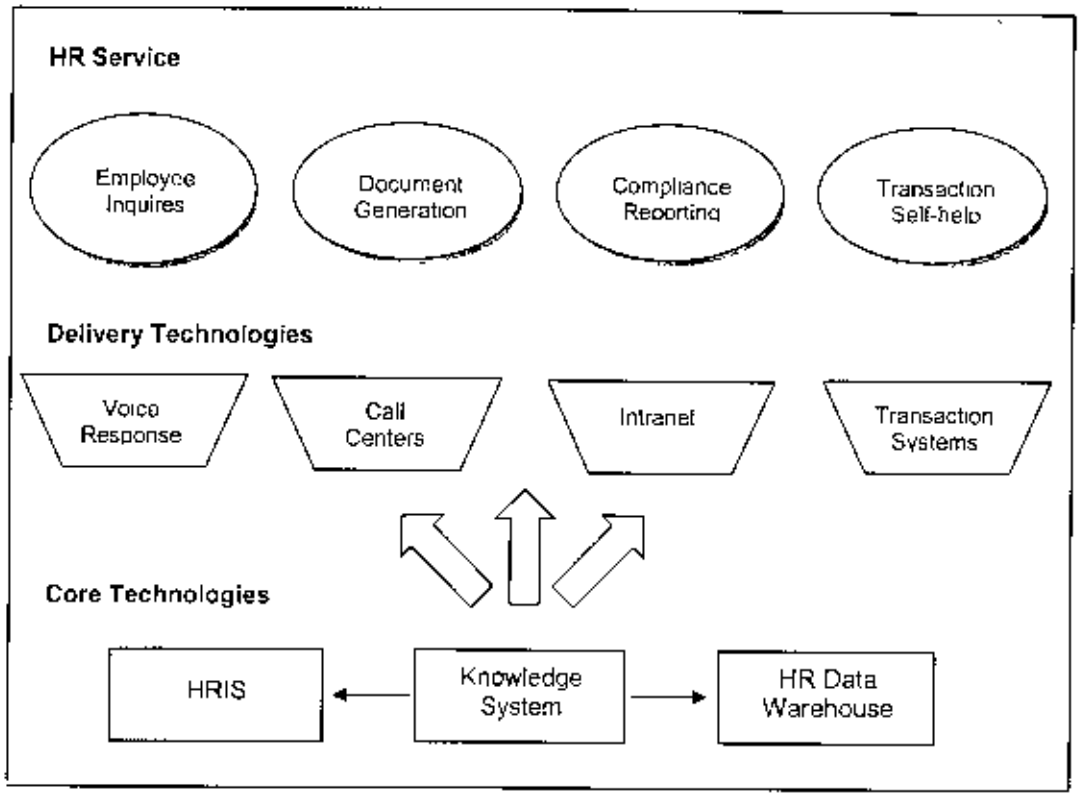


Figure 2.5 The three core technologies of the HR IT infrastructure.

The HRIS is a conventional database application platform, typically purchased from a vendor like PeopleSoft, SAP, Oracle, Baan, or Lawson. The HRIS is specifically designed to:

- Offer automation for standard HR business processes, like benefits enrollment and other transactions, along with a repository of the data required for those transactions;
- Integrate and share a common data model with other ERP modules, like payroll, and
- Generate a broad array of standard reports for personnel management and government reporting.

Of course, the installation and customization of an HRIS for a multinational organization can itself be a daunting and expensive process. But, by itself, the HRIS is not enough — it is only the first component of an IT infrastructure to support the new HR organization. The HRIS products on the market are designed to bring efficiency to current HR functions, but they are

not designed for agility in response to business changes and they have not considered the new HR functions required to realign HR with business objectives.

In addition to the HRIS, an HR-specific **data warehousing** effort is needed. The goal for this piece of the system is to build a model of HR-related data, beyond the model implicit in each vendor's HRIS system. This model allows flexibility down the line for reports that not only satisfy the requirements of all those agencies and localities not covered by the HRIS product, but also support analysis and decision making about HR and about the employees themselves.

Finally, essential to the successful transformation of HR is a **knowledge system** that contains an encoding of knowledge about corporate policy, HR procedures, various types of benefits plans, and so on. The key technical feature of a knowledge system is that the knowledge is expressed *explicitly* in a special database, not embedded in the text of an on-line manual or in the set-up tables of a PeopleSoft implementation. In this explicit form, the knowledge can be used to drive many different HR systems. This knowledge system is central to achieving the kinds of efficiency gains we're describing, and to the future strength of the HR function.

A knowledge system is an information system that has been separated into three components:

1. A specialized database, called the knowledgebase, which is where knowledge is stored: eligibility constraints, taxonomies of benefits plans, rules on what must be in a simplified plan description, phrasing of a sex discrimination policy, etc. The knowledgebase houses knowledge in a standard, neutral representation that does not presuppose the systems with which it will integrate. Moreover, the HR knowledge system does not assume (implicitly or explicitly) the uses that might be made of the knowledge;
2. A set of editing tools for entering the knowledge and keeping it up to date; and
3. An algorithm for using the right knowledge in the right way at the right time. If some additional information is needed to answer a question or solve a problem, the system can determine what questions to ask to clarify the situation.

Compare the knowledgebase approach to traditional software systems, where the knowledge inherent in the system is implicit in the software code itself, and can only be understood and changed by programmers. In the knowledge system, the special editing tools allow a subject matter expert (SME) to make sure the right knowledge gets into the system, to correct the

system's behavior by adding or changing its knowledge, and to keep the knowledge up to date.

Key to the value of knowledge systems is that the same piece of knowledge can be used in a variety of ways. The knowledge system might combine the knowledge it has about employees, medical benefits, and web screens, for example, with the data about a particular employee and his particular medical plan coverage, to generate a screen in response to his on-line query about co-payments. The same knowledge might be combined with a voice response unit to answer the employees questions over the phone, or with an on-screen forms generator to help the employee fill out an office visit claim form.

The very same knowledgebase could be used to print up a benefits manual, or to set up a PeopleSoft workflow process. When the rules are changed (by an insurance carrier or by corporate policy changes), the update need only be entered once, to the central knowledgebase, which is linked to all the places where that knowledge is used. Moreover, a knowledge system can reason about the knowledge in ways that a static web site or information retrieval system cannot. For example, the system can reason about "effective dates" and communicate the appropriate eligibility requirement for each situation: provide an answer to a retiree's question about filing a claim under previous eligibility rules; offer information about future eligibility (e.g. at the next open enrollment period), or provide tailored eligibility information contingent upon a current or potential future life event. There are a variety of technologies used for building these knowledge systems. They are named after the type of reasoning they support. Rule-based, case-based, model-based, constraint-based, temporal, and probabilistic reasoning systems are the most common types available commercially. Many systems combine several paradigms, mimicking human ability to get to the answer using any of several alternative techniques.

2.10 HUMAN RESOURCE INFORMATION SYSTEM: A CURRENT ASSESMENT

The number-one use for HR information systems (HRIS) is for benefits administration, cited by 88.5% of respondent as shown in Table 2.1. However, relatively few of the polled companies use computerized benefits enrollment-just 62% of them. An increase in the number of companies using electronic enrollment as more employers implement self-service technologies that allow employees to enroll in plans electronically via the Web or company intranet.

Interestingly, the payroll function is high on the usage list, cited by 80.7% of survey respondents Payroll is often outsourced, so this high usage rate is notable. One of the reasons for this may be the availability of new options in payroll processing. Payroll modules in leading HRIS packages are better and easier to use than ever.

Table 2.1: How Companies Use Their HR Information Systems

Function	All	Mfg.	Finance	Whsle. / Retail	Private Practice	Trans./ Utilities	Educ -ation	Non Profit	Health Care
	%	%	%	%	%	%	%	%	%
Benefits	88 5	85 2	77.3	92 9	96 9	92 9	100 0	86 7	87 5
Personnel Administration	83 9	85 2	90 9	85 7	78 1	85 7	66.7	80 0	87 5
Payroll	80 7	85 2	72.7	64 3	84.4	85 7	83 3	86 7	81 3
Administration	74 0	77 0	90 9	71 4	68 8	78 6	83 3	60 0	50 0
Benefits Enrollment	62 0	67.2	45.5	71 4	68.8	57.1	41 7	53 3	68 8
Applicant Tracking	46 4	41 0	45 5	21 4	43 8	50 0	58 3	53 3	75 0
Staff Training /Development	40.6	41 0	31 8	21 4	46 9	57.1	41 7	20 0	56.3
Recruiting	32 3	32.8	18.2	14.3	37.5	35 7	33 3	40 0	43 8
Other	9 4	8 2	13 6	0 0	6 3	14.3	8 3	0 0	18 8

Also, several payroll systems are available on a hosted basis, which is much cheaper than traditional outsourcing. Under a hosted setup, companies access payroll software via the Internet for a monthly fee, allowing them to "insource" the payroll function.

How technology is being used for HR applications changes to a certain degree when the data are analyzed by company size. For example, while benefits administration is the top use for HRIS at companies with fewer than 5,000 employees, personnel administration leads the applications at larger companies (shown in Table 2.2).

Table 2.2: How Companies Use HRIS, by Company Size

Function	Number of Employees			
	Up to 999	1,000 to 4,999	5,000 to 10,000	More Than 10,000
	%	%	%	%
Benefits	88 4	100 0	86.8	80.4
Personnel Administration	79.5	78 4	94 7	89.1
Payroll	75.0	64.7	78 9	80 4
Administration	72 7	80 4	84.2	84.8
Benefits Enrollment	56 8	72 5	71.1	52.2
Applicant Tracking	38.6	49.0	50 0	45 7
Staff Training /Development	36.4	49.0	47.4	30 4
Recruiting	15 9	33 3	31.6	39 1
Other	13 6	7 8	10 5	8.7

❑ Future System Uses

Half of the respondents plan to add new modules and implement employee and manager self-service. Twenty seven percent say they will add new modules over the next year, and another 23% specifically said that self-service applications are on the way (shown in Table 2.3 for a breakdown of respondents' plans overall and by industry and Table 2.4 by company size).

Table 2.3: Planned Use and Strategies for HRIS

Planned Use / Strategy	All	Mfg.	Finance	Whsle. / Retail	Private Practice	Trans./ Utilities	Educ -ation	Non Profit	Health Care
	%	%	%	%	%	%	%	%	%
Integrate/ add new modules	27.4	20 3	31.8	23 1	37.9	13 3	33.3	35 7	18 8
Implement new system	23 7	22 0	31.8	38 5	24.1	6 7	25 0	14 3	31 3
Implement employee/ manager self-service	22.6	22 0	27.3	23 1	27.6	13.3	16 7	21.4	31 3
Add Internet/ Intranet Applications	21 5	30 5	9.1	15 4	3 4	53 3	16 7	21 4	18.8
Other	4 8	5.1	0 0	0 0	6.9	13 3	8.3	7 1	0 0

Table 2.4: Planned Use and Strategies for HRIS, by Number of Employees

Planned Use/ Strategy	Number of Employees			
	Up to 999 %	1,000 to 4,999 %	5,000 to 10,000 %	More Than 10,000 %
Integrate/ add new modules	26 2	23.5	27.0	27.3
Implement new system	21.4	27.5	27 0	25 0
Implement employee/ manager self-service	23 8	21.6	24.3	22 7
Add Internet/ Intranet Applications	19 0	25 5	21 6	25 0
Other	9 5	2 0 7	0 0	0 0

The new modules most frequently mentioned were recruitment and applicant tracking. Companies reported that they are evaluating these modules for implementation within the next 12 months. The other soon-to-be-implemented modules most frequently mentioned include those for benefits enrollment and time and attendance.

- **Barriers and Benefits to Implementation of HRIS**

The perception of barriers to implementation of HRIS was investigated by asking respondents to rate each of the ten potential barriers shown in Table 2 5. Table 2.5 shows the mean ratings of potential barriers and their ranking The measure of the relative degree of perception as a barrier was set on a five-point rating scale with 5 being "the greatest barrier', 3 being "a barrier" and 1 being "not a barrier". Therefore, an average score of 3 or above can be taken as perceived barrier to implementation of HRIS in their organizations by the respondents. Based on the responses, we find that barriers with a mean rating greater than 3 on a five-point scale in descending order of their magnitude are as follows:

- Insufficient financial support
- Lack of expertise (s) in information technology

Table 2.5: Mean Rating of Perceived Barriers to HRIS Implementation

Potential Barriers	Mean	S.D.	Ranking
Difficulty in changing organization culture	2.500	1.267	7
Lack of top managers' commitment	2.679	1.455	4
Insufficient financial support	3.199	1.360	1
Fear to change the way they do things	2.460	1.138	8
Inadequate knowledge in implementing the system	2.737	1.208	3
Lack of expertise(s) in IT	2.878	1.316	2
Lack of commitment and involvement by all employees	2.399	1.124	10
Not perceived as an advantage at all	2.417	1.239	9
No suitable HRIS or software	2.511	1.276	6
A lot of paper work which is difficult to computerize	2.287	1.122	11

Table 2.6 shows the mean ratings of the greatest benefits achievable through adoption of HRIS in the organization. The measure of the relative degree of perception as a benefits was set on a five-point rating scale with 5 begin "the greatest benefit", 3 being "a benefit" and 1 being "not a benefit".

Based on the responses, we find that benefit with a mean rating greater than 3 on a five-point scale in descending order of their magnitude are as follows:

- Quick response and access to information;
- Improve data control,
- Reducing manpower

Table 2.6: Mean Rating of Perceived Benefits Through Adoption of HRIS

Benefits	Mean	S.D	Ranking
Reduce paper work	3.412	1.275	7
Allowing for fewer error	3.779	1.100	5
Helping make more informed decision	3.257	1.140	10
Improving data control	4.186	.892	2
Quick response and access to information	4.377	.813	1
Improving customer service	3.254	1.225	11
Enhancing competitiveness	3.063	1.149	12
Streamlining HR process	3.835	.0927	4
Standardizing programs and procedures	3.522	.983	6
Reducing data re-entry, add data may be used immediately	3.991	1.026	3
Reducing manpower	3.404	1.002	8
Tracking and control of the different HR functions	3.287	1.227	9

2.11 STEPS TO SELECTING A HUMAN RESOURCE INFORMATION SYSTEM

Technology has dramatically altered the lives of human resource professionals over the past 15 years. Today, much of what used to be time-consuming manual processes are performed by computers, freeing to work on higher value activities. The demand for technological solutions to human resource issues is increasing each year.

This is a blueprint to follow for any type of human resource software selection, from stand alone applicant tracking systems to fully integrated HRIS and Payroll solutions.

The process that follows has some discrete steps. Software selection is invariably a more complex process than originally estimated and one with long-term consequences for an organization. It requires a careful and thoughtful approach to fully address the issues and impacts related to the decisions to be taken. Some steps may be combined or performed concurrently, but according to the specialists, human resource professionals can optimize their selections by following the process as presented.

Steps to be taken:

- **Teamwork**

At the very beginning, in a project to select a new software package for human resources department, most organizations start by forming a team to manage the software selection process and a 3 to 7 person team is strongly recommended to oversee the selection. There are a myriad of issues to consider and software selection is definitely one area where the quality of the decision is improved by having several people involved in the evaluation and decision making process. Here people should be carefully selected looking at the fact that who the key users and stakeholders will be for the new application. A knowledgeable member of the Information Technology staff should be included from the very beginning and there should be an appropriate management representation so that as costs are developed, any situation of delivering "surprising" news at the end of the evaluation process does not arise. Larger organizations may also have a "Steering Committee" separate from the project team. Steering committees typically consist of the decisions makers - management who will sign off on the costs, participate in contract negotiations, support the project team and provide visible top level support.

❑ Goals

At the initial team meeting(s) things should begin by identifying and agreeing on the goals for the project. Without a set of fully developed goals at the beginning of the search, significant time will be wasted evaluating the wrong products, or, even worse, select the wrong software. The team should be addressed with the following questions:

- What is the overall HR information technology strategy?
- What is needed and why it is needed, what system functionality is needed?
- What results should be accomplished with this effort?
- What work processes are set to be changed through this selection and what should the new processes look like?
- What are the business drivers for the new system, how does this system support the overall needs of the business?

Identifying goals may include interviewing senior management, others in HR and clients to identify the "right" needs for the organization

❑ Big Picture

Once the goals are developed, how they fit into the bigger picture of the overall human resource information system that should be evaluated If anything like specialized application such as applicant tracking or COBRA management is going to be selected, how it will need to integrate with other applications such as the main HRIS –should be considered. Every software issues must be addressed that should be considered not focusing on only one problem. If a new HRIS is going to be selected, it should cover all of specialized needs such as COBRA and HIPAA compliance or training records management. This application should also fit with the overall HR IT strategy.

❑ Future Needs

At this stage of the selection process, it should be thought out what the information system needs will be in the next few years There should be a clear conception about what other applications will be needed and when will be needed and will they share the same information needs as this application, i.e. employee id, date of birth, name, address, etc. If so, some other questions arise:

- How the entrance of the same data into different applications in future years will be prevented?
- Is there any planning to move to web based applications and if so, is this the time to begin moving in that direction?
- Are any major business processes going to change either as a result of this selection or in the near future?
- Where do issues like employee self service and manager self service fit into the overall strategy?

❑ **Technical Environment**

It is absolutely critical to define the base technical environment for the new application before the beginning to look at any specific products. This is an area where the Information Technology representative plays a key role. The questions that need to be answered include: what type of application is being searched, stand alone PC, networked client/server, or mainframe. What operating system does it need to run on -- Windows NT, Unix, etc.? If it's a database application, what database does the company support, SQL, Oracle, DB2? How will it connect to remote offices? Does it need to be web deployable? Does it make a difference what language the application is programmed in such as C++ or Visual Basic? Is the IT department planning a major change in technology platforms in the next year?

❑ **Budget**

Budgets can be hard to define before speaking with any vendors but it is needed to at least define some ballpark estimate of what the organization is willing to pay before talking to vendors. A key item to keep in mind during budget definition is to separate the costs into three areas: software, hardware and implementation. Software includes the actual software-licensing fee and other software costs for items such as database licenses and annual maintenance costs. Hardware is what is needed to spend for servers, PCs, and network upgrades. Finally, implementation costs encompass the money that will be spent for configuring the software, training, and data conversion including the possible need to hire consulting services from the vendor or third party consulting firm to help in implementation.

- **Specifications**

At this stage, a written specification document for the new software package is needed. The specification should include the overall HR IT strategy, list of project goals, definition of the base system functionality that is required, specification of how it needs to integrate with other systems, and list of the technical requirements developed previously. This is a key deliverable for the overall project. If the specification is clear, specific and well defined, the selection process will be relatively painless However, if goals, functionality or the technical environment are unclear, then moving forward will not be functional.

- **Build vs. Buy**

At some point during the process, most organizations address the issue of whether they want to develop the application internally or purchase commercially available software. According to the specialists, the issue should not come any later than this stage because it is typically both an emotional and confusing debate and one that can sidetrack the process indefinitely. Many organizations have successfully developed their own human resource software. Many more have been less than successful in such efforts. When the issue arises in the process, ask the following questions:

- Are the necessary IT resources available internally for this project?
- Does the human resource staff have the time and expertise to develop detailed system specifications, screen designs, system edits and reporting requirements?
- What priority will it be given by IT management compared to other business systems?
- What is so specialized about the needs those are not at least 80% fulfilled with commercially available software?

Finally, if the Information Technology staff develops any preliminary budgets or schedules for doing the job internally, experience says that both should be doubled and then a more realistic estimate come to compare against the commercial products

- **Research**

At this stage, vendors and products should be identified that could meet the needs. The obvious starting point is to talk to the employees/colleagues in other companies for recommendations on products they have used that fit the general needs. Another source is the Internet. The annual SHRM and IHRIM conferences also include vendor exhibits where there is an easy access to a variety of software vendors.

Literature

This prior research should generate a good list of potential vendors. The next step is to contact each and get some product literature. Vendors supply different levels of information in their brochures, some are very high level without much detail, and other pieces are more informative. Specifically that literature should be asked for that contains the level of detail needed. This is a key step in the process and should not be skipped because it should reduce the potential vendor list to a manageable number. Some vendors will drop out when called for literature and it may be revealed that their product isn't available to fit the technical platform, or it really does not meet the needs. Some can be eliminated after reviewing their literature and determining that the product is not as close a match with the technical specifications as others. One note of caution about this step, many vendors will want to schedule meetings while having contact with them for literature. But this is not a proper time to meet vendors. They should be limited to sending as much information as they can, and they should be assured that there will be further contact if there is any proceedings meeting the requirements

RFP

This stage is proper to develop and send a request for proposal (RFP) to the smaller list of target vendors. RFP's can be one page in length or ten or more. It is to be decided how much detail is wanted prior to seeing product demonstrations. Smaller companies may want to use a simplified 1 or 2 page request for information (RFI) that requests less information and has more flexible response guidelines in order to expedite this stage. Larger companies and those in the public sector most typically will use a formal RFP process. The most common elements in an HRIS request for proposal include:

- An overview that describes the company,
- A description of the software need and the employee population it will support,
- Desired system functionality,
- Required technical environment/specifications,
- A request for pricing (licensing fees, maintenance charges, training and implementation support, annual maintenance fees and telephone hotline support),
- A request for customer references,
- Details on customer service/support available from the vendor,
- A request for sample contract terms.

Once RFP is assembled, it should be sent to vendor contacts and they should be given a reasonable period of time to respond, typically 3 to 6 weeks. Some vendors will supply with a "sample" RFP if is requested for one, which can be modified for specific system needs. The RFP needs to contain guidelines for the vendor response such as:

- Is each of the required features currently in their system?
- Are certain features proposed in a future version of the system?
- Will any of the required features require system customizations and if so what are the costs and problems associated with the customizations?

There should be the awareness for the "special needs" and the extra money and effort it will cost for implementation and future support. There should be the modification of internal processes to match the software before embarking on customization.

- **Evaluate**

As the RFP's are returned, there should be a common basis for evaluating all of the proposals A typical approach is to create a spreadsheet with all of the items in the RFP as column headings and the vendors listed on the rows. Then a value may be assigned to each RFP item (yes/no, a dollar value, or a numerical ranking of some type) for each vendor. Once all of the proposals have been received and data has been entered into the spreadsheet, then the evaluating team can meet, review the evaluations and select the vendors they want to schedule for product demonstrations.

- **Demos**

Software product demonstrations, by their very nature, are designed to showcase the best attributes of the product and downplay the limitations. Product demonstrations should be controlled to try and get as accurate and unbiased information as possible from what is clearly a major sales event for the vendor. Demonstration can be controlled by modifying the vendor's agenda. All software vendors have standard product demonstrations – which should not be accepted. By this point in the process, there should be a strong grasp of the needs and issues. A list of specific questions/trends should be prepared for the demonstration that focuses on the issues and concerns and it should be provided to the vendor in advance of the meeting. In this way the vendor can include issues as part of their overall demonstration and a more unbiased look at the product may be acquired. All the team members should be involved in the demonstration and the team should agree in advance on specific issues.

- **Evaluate Again**

After the completion of initial product demonstrations, it is time for the team to meet and evaluate the products based on all of the information available. Each team member should list the likings, disliking, concerns, and unresolved questions that they have concerning each product. There may be need of some additional information from one or more vendors before moving forward Pricing differences are also need to be concerned with at this point in the process However, it should not be assumed that each vendor will provide the 'final price'. As the vendors learn more about specific needs, they may be in a position to refine the pricing submitted with their RFP Finally, vendor list should be narrowed to 2 or no more than 3 vendors Those remaining vendors should be invited back for a second product demonstration.

- **Decision Points**

All the products have been seen once and have the preliminary pricing proposals. It's time for the team to start discussing the items that will drive the final decision. In most software selections price is one of, but not the only, selection criteria. Other obvious decision points may include differences in functionality and compatibility with existing systems. For many companies, implementation costs and timeframes are critical decision points. One thing should be always remembered that the management team representative should be heavily involved during this discussion as the team needs to be very sensitive to the items that will influence the eventual approval or disapproval of their recommendation.

- **Check References**

Then comes the time to start checking references of the finalists The team should develop a list of questions that they would like answered by each reference. Questions should cover any areas of concern that may have relevance with the product, product functionality, implementation, problems the reference has encountered and ongoing support The technical environment of each reference should be understood, i.e. Windows NT, Unix, AS/400, etc so that issues can be identified that may or may not apply to own situation What is said and not said by the reference- should be listened carefully If any reference is in the same geographic area in which the company works, try and reference's business may be visited to see the product in action and there may be conversation with the actual users. It is the best to check

all of the references before the second demonstration so that issues that come up during this process can be addressed at the time of the next demonstration.

- **Demo Again**

As with the first demonstration, the agenda must be set. The team will have specific items that they want to see again or need to have clarified. These items should form the basis of the second demonstration. The management team representative should be present at this demo. The IT representative should ensure that all technical issues are resolved at this time. Core functionality, reporting, processing time, implementation schedule and costs, customer support, issues raised in the reference checking process and any specific concerns of the team- everything should be reviewed. Each item in the pricing of the product with the vendor's sales representative should be reviewed also. If there comes any concerns about the pricing portion of vendor's proposal, it is the time to express them so that the vendor has a chance to clarify this critical issue before making decision. If everything is not resolved to full satisfaction during the second round of demonstrations, bringing one or more of the vendors back for a third demonstration should be a prompt attempt.

- **Evaluate Again & Select**

The demonstrations are finished and all the questions have been answered. It is time to make a selection. Before everyone decides to vote, information learnt in the second round of product demonstrations should be evaluated carefully and the initial goals and product specifications should be compared. A matrix may be created to bring out how each product is evaluated against decision points. If a thorough job is done of learning the strengths and weaknesses of each product, established clear goals and product specifications and it has been aligned as team from goal setting through final demonstrations, then it should have an easy time reaching consensus on a product recommendation. In some situations, two systems may be available that meet the needs. In that situation, contract negotiations should begin with both companies and the best package for your company should be worked on by negotiating - software price, training credits, implementation assistance, etc. It should be remembered that making the right selection is only phase one of the project. A successful implementation that achieves the goals is the real challenge.

CHAPTER 3

ORGANIZATION PROFILE

3.1 BACKGROUND OF THE ORGANIZATION

The Bangladesh Jute research Institute (BJRI) is the oldest mono crop research institute of the country. Jute research was first started in Dhaka with the creation of fibre expert's position and assumption of responsibility by Sir R. S. Finlow in 1904. The BJRI in its present form and functions has developed from the first Jute Agricultural Research Laboratory (JARL) established by the Indian Central Jute Committee (ICJC) at Dhaka Farm in 1936.

The impact points and broad perspectives of jute research activities have always been pursued in accordance with the situation related to jute and its socio economic importance. It is therefore, pertinent here to briefly trace back into the history of jute research activities in the subcontinent. To improve the jute plant both in regard to quality and yield, the ICJC established its Jute Agriculture Laboratory (JARL) at Dhaka in 1936. During 1936-47 the effective infrastructure required for a broad-spectrum jute research activities was established. But due to the partition of India (1947), the jute research activities in Dhaka suffered a serious setback for many obvious reasons It became imperative to reorganize and start afresh.

Jute being the main source of foreign exchange of earning of Pakistan, the role of jute in the national economy became more pronounced. Government of Pakistan constituted the Pakistan Central Jute Committee (PCJC) in the light erstwhile ICJC. The PCJC in turn reorganized the existing JRL as the Jute Research Institute (JRI) at the present site in 1951.

It was laid down in the original plan (1951) that the JRI would have three main branches, namely:

I. Agricultural Research on Jute.
II. Technological Research on Jute and
III. Marketing and Economic Research on Jute.

The JRI started functioning from 1951 only with Agricultural Research on Jute. The second branch, Technological Research on Jute was founded in 1963 and the branch for Marketing and Economic Research on jute has not yet been set up Only very recently the government has agreed to setup a research division namely Economics and Marketing Research Division.

The objectives of jute research during 1947-71 were based on contingent and short-term considerations. The sole aim was to maintain a monopolistic grip over the world market. The outcome of research during those days was only the development and release of some high yielding varieties.

After the birth of Bangladesh in 1971 the jute sector was taken up with special and realistic outlook. The Jute Act was promulgated in 1974. Subsequently in the light of the recommendation of the FAO/ADB appraisal report and approval of the ECNEC in 1976 a new branch for multiplication and distribution of HYV jute seeds was created. Having done so BJRI was functioning with the following branches from 1976.

I. Directorate of Agricultural Research on Jute,
II. Directorate of Technological Research on Jute and
III. Directorate of Jute Seeds

But in 1988, by a government order the function of the Directorate of Seed was transferred from BJRI to BADC. The BJRI was thus left with two functional research wings as listed I and II above.

With regard to the history of development of BJRI it is worthwhile to mention that the jute research activities originally started under the Ministry of Agriculture (MOA) in 1904. During 1947-71 it continued under MOA as a subject of the Central Government Jute Research Institute was placed under the newly created Ministry of Jute in 1974, then under Science & Technology Ministry in 1980. Again in 1982 BJRI came back to MOA. These shifts did not alter the specific research objectives but definitely hampered the progress of the institute in the broader prospective.

The diversified usage of jute blended textile products is another prospective field of research. To implement the research activities on jute blended textile products, a new wing namely Jute-Textile was emerged in 1997 at BJRI premise as a development project namely JTPDC (Jute and Textile Product Development Center). Later it was named as Jute-Textile wing and approved by Ministry of Establishment.

At present there are three wings of research activities, namely,

I Directorate of Agriculture Wing,
II. Directorate of Technological Wing, and
III. Directorate of Jute-Textile Wing.

3.2 LOCATION OF RESEARCH ACTIVITIES

The BJRI head quarter is at Manik Mia Avenue, Dhaka-1207. The head quarter is comprised of the laboratories under different disciplines; gene bank for serving as the germplasm depository of jute; green houses to facilitate off-season research; experimental mill for production of yarns and fabrics, pilot plant facilities exist for production of jut blanket, upholstery, draperies, finer union and blended fabric; textile mill setup for production of jute blended textile product.

The total activities of the technological research are housed in the head quarter. They make cooperative and coordinate research with public and private sectors and also serve as collateral of exportable commodities.

The agricultural research activities are spread over the different jute growing areas of the country. The Central Research Station is located at Manikgonj, about 55 kilometers at the northwest of the head quarter. There are four regional stations at Faridpur, Rangpur, Kishoregonj, and Chandina Besides these four regional stations, there are four sub-stations are located Tarabo (Narayangonj), Monirampur (Jessore). Pakhimara (Patuakali) and Nasipur (Dinajpur). BJRI collaborates the department of Agricultural Extention and other organization for dissemination, validity and feedback.

3.3 OBJECTIVES OF BJRI

The BJRI, at present, has been conducting research on jute with two specific sets of objectives. One is referred to as Agricultural Research on Jute and the other as Technological Research on Jute (including diversified product of jute). In both these fields the important focal points determining the specific objectives have undergone shifts and modifications to keep pace with the changes in agricultural, technological and economic situations.

- To regulate, control and promote agricultural, technological and economic research on jute and allied fibres and their manufactures and dissemination of results thereof,

- To organize production, testing and supply of improved breeders' jute seeds and their distribution to recognized organizations, selected growers and such other agencies as may be approved by the board.

- To set up research centers, sub-stations, pilot projects and farms in different regions of the country for carrying out research on different problems of jute and allied fibre crops, jute products and allied materials.

- To establish project areas for demonstration of new varieties of jute developed by the institute and to train the farmers for cultivation of those varieties of jute.

- To invent & identify suitable technologies & processes for production of jute-diversified products and their marketable technologies for commercialization including transfer of technology.

- To publish annual reports, monographs, bulletins and other literatures relating to jute research and the activities of the institute.

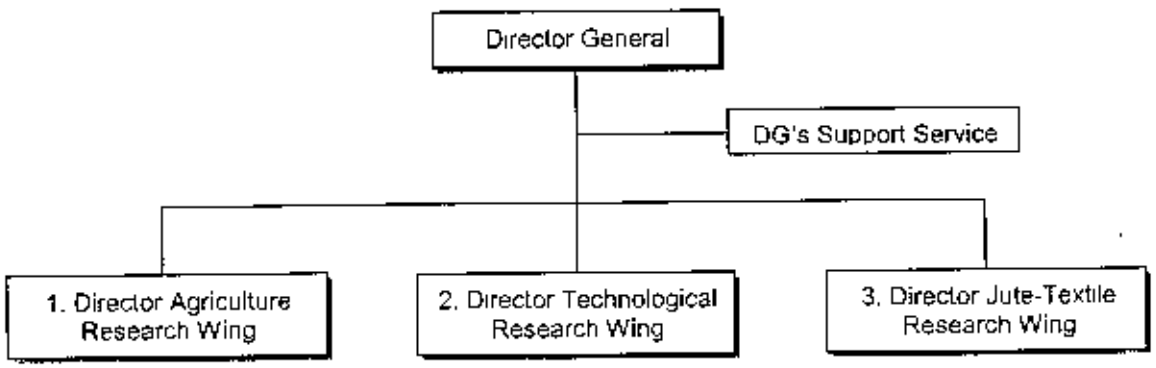
- To organize training of staffs and progressive farmers in modern improved method of cultivation of Jute and allied fibre crops and also to train technical hands for utilization of technological research findings.

3.4 ORGANIZATION STRUCTURE

The BJRI has an organization structure which is approved by the Ministry of Establishment, Government of Bangladesh. Since its inception the structure has changed time to time. However, the process of making any change in the structure is quite complicated and time consuming.

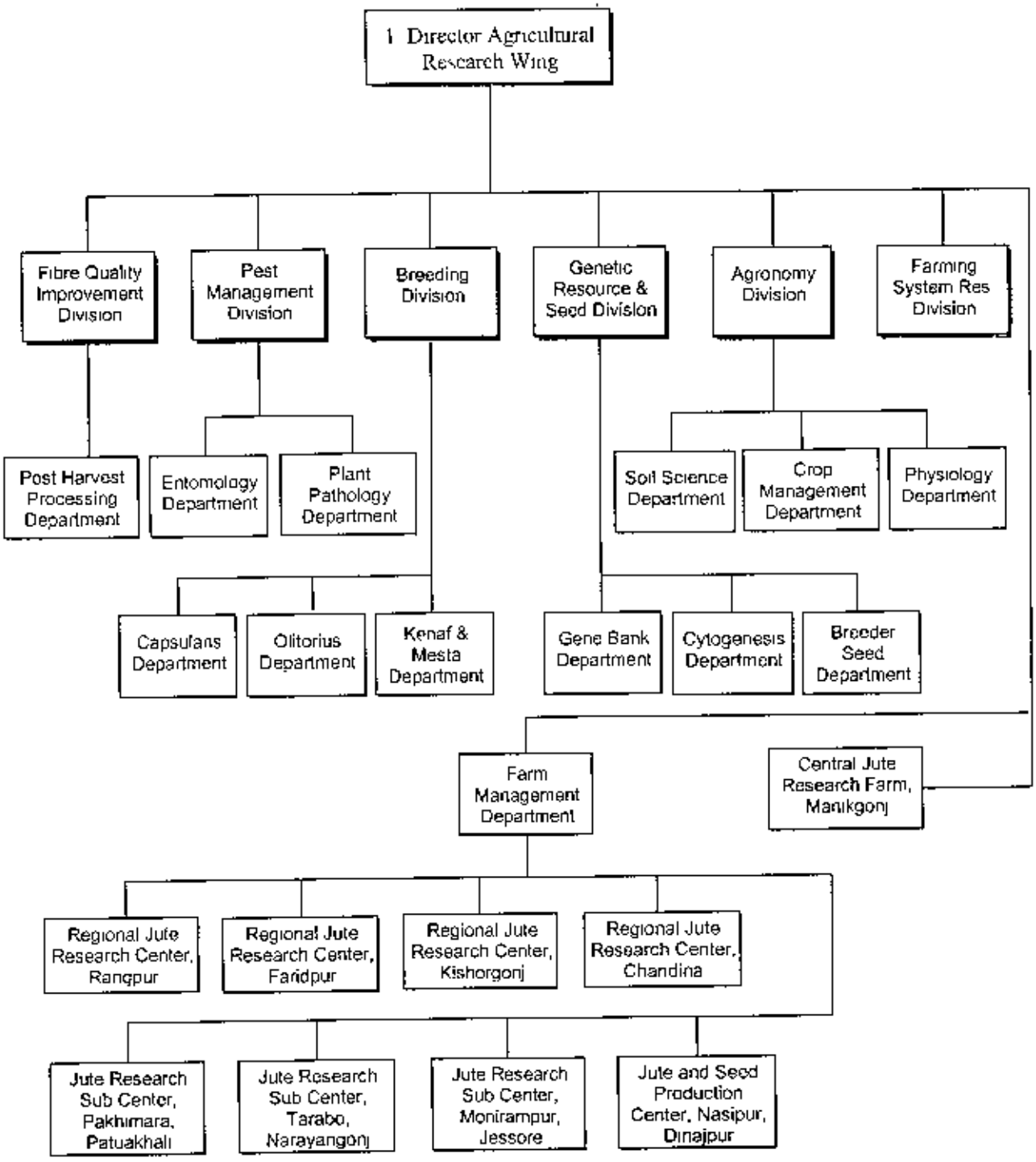
The Director General (DG) is the Chief Executive of the institute. The BJRI has been presently functioning with three wings. A director heads each of the wings, Agriculture, Technology and Jute-Textile. At present Agriculture, Technological and Jute-Textile wing consists of six, four and one divisions respectively. Besides these three wings, there are two divisions under the direct supervision of DG. The organization structures of the three wings and Director General Support Service are shown in below

3.4.1 Organization structure of BJRI:



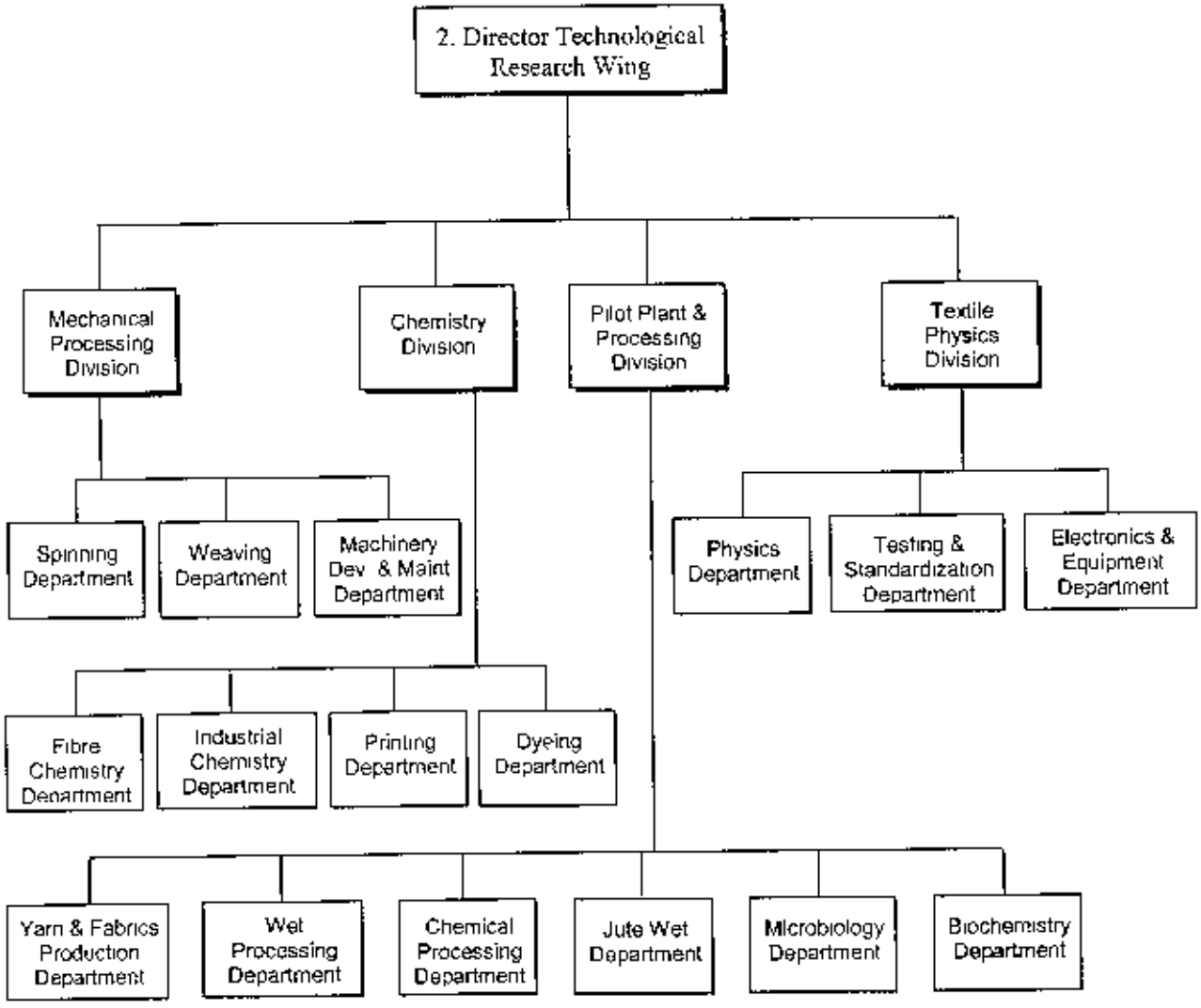
3.4.2 Functional Structure of the Directorate Agricultural Research Wing

The Director Agricultural Research Wing mainly consists of six divisions.



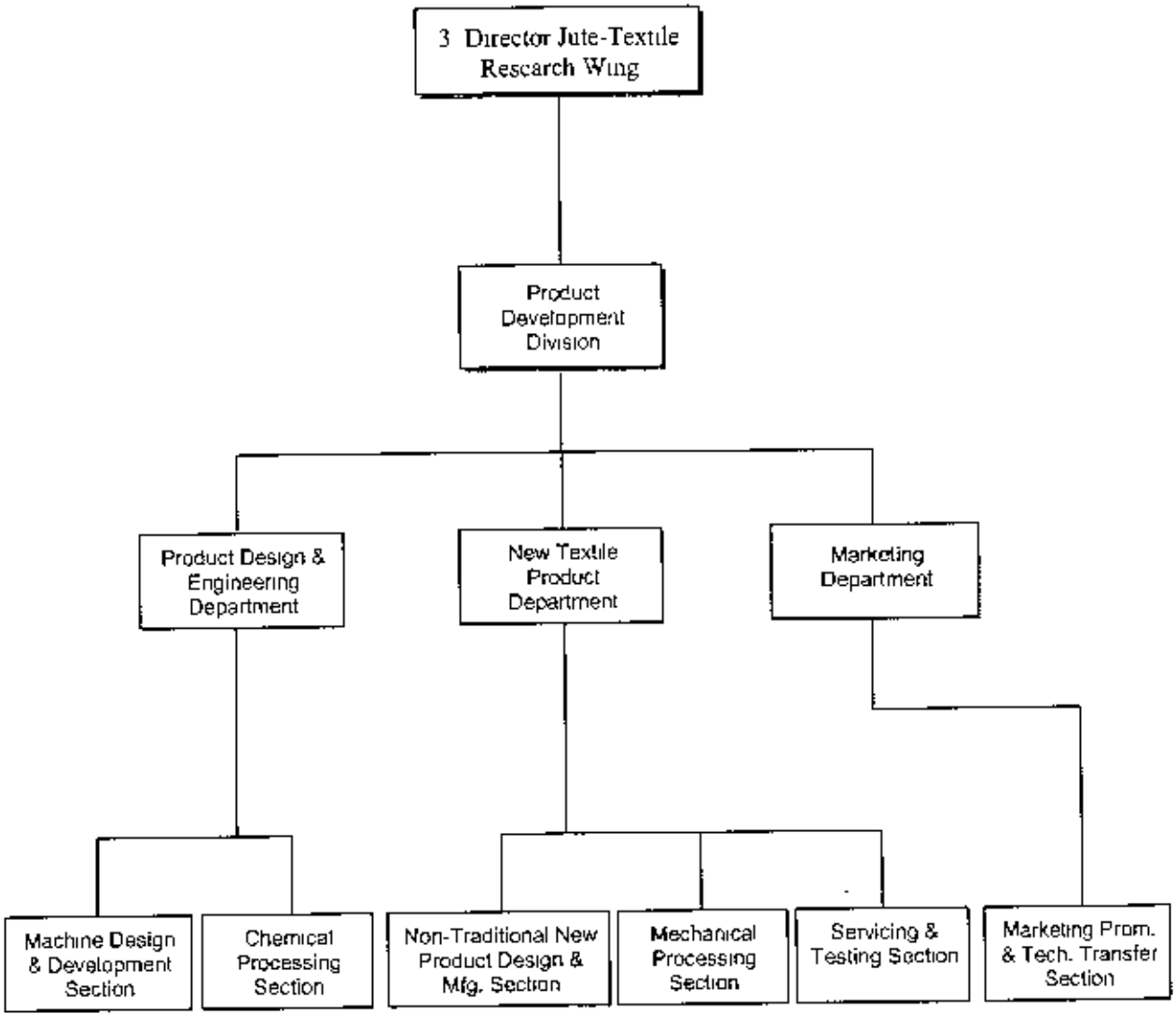
3.4.3 Functional Structure of the Directorate Technological Research Wing

The Director Technological Research Wing consists of four divisions.



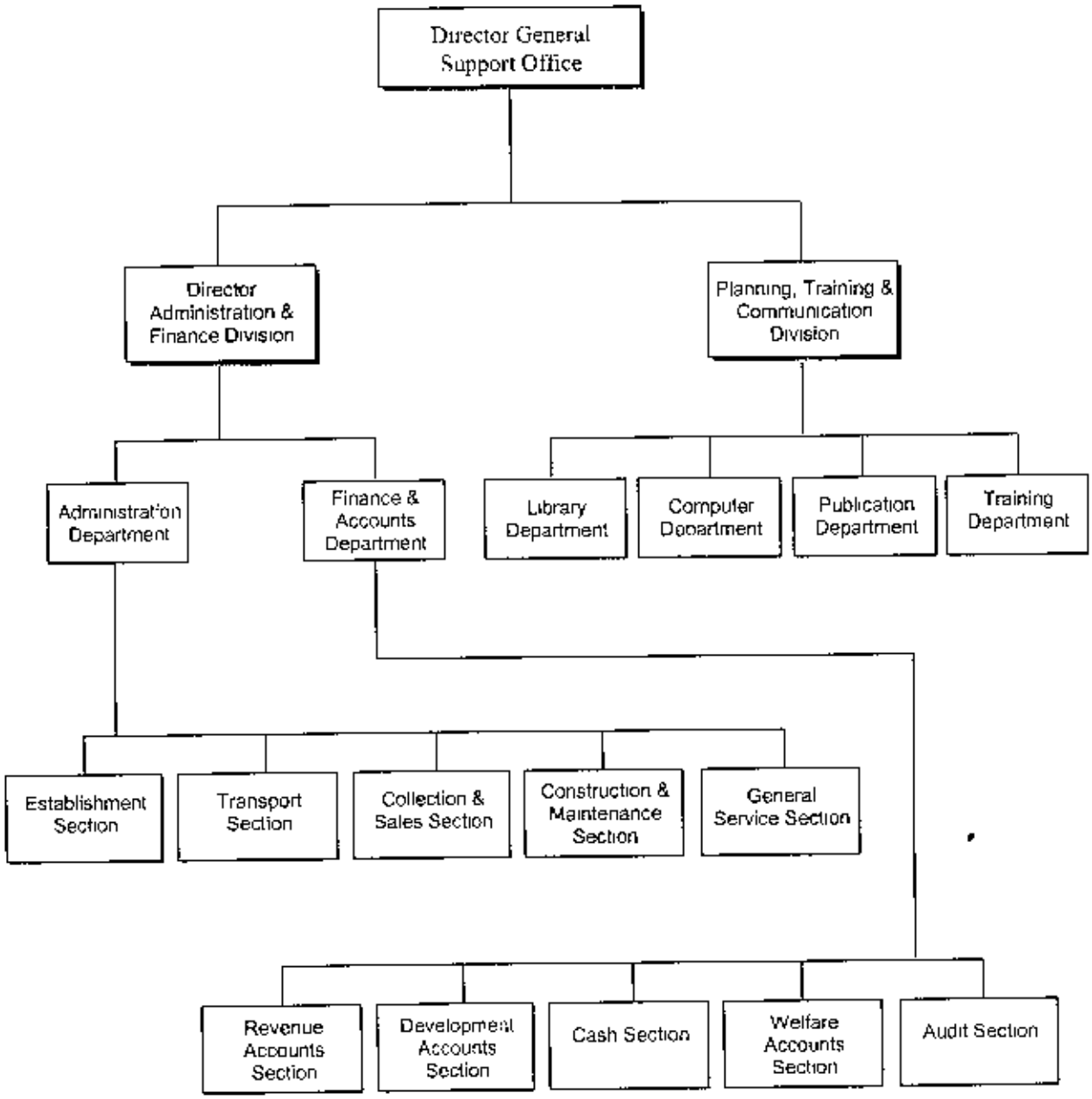
3.4.4 Functional Structure of the Directorate Jute-Textile Research Wing

The Director Jute-Textile Research Wing mainly consists of one division.



3.4.5 Functional Structure of the Director General Support Office

The Director General Support Office mainly consists of two divisions.



3.5 MANPOWER INVOLVED

Two types of staffs work in BJRI One is technical or research staffs, who are directly involved in research activities and the other is supporting staff who assist the research personnel. The approved manpower provision of BJRI at present is 486. The Agriculture Research Wing has strength of 229; the Technological Research Wing has 120; the Jute-Textile Wing has 41 (under consideration of revenue budget), and 113 personnel are in the support service. Out of 486 personnel, 144 are approved scientists in BJRI.

Table 3.1 Summary of the Approved Manpower in BJRI

Total Approved Manpower		
1.	Officer	
	Scientists	
	a. Chief Scientific Officer (CSO)	11
	b. Principal Scientific Officer (PSO)	31
	c. Senior Scientific Officer (SSO)	46
	d. Scientific Officer (SO)	56
	Other Officer	
	First Class Officer	19
	Second Class Officer	15
	Sub Total	178
2.	Staff	
	Third Class Staff	165
	Fourth Class Staff	143
	Sub Total	308
	Total Manpower	486

3.6 HR TRANSACTION PROCESS IN BJRI

Like other government organization, there is not a title department that involved in HR function at BJRI. The Administration and Finance division, under the direct supervision of DG, mainly deals the HR functions. Recruitment, promotion, personnel record keeping activities are done by the Establishment section under the Administration department of BJRI. The overall HR functions are in discrete manner. The automation of the HR function can save the valuable time and paper works of BJRI. The existing system is described as below:

3.6.1 Job Analysis

A job analysis is a systematic exploration of the activities within a job. It is a basic technical procedure, one that is used to define the duties, responsibilities and accountabilities of the job.

85 categories of jobs are available in BJRI. The job list of BJRI is shown in appendix-A. Being a research organization we can define the job categories in two ways, Research service and Support service. The Research service jobs belong to research activities and Support service supports the research personnel of the organization. Research personnel are the prime force of the organization. Scientific Officer (SO) is the entry post of the research personnel. According to the research activities of different division of BJRI, the qualification and requirements of a SO varies from division to division. After fulfilling the requirements an SO can be promoted up to Chief Scientific Officer (CSO) progressively. The steps of promotion are shown Table 3.2.

Table 3.2: The Successive Steps of Research Personnel (in ascending order)

Steps	Designation	Basic Requirements
1	Scientific Officer (SO)	• Minimum Honors Degree in respective field. • Experience and Postgraduate qualification is an advantage • Age Limit: Thirty years (max)
2	Senior Scientific Officer (SSO)	• PhD degree in respective field with two years experience and should have three publications. Or, • Postgraduate degree/Honors in respective field with five years experience and should have three publications. • Age Limit: Thirty five years (min)
3	Principal Scientific Officer (PSO)	• PhD degree in respective field with seven years experience and should have eight publications. Or, • Postgraduate/Honors degree in respective field with ten years experience and should have eight publications. • Age Limit. Thirty nine years (min)
4	Chief Scientific Officer (CSO)	• PhD degree in respective field with twelve years experience and should have ten publications. Or, • Postgraduate/Honors degree in respective field with fifteen years experience and should have ten publications. • Age Limit· Forty two years (min.)

Again vacant posts of SO to CSO are filled by either promotion of subordinates or new recruitment. The DG and Directors are selected from the CSOs, but it is selected by the

administrative ministry i.e. Agriculture Ministry. The Support services jobs have limited scope in promotion

3.6.2 Recruitment Process

Recruitment is the process of discovering potential candidates for actual or anticipated organizational vacancies. From another perspective, it is a linking activity – bringing together those with jobs to fill and those seeking jobs.

If any vacant post exists in any wing of BJRI, Director of that wing makes a proposal for that post(s) and forward it to Director General (DG) The Agriculture Ministry is the major administrative authority of BJRI. If any conflict arises in decision, DG contacts with the Agriculture Ministry and try to dispute the conflicts. So, if any conflict arises in recruitment, then DG takes approval from the Agriculture Ministry. Again Agriculture Ministry takes approval from the Establishment Ministry, if the vacant post contradicts any government legislation. If the vacant post doesn't contain any contradiction, then DG directly orders the Administration and Finance division of BJRI to take initiative to recruit the vacant post. After consent from the DG, the Establishment section of BJRI makes an advertisement to daily newspaper about the vacant posts. The criterion of the vacant posts must be followed the Service Rule of BJRI. After giving the advertisement, the qualified applicants apply for the vacant posts Only competent candidates are selected initially after scrutinizing the applications. The competent candidates are invited for written or oral test on a selected date. The Administration and Finance Division of BJRI provides the whole logistic support.

3.6.3 Selection Process

Through the recruitment process, an organization gets a pool of competent employees and through selection process the organization selects the most competent employees who is willing to join their organization.

There are two committees namely. Selection Committee–1 (SC-1) and Selection Committee-2 (SC-2) who assist the selection process. The members of SC-1 are DG, Directors, Deputy Secretary (Agriculture Ministry), and the technical experts. The SC-1 deals with first class job i.e. SO to PSO The members of SC-2 are Directors, CSO, and Senior Assistant Secretary (Agriculture Ministry). The SC-2 deals with non first class jobs i.e. second-class to fourth-class. There is another committee that deals with the selection of CSO. The members of the

committee are member and chairman of Bangladesh Agricultural Research Council (BARC), DG, Directors, and Joint Secretary (Agriculture Ministry).

The selection process involves written, viva test etc depending on number of candidates and decision of the Selection Committee. In general, there may be a written test for the entry post (i.e. SO, other non first class jobs). The Selection Committee makes a panel list for the successful candidates after the selection process and they send it to DG for further processing. The DG approves the selected candidates through the Board of Management and orders the Administration and Finance division for proceedings. The Director of Administration and Finance division issues the appointment letter to the selected candidates.

3.6.4 Personnel Data

After getting the appointment letter, the selected candidates join their respective wing and submit a joining letter to DG forwarded by their respective wing Director. DG approves the joining letter(s) and sends it to Establishment section through The Director of Administration and Finance of BJRI. The Establishment section open personal file(s) for the selected candidate(s). Personal file consists of following documents such as, joining letter, civil surgeon medical certificate, police verification report, and relevant other documents related to recruitment. Personal file also contains the Service Book that record the pay scale, increments, leaves etc. during the employee's service life. Punishment and any action reports against the employee are also recorded in personal file.

For first class employees, Annual Confidential Report (ACR) is also maintained. The ACR is written by the higher authority of the employee and kept secret to the employee. The ACR of SO to PSO is written by the CSO of the respective division and the Director of the respective wing cross checks it. The ACR of CSO is written by the Director of the relative wing and DG cross checks it. The ACR of an employee is an evaluation criterion during his/her promotion.

3.6.5 Payroll and Financial Benefits

Revenue Accounts section deals with the payroll of permanent staff of BJRI in cooperation with Cash and Audit sections. The Welfare Accounts section deals with employee's welfare such as group insurance etc. Other financial benefits such as employee's provident fund (PF), gratuity etc, are under the direct supervision of Financial and Accounts department of BJRI

3.6.6 Training

Training is a learning experience in that it seeks a relatively permanent change in an individual that will change his/her ability to perform on the job. Training can involve in change of skill, knowledge, attitude, or social behavior of an individual. It may change what employees know, how they work, their attitude toward work or their interaction with their co-worker or supervisor.

The Training department under the supervision of Planning, Training and Communication division arranges the training program of the employees. Mainly other government organizations such as Bangladesh Academy of Rural Development (BARD), Public Administration Training Center (PATC) etc. offered the training program. Other non-government organizations also offered the training program. The prospective candidates are selected by Planning Division with the approval of DG. Training department coordinates the employees and training program according to the schedule. The Foundation Training offered by BARD is one of the notable training program among the young scientist.

3.6.7 Evaluation and Promotion

The personal file and ACR reflect the overall activities of an employee. But during the evaluation of a scientist, the authority uses a prescribed form. This evaluation form reflects the performance of a scientist and it is mandatory requirement during the promotion. A sample of evaluation form for promotion from PSO to CSO is shown in appendix-A. Fair records in ACR and better points in evaluation form can be helpful to a scientist to get promoted into the upper positions.

CHAPTER 4

CONCEPTS

4.1 SYSTEM DEVELOPMENT LIFE CYCLE

The commission and implementation of any computerized system involves the work of a team of people. This team is led by a Project Leader. A Project Leader essentially decides which tasks are to be performed by each team member and how much time should be allotted to each Project Development Phase.

A team typically consists of the following people:

- **Analyst**

  The Analyst studies the requirements of the system and defines the problem. The Analyst identifies the needs of the system and determines the Inputs, the Outputs and the Processes involved in transforming these inputs into outputs.

- **Designer**

  The Designer creates a blueprint of the system in terms of the database structure, screens, forms and reports.

- **Developer/Programmer**

  The Developer builds the user interface according to the specifications prepared by the Designer. Then the Developer builds the prototype of the system. After receiving Client approval on the prototype, the Developer adds the necessary code to make the prototype a full-fledged system.

- **Tester**

  The Tester tests the working of an application by first testing each module for functionality. Test data is used to check if the module is able to process it without causing any errors. Test data may be live data extracted from existing records in the system or dummy data. The Tester then also verifies the integrated application's functionality with test data.

- **Implementation Engineer**

  The Implementation Engineer ports the completed application to the Client's computers. The Implementation Engineer will ensure that the installation process has been carried out accurately and hands over the system to the Client.

- **Maintenance Engineer**

  The Maintenance Engineer is responsible for taking care of the maintaining the system that has been built. Maintenance includes extending troubleshooting support and performing software upgrades in case of changes in the external system.

4.2 THE PHASES OF THE SYSTEMS DEVELOPMENT LIFE CYCLE

It is virtually impossible to manage effectively, a systems development project without a deep understanding of the phases necessary for the development of an application system. The systems development life cycle (SDLC) is a phased approach to analysis and design that holds that systems are best developed through the use of a specific cycle of analyst and user activities.

Analysts disagree on exactly how many phases there are in the systems development life cycle, but they generally laud its organized approach. The seven phases of SDLC are shown in Figure 4.1. Although each phase is activities can occur simultaneously, and activities may be repeated. It is more useful to think of the SDLC as accomplished in phases (with activites in full swing overlapping with others and then tapering off) and not in separate steps.

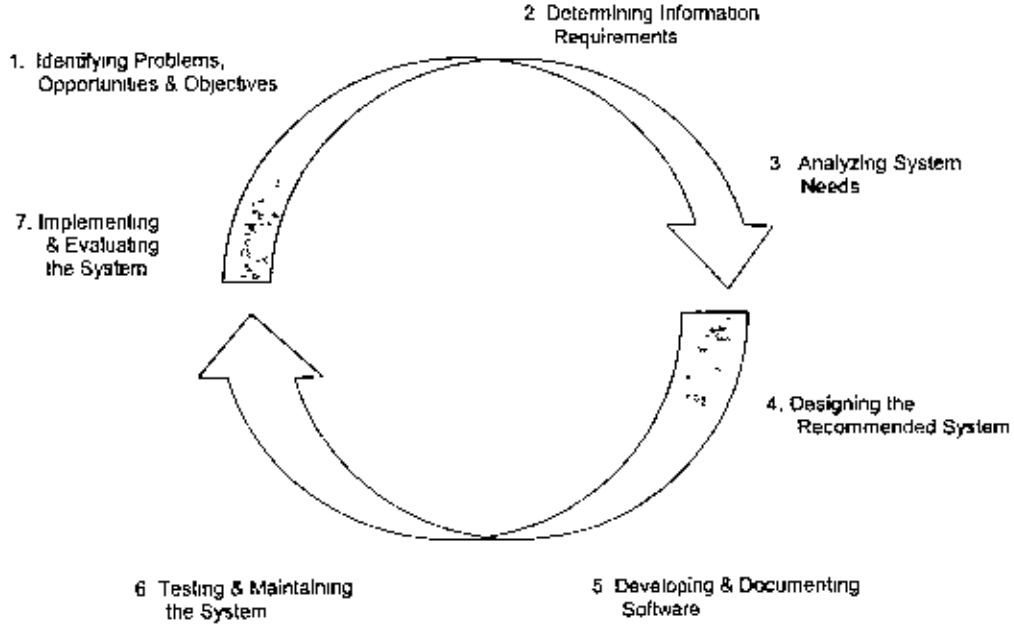


Figure 4.1: The seven phases of the systems development life cycle

The descriptions of the seven phases of systems development life cycle are given below.

4.2.1 Identifying Problems, Opportunities, & Objectives

In this first phase of the systems development life cycle, the analyst is concerned with identifying problems, opportunities, and objectives. This stage is critical to the success of the rest of the project, because no one wants to waste subsequent time addressing the wrong problem

The first phase requires that the analyst look honestly at what is occurring in a business. Then, together with other organizational members, the analyst pinpoints problems. Often, others will bring up these problems, and they are the reason the analyst was initially called in. Opportunities are situations that the analyst believes can be improved upon through the use of computerized information systems. Seizing opportunities may allow the business to gain a competitive edge or set an industry standard.

Identifying objectives is also an important component of the first phase. First, the analyst must discover what the business is trying to do. Then the analyst will be able to see if some aspect of information systems application can help the business reach its objectives by addressing specific problems or opportunities.

Therefore, this phase involves defining the problem and fixing up its boundaries. The needs and problems faced by the client are recorded in this phase At the end of this phase, the team becomes clear with the project objectives and their work purview Inputs to this phase are always unstructured These inputs are gathered from interactions had with the client.

The activities involved in this phase are:

- Meeting the client
- Understanding the client's needs
- Identifying the probable solution
- Defining the scope of the project

4.2.2 Determining Information Requirements

During this phase the analyst enters is that of determining information requirements for the particular users involved. Among the tools used to define information requirements for the particular users involved. Among the tools used to define information requirements in the

business are sampling and investigating hard data, interviewing, observing decision makers' behavior and office environments, and even prototyping.

In the information requirements phase of the SDLC, the analyst is striving to understand what information users need to perform their jobs. There are several methods for determining information requirements involve interacting directly with users. This phase serves to fill in the picture that the analyst has of the organization and its objectives. Sometimes only the first two phase of the systems development life cycle are completed. This kind of study may have a different purpose and is typically carried out by a specialist called an information analyst (IA).

The people involved in this phase are the analyst and users, typically operations managers and operation workers The systems analyst needs to know the details of current system function: who (the people who are involved), what (the business activity), where (the environment in which the work takes place), when (the timing), and how (how the current procedures are performed) of the business under study. The analyst must then ask why the business uses the current system. There may be good reasons for doing business using the current methods, and these should be considered when designing any new system.

If the reason for current operations is that "it's always been done that way," however, the analyst may wish to improve on the procedures. Business process reengineering may be of help in framing an approach for rethinking the business in the business functions and have complete information on the people, goals. data, and procedures involved.

4.2.3 Analyzing System Needs

The next phase that the system analyst undertakes involves analyzing system needs Again, special tools and techniques help the analyst make requirement determinations. One such tool is the use of data flow diagrams to chart the input, processes, and output of the business's functions in a structural graphical form. From data-flow diagram, a data dictionary is developed that lists all the data items used in the system, as well as their specifications: whether they are alphanumeric or text and how much space they take up when printed.

During this phase the systems analyst also analyzes the structured decisions made. Structured decisions are those for which the conditions, condition alternatives, actions, and action rules

can be determined. There are three major methods for analysis of structured decisions: structured English, decision tables, and decision trees.

Not all decisions in organization are structured, but it is still important for the system analyst to understand them. Semistructured decisions (decisions made under risk) are often supported by decision support systems. When analyzing semistructured decisions, the analyst examines the decisions based on the degree of decision –making skill required, the degree of problem complexity, and the number of criteria considered when the decision is made.

Analysis of multiple-criteria decisions (decisions where many factors must be balanced) is also part of this phase. Many techniques are available for analyzing multiple-criteria decisions, including the tradeoff process and the use of weighting methods.

At this point in the systems development life cycle, the systems analyst prepares a systems proposal that summarizes what has been found, provides cost/benefit analyses of alternatives, and makes recommendations on what (if anything) should be done. If one of the recommendations is acceptable to management, the analyst proceeds along the course. Each systems problem is unique, and there is never just one correct solution. The manner in which a recommendation or solution is formulated depends on the individual qualities and professional training of each analyst.

4.2.4 Designing the Recommended System

In the design phase of the systems development life cycle, the systems analyst uses the information collected earlier to accomplish the logical design of the information system. The analyst designs accurate data-entry procedures so that data going into the information system are correct. In addition, the analyst provides for effective input to the information system by using techniques of good form and screen design.

Design phase involves the preparation of the blueprint of the proposed system, which involves the following:

- **Designing the GUI standards**

  When an application is designed, it must follow standards with respect to flow, appearance and look of an application. Standards are used to bring about consistency throughout the application.

Graphical User Interface (GUI) standards are related to the appearance of an application. It is mandatory for the project leader and team members to visualize the entire look of the application before it is actually developed. This visualization has to be defined in terms of GUI standards so that each screen being developed maintains consistency in look and flow. The color, font style, size of titles and labels, appearance of header and footer and there design and size of controls like check boxes or text boxes should be consistent through all the forms.

The GUI standards are recorded in the GUI Standards Documents.

- **Designing the Interface for the Application**

  Here, the layouts of the screens are designed in line with the GUI standards set. These screens can be either input forms, which accept the user inputs, or reports used for displaying information to the user. In this phase, the contents and appearance of the input forms and reports are decided along with their number and purpose of each one. The navigation details of the entire application are also specified during this phase if the application has a browser interface

  The Interface Design is recorded in the Interface Design Document

- **Designing the Database**

  In this phase, the information from the Entity Relationship Diagram (ERD), a visual representation of the entities of the system and the interactions between these entities in the system, is used to design the database. The entities in an ERD represent the tables that have to be created and their attributes represent the fields that are in each table. Table design will follow the rules of Normalization.

  The Table Design is recorded in the Table Design Document.

- **Designing the Process Modules**

  Process Design involves translating the process definitions, arrived at in the analysis phase, into code modules. This module design is then expanded into program specifications. The types of validations needed to verify the functionality of each process in the project are also specified in this phase.

  The Process Design is recorded in the Process Design Document.

- **Designing the Coding Standards**

The process modules designed will be considered good only if they are standardized. Standardized involves setting up of naming conventions of program entities and database referencing to name a few. Standardization helps to bring about better readability and easy maintenance of the code. Standard naming conventions make it easy to program entities like forms or modules. When standard naming conventions are used, the names of variables, forms and modules will denote their purpose even to a person other than the developer.

Coding standard to be followed:

- Consistent level of indention should be used, especially with regard to complex structure like If statements, loops etc.
- Blank lines should be added above and below structures such as loops, multiple line if statements etc.
- Comment entries for describing the program's logic and the parameters list should be used.
- Signpost comments, which are 4-5 sentences that describe the purpose of the succeeding lines of code, should be used in a module containing several steps or functional parts to explain the function of each part
- Inline comments should be used to explain a specific line or section of a code, which is not self-explanatory.
- Inline comments can also be used to define the purpose of each variable

The Coding standards followed are recorded in the Coding Standards Documents.

- **Designing the Prototype**

Next, a prototype of the application is created and shown to the client for approval. The designer delegates the development of the prototype to the developer. The prototype is a model of what the application would look like. The prototype's screens allow the client to view the User Interface of the application. It also allows him/her to understand the functionalities that will be achieved in the completed application. The client must give approval for the following after seeing the prototype:

- The navigation sequence of the application,

- The look and appearance of the application,
- The functions that will be performed by the application when fully developed.

There is no document related to prototype.

- **Assigning and Monitoring Tasks**

When the project development starts, the project leader needs to budget the number of person-hours required to complete the project. In order to do so, the project leader may create a Task Sheet, with which he/she will be able to track and monitor the various phases of project development, thus helps him/her to anticipate delays

4.2.5 Developing & Documenting Software

In the fifth phase of the systems development life cycle, the analyst works with programmers to develop any original software that is needed Some of the structure techniques for designing and documenting software include structure charts, Nassi-Shneiderman charts, and pseudocode. The systems analyst uses one or more of these devices to communicate to the programmer what needs to be programmed.

During this phase the analyst also works with users to develop effective documentation for software, including procedure manuals, online help, and Web sites featuring Frequently Asked Question (FAQ), on "Read Me" files shipped with new software. Documentation tells users how to use software and what to do if software problem occur.

Programmers have a key role in this phase because they design, code, and remove syntactical errors from computer programs. If the program is to run in a mainframe environment, job control language (JCL) must be created. To ensure quality, a programmer may conduct either a design or a code walkthrough, explaining complex portions of the program to a team of other programmers

4.2.6 Testing & Maintaining the System

This is the most crucial phase where each unit is tested for it's functionality. Test data is used to check if the module is able to process it without causing any errors. Test data may be live data extracted from existing records in the system or dummy data. Then the individual tested modules are integrated and tested as a whole through its various paths.

During this phase, the analyst reviews the developed system against each of client's requirements thus ensure that the developed system is able to resolve the problems and objectives completely.

The activities during this phase can be:

- *Unit Testing*

  This involves confirmation of whether each unit is able to perform its required function. Each unit must meet its objective and purpose.

- *Validating Screen Inputs*

  This involves verification of the data entered by the customer in the various forms.

- *Peak Load Testing*

  Measures the performance of the system, at times when the processing load is the maximum on the system.

- *Volume Testing*

  This involves verification of whether the application is able to process a large volume of data.

- *Reliability Testing*

  Tests the consistency of response time and behavior of the system when a command is issued.

- *Integration Testing*

  This involves combining all the tested modules and running them as the whole application. This involves testing whether the application can perform all the required functions.

4.2.7 Implementing & Evaluating the System

In this last phase of system development, the analyst helps implement the information system. This phase involves training users to handle the system. Some training is done by vendors, but oversight of training is the responsibility of the systems analyst. In addition, the analyst needs to plan for a smooth conversion from the old system to the new one. This process includes converting files from old format to new ones or building a database, installing equipment, and bringing the new system into production.

Evaluation is shown as part of the final phase of the SDLC mostly for the sake of discussion. Actually, evaluation takes place during every phase. A key criterion that must be satisfied is whether the intended users are indeed using the system.

It should be noted that systems work is often cyclical. When an analyst finishes one phase of system development and proceeds to the next, the discovery of a problem may force the analyst to return to the previous phase and modify the work done there. For example, during the testing phase, the programmer may discover that the program does not work correctly, either because code was not written to support certain portions of the system design or the design was incomplete In either event the programs must be modified, and the analyst may have to change some of the system design materials. In turn, it may be necessary for the analyst to meet with the user and reinvestigate how a specific business activity functions

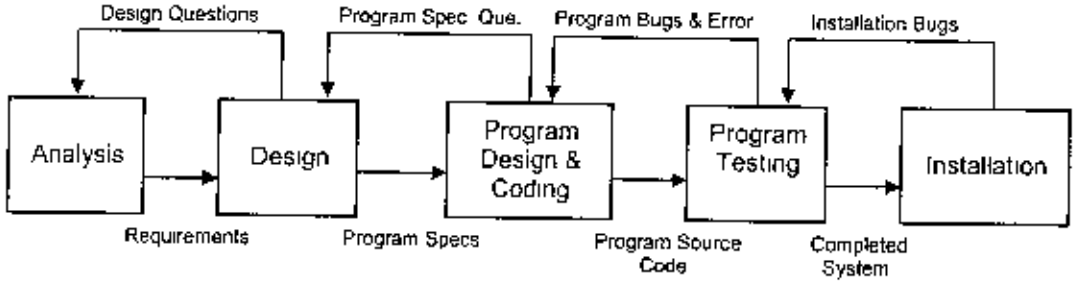


Figure 4.2: Feedback from Different Phases of Systems Development Life Cycle

4.3 THE IMPACT OF MAINTENANCE

After the system is installed, it must be maintained, meaning that the computer programs must be modified and kept up to date. Figure 4.3 illustrates the average amount of time spent on maintenance at atypical MIS installation Estimates of the time spent by developments on maintenance have ranged from 48 to 60 percent of the total time spent developing systems Very little time remains for new system development. As the number of programs written increases, so does the amount of maintenance they require.

Maintenance is performed for two reasons. The first of these is to correct software errors. No matter how thoroughly the system is tested, bugs, or errors creep into computer programs. Bugs in commercial PC software are often documented as "known anomalies" and are

corrected when new version of the software are released or in an interim release. In customized software, bugs must be corrected as they are detected.

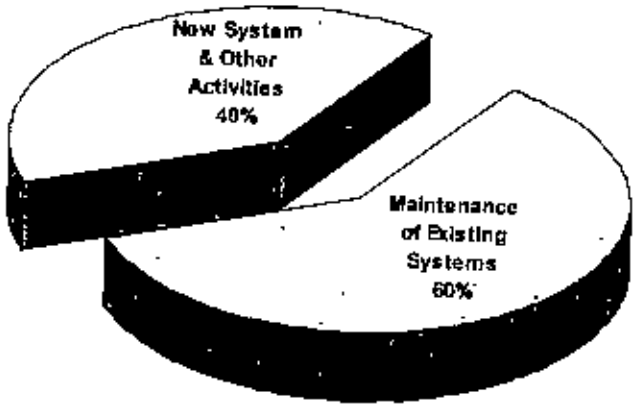


Figure 4.3: Some researchers estimate that the amount of time spent on system maintenance may be as much as 60 percent of the total time spent on systems project.

The other reason for performing system maintenance is to enhance the software's capabilities in response to changing organizational needs, generally involving one of the following three situations:

1. *Users often request additional features after they become familiar with the computer system and its capabilities.* These requested features may be as simple as displaying additional totals on a report or as complicated as developing new software.
2. *The business changes over time.* Software must be modified to encompass changes as new government or corporate reporting requirements arise, as new client information needs to be produced, and so on.
3. *Hardware and software are changing at an accelerated pace.* A system that uses older technology may be modified to use the capabilities of newer technology. An example of such a change is replacing a mainframe with a client/server system in which client PCs house some data and processing and servers provide data and applications by splitting up tasks efficiency via a local area network (LAN).

Figure 4.4 illustrates the amount of resources-usually time and money-spent on system development and maintenance. The area under the curve represents the total dollar amount spent. We can see that over time the total cost of maintenance is likely to exceed that of

system development. At a certain point it becomes more feasible to perform a new systems study, because the cost of continued maintenance is clearly greater than that of creating an entirely new information system.

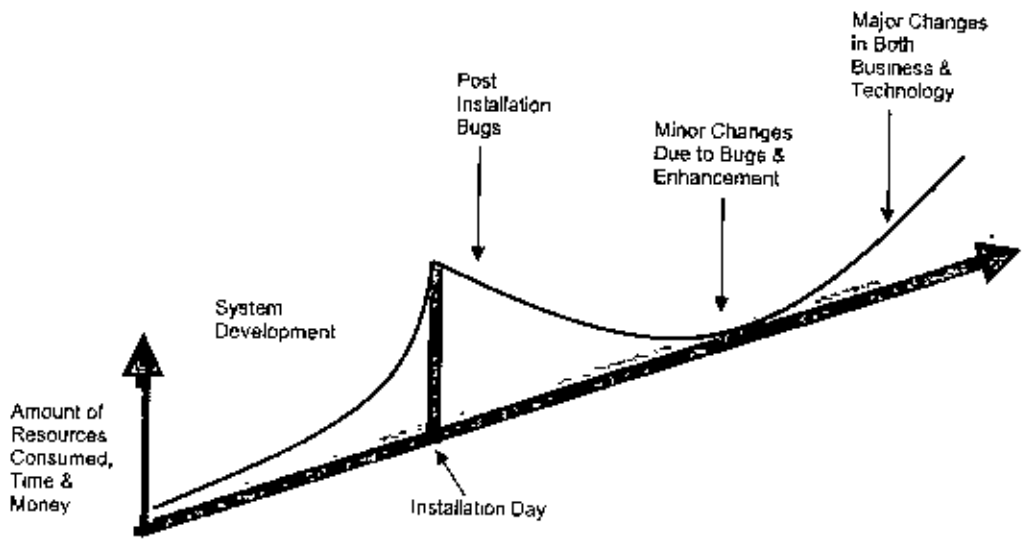


Figure 4.4 Resources consumption over the system life.

In summary, maintenance is an ongoing process over the life cycle of an information system After the information system is installed, maintenance usually takes the form of correcting previously undetected program errors. Once these are corrected, the system approaches a steady state. providing dependable service to its users. Maintenance during this period may consist of removing a few previously undetected bugs and updating the system with a few minor enhancements. As time goes on and the business and technology change, however, the maintenance effort increases dramatically.

4.4 DESIGNING A DATABASE – UNDERSTANDING RELATIONAL DESIGN

4.4.1 Database

Databases are not merely a collection of files. Rather, a database is a central source of data meant to be shared by many users for a variety of applications. The heart of a database is the database management system (DBMS), which allows the creation, modification, and

updating of the database; the retrieval of data; and the generation of reports. The person who ensures that the database meets its objectives is called database administrator.

The effectiveness objectives of the database include the following:

- Ensuring that data can be shared among users for a variety of applications
- Maintaining data that are both accurate and consistent.
- Ensuring that all data required for current and future applications will be readily available.
- Allowing the database to evolve and the needs of the users grow
- Allowing users to construct their personal view of the data without concern for the way the data are physically stored.

The foregoing list of objectives provides us with a reminder of the advantages and disadvantages of the database approach. First, the sharing of the data means that data need to be stored only once. That in turn helps achieve data integrity, because changes to data are accomplished more easily and reliably if the data appear once rather than in many different files.

When a user needs particular data, a well-designed database anticipates the need for such data (or perhaps it has already been used for another application). Consequently, the data have a better chance of being available in a database than in a conventional file system. A well-designed database can also be more flexible than separate files; that is, a database can evolve as the needs of users and applications change.

Finally, the database approach has the advantage of allowing users to have their own view of the data. Users need not be concerned with the actual structure of the database or its physical storage.

The first disadvantage of the database approach is that all the data are stored in one place. Therefore, data are more vulnerable to catastrophes and require complete backup. There is a risk that the database administrator becomes the only one privileged or skilled enough to go near the data. The bureaucratic procedures required to modify or even update the database can seem insurmountable.

Other disadvantages come about when attempting to achieve two efficiency objectives for the management of the data resource:

1. Keeping the time required to insert, update, delete, and retrieve data to a tolerable amount.
2. Keeping the cost of storing the data to a reasonable amount.

Remember that a database cannot be optimized for retrieving data for a specific application, because many users for various applications may share it. Furthermore, additional software for the DBMS is required, and occasionally a larger computer is required

The database approach is a concept that is becoming increasingly important. The use of relational databases on networked PCs means that the concept is becoming understandable to many users. Many users are extracting parts of the central database from mainframes and downloading them onto PCs. These smaller databases are then used to generate reports or answer queries specific to the end user.

Relational databases for PCs have improved dramatically over the last few years. The competition among database software vendors is keen. Most standard PC databases are extremely flexible, a feature that aids in the design of reports and labels. They allow the end user to read in databases from other software programs. All have good query capability. Some are more user-friendly than others.

4.4.2 The Database Design Process

The key to effective database design lies in understanding exactly what information we want to store and the way a relational database management system (RDBMS), such as Visual FoxPro, Microsoft SQL Server, Microsoft Access, stores data. To efficiently and accurately provide with information, a RDBMS needs to have the facts about different subjects organized into separate tables. For example, we might have one table that stores facts only about employees and another that stores facts only about sales.

When we organize our data appropriately, we design flexibility into our database and gain the capability to combine and present facts in many different ways. For example, we can print reports that combine facts about employees and facts about sales.

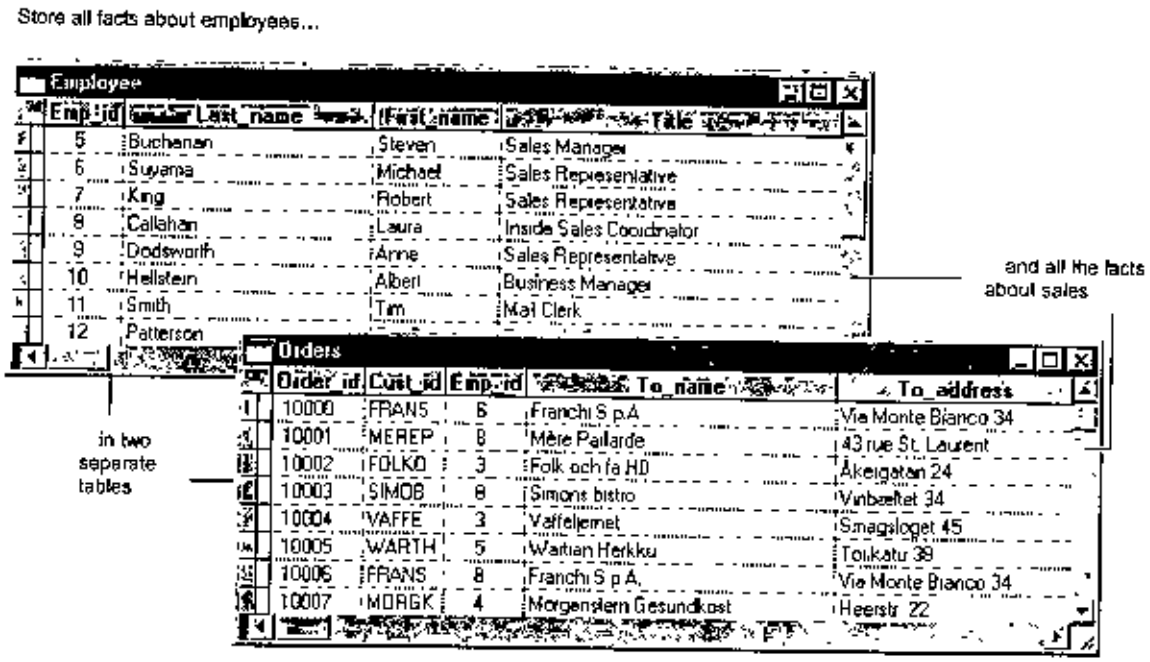


Figure 4.5 Separating facts into tables bring flexibility to a database.

When we design a database, we first break down the information we want to keep as separate subjects, and then we tell RDBMS how the subjects are related to each other so that it can bring the right information together when we need it. By maintaining information in separate tables, we make it easier to organize and maintain our data, as well as to build a high-performance application.

4.5 STEPS IN DESIGNING A DATABASE

The steps in the database design process are:

Step One: Determine the purpose of our database.

This helps to decide which facts we want the RDBMS to store.

Step Two: Determine the tables we need.

When we have a clear purpose for our database, we can divide our information into separate subjects, such as "Employees" or "Orders." Each subject will be a table in our database.

Step Three: Determine the fields we need.

We must then decide what information we want to keep in each table. Each category of information in a table is called a *field* and is displayed as a column the table. For example, one field in an Employee table could be Last_name; another could be Hire_date.

Step Four: Determine the relationships.

We must look at each table and decide how the data in one table is related to the data in other tables. We then add fields to tables or create new tables to clarify the relationships, as necessary

Step Five: Refine your design.

Next we must analyze our design for errors. To do that, we create the tables and add a few records of sample data to see if we can get the results we want from our tables. Now we make adjustments to the design as needed

One thing must be kept in mind when designing a database. It's easy to change the design of a database as we're creating it. However, it becomes much more difficult to make changes to tables after they're filled with data and after we've built forms and reports. For this reason, we must make sure that we have a sound design before pushing too far ahead.

Each step of designing a database is discussed in greater detail in the below.

4.5.1 Step One: Determining the Purpose

The first step in designing a database is to determine the purpose of the database and how it's to be used. This tells us what information we want from the database. From that, we can determine what subjects we need to store facts about (the tables) and what facts we need to store about each subject (the fields in the table).

Talking to the people who will use the database, brainstorming about questions we'd like the database to answer, sketching out the reports we'd like it to produce, gathering the forms we currently use to record our data – we'll use all this information in the remaining steps of the design process.

Suppose that Tasmanian Traders, an import/export company that sells specially foods around the world, wants a database that can track information about the company's sales and inventory.

We start by writing down a list of questions the database should be able to answer. How many sales of their featured product did they make last month? Where do their best customers live? Who's the supplier for their best-selling product?

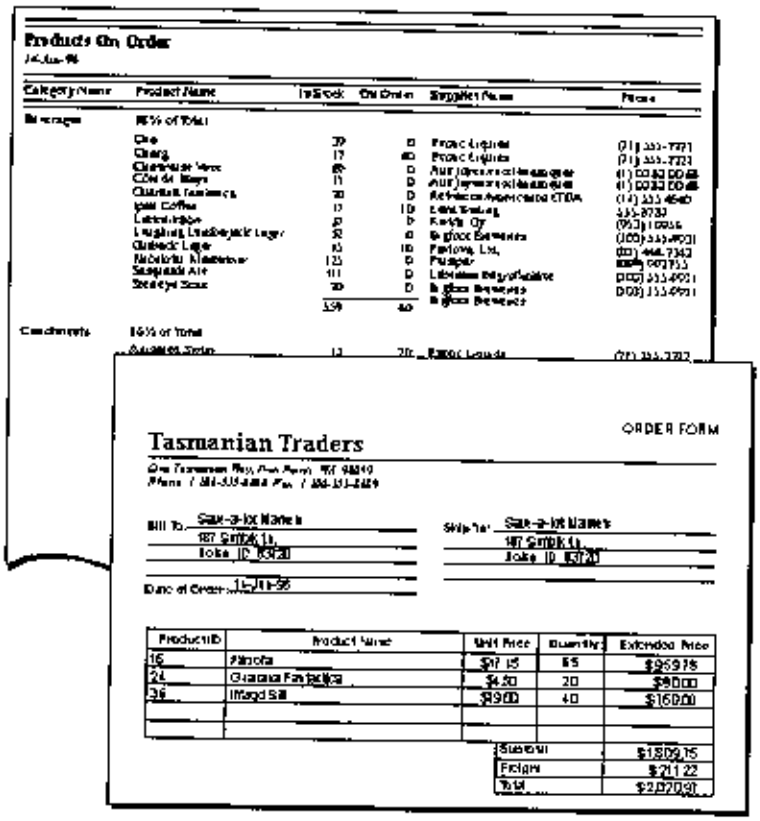


Figure 4.6 Forms and reports show some data requirements in a database.

Next, we gather all the forms and reports that contain information the database should be able to produce. Tasmanian Traders currently uses a printed report to keep track of products being ordered and an order form to take new orders. The above illustration shows these two documents.

4.5.2 Step Two: Determining the Tables Needed

Determining the tables in the database can be the trickiest step in the database design process. That's because the results wanted from the database – the reports we want to print, the forms we want to use, the questions we want answered – don't necessarily provide clues about the structure of the tables that produce them. They tell us what we want to know, but not how to categorize the information into tables.

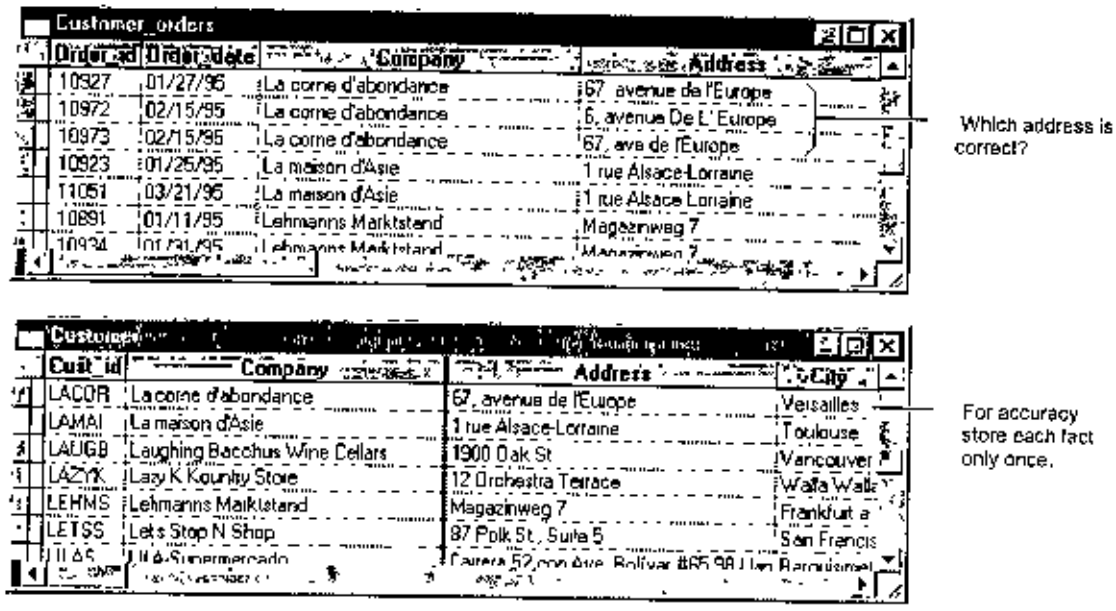


Figure 4.7. The Customer table stores address information once.

The preceding order form as for example includes facts about the customer – the customer's address and phone number – along with facts about the order. This form provides us with a number of facts that we want to store in database. But we'd run into problems if we stored the customer facts in the same table as the order facts.

- **Introducing Errors in Duplicate Information**

  Suppose that one customer places three different orders. We could add the customer's address and phone number to the database three times, once for each order. But this multiplies the chance of data entry errors.

  Also, if the customer moves, we'd have to either accept contradictory information or find and change each of that customer's sales records in the table. It's much better to create a Customers table that stores the customer's address in our database once. Then if we need to change the data, we change it only once.

- **Deleting valuable information**

  Suppose a new customer places an order and then cancels. When we delete the order from the table containing information on both customers and their orders, we would delete the customer's name and address as well. But we want to keep this new customer in our database so we can send the customer our next catalog. Again, it's

better to put the information about the customer in a separate Customer table. That way we can delete the order without deleting customer information.

The information we want to get out of our database and divide it into fundamental subjects we want to track, such as customers, employees, products we sell, services we provide, and so on. Each of these subjects is a candidate for a separate table.

One strategy for dividing information into tables is to look at individual facts and determine what each fact is actually about. For example, on the Tasmanian Traders order form, the customer address isn't about the sale; it's about the customer. This suggests that we need a separate table for customers. In the Products On Order report, the supplier's phone number isn't about the product in stock; it's about the supplier. This suggests that we need a separate table for suppliers.

As for example, The Tasmanian Traders Order Form and Products On Order report include information about these subjects:

- Employees
- Customers
- Suppliers
- Products
- Orders

From this list, one can come up with a rough draft of the tables in the database and some of the fields for each table.

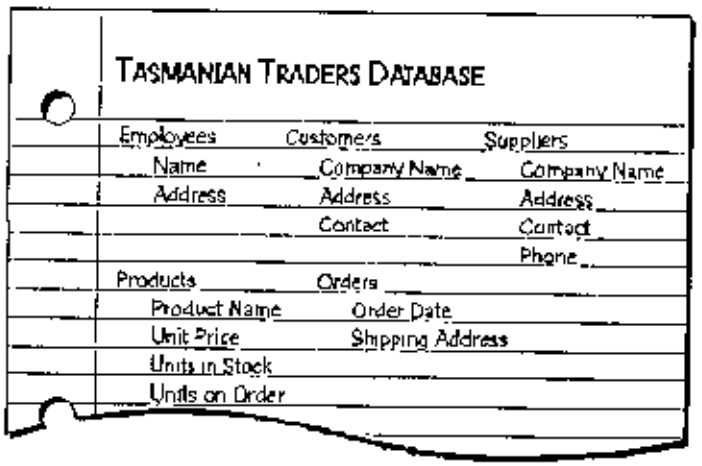


Figure 4.8: Rough draft of tables and fields required for Tasmanian Traders database.

4.5.3 Step Three: Determining the Field Needed

To determine the fields in a table, decide what we need to know about the people, things, or events recorded in the table. We can think of fields as attributes of the table. Each record (or row) in the table contains the same set of fields or attributes. For example, an address field in a customer table contains customers' addresses Each record in the table contains data about one customer, and the address field contains the address for that customer.

- Guideline for Identifying Fields:
  - **Relate each field directly to the subject of the table**

    A field that describes the subject of a different table belongs in that other table. We have to make sure that each field in a table directly describes the subject of the table. If we find repeating the same information in several tables, it's a clue that we have unnecessary fields in some of the tables.

  - **Don't include derived or calculated data**

    In most cases, we don't want to store the result of calculations in tables. Instead, we can have the RDBMS perform the calculations when we want to see the result. For example, the order form has shown earlier displays the extended price for each line of the order in the Tasmanian Traders database. However, there's no Extended Price subtotal field in any Tasmanian Traders table. Instead, the Order_Line_Items table includes a quantity field that stores the units on order for each individual product, as well as the unit price for each item ordered. Using that data, RDBMS calculates the subtotal each time we print an order form. The subtotal itself doesn't need to be stored in a table.

  - **Include all the information you need**

    It's easy to overlook important information. Return to the information gathered in the first step of the design process. Look at paper forms and reports to make sure all the information required in the past is included in the tables or can be derived from them. Think of the questions we will ask RDBMS. Can it find all the answers using the information in our tables?

  - **Store information in its smallest logical parts**

    One might be tempted to have a single field for full names, or for product names, along with product descriptions. If we combine more than one kind of information in a field, it's difficult to retrieve individual facts later. Try to break down information

into logical parts; for example, create separate fields for first and last name, or for product name, category, and description.

- **Primary Key Fields**

The power in a relational database management system such as Visual FoxPro or Microsoft Access comes from its ability to quickly find and bring together information stored in separate tables. In order for the RDBMS to work most efficiently, each table in our database should include a field or set of fields that uniquely identifies each individual record stored in the table. This is often a unique identification number, such as an employee ID number or a serial number. In database terminology, this information is called the *primary key* of the table The RDBMS uses primary key fields to quickly associate data from multiple tables and bring the data together for us.

If we already have a unique identifier for a table, such as a set of product numbers we've developed to identify the items in our stock, we can use that identifier as the table's primary key. But we have to make sure the values in this field will always be different for each record — RDBMS doesn't allow duplicate values in a primary key field. For example, we cannot use people's name as a primary key, because names aren't unique. We could easily have two people with the same name in the same table

When choosing primary key fields, we have to consider the followings:

- RDBMS doesn't allow duplicate or null values in a primary key field. For this reason, we shouldn't choose a primary key that could contain such values.
- We may use the value in the primary key field to look up records, so it shouldn't be too long to remember or type. We want it to have a certain number of letters or digits, or be in a certain range.
- The size of the primary key affects the speed of operations in our database. When creating primary key fields, we set a property to limit the size of the field. For best performance, use the smallest size that will accommodate the values needed to store in the field.

As for example, the primary key of the Tasmanian Traders Products table contains product ID numbers Because each product number identifies a different product, we don't want two products with the same number.

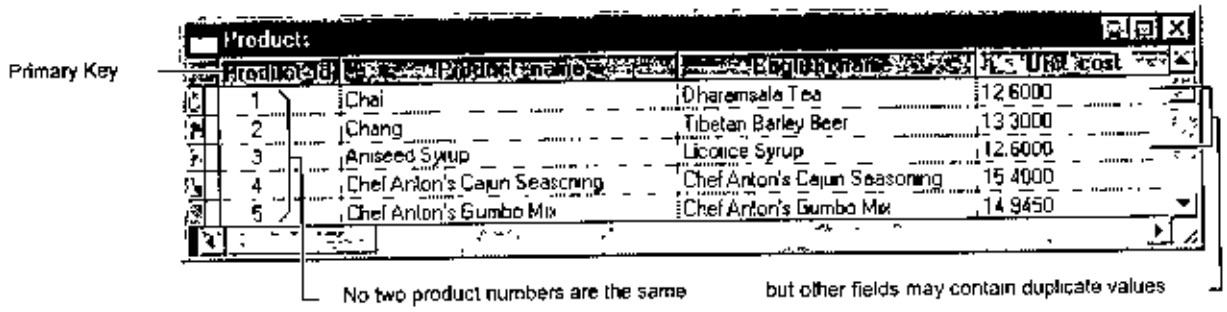


Figure 4.9. The Primary key for the Products table is the Product_id field

4.5.4 Step Four: Determining the Relationships

Visual FoxPro or Microsoft Access is a *relational* database management system (RDBMS). That means we store related data in separate tables. Then we define relationships between the tables and the RDBMS uses the relationships to find associated information stored in our database

For example, suppose that we want to phone an employee with questions about a sale the employee made. Employee phone numbers are recorded in the Employee table; sales are recorded in the Orders table. When we tell RDBMS which sale we're interested in, the RDBMS can look up the phone number based on the relationship between the two tables. It works because Employee_id, the primary key for the Employee table, is also a field in the Orders table. In database terminology, the Employee_id field in the Orders table is called a *foreign key*, because it refers to a primary key from a different, or foreign, table.

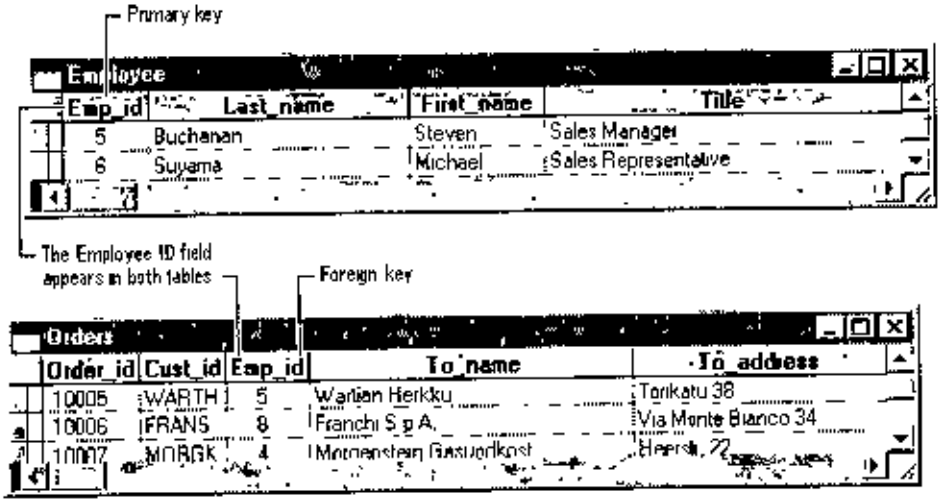


Figure 4.10: Employee_id field as primary key for Employee table and foreign key for Orders table.

So, to set up a relationship between two tables — Table A and Table B — we add one table's primary key to the other table, so that it appears in both tables. To set up the relationship correctly, we must first determine the nature of the relationship. There are three types of relationships between tables:

- One-to-many relationships
- Many-to-many relationships
- One-to-one relationships

◻ One-to-Many Relationship

A one-to-many relationship is the most common type of relationship in a relational database. In a one-to-many relationship, a record in Table A can have more than one matching record in Table B, but a record in Table B has, at most, one matching record in Table A.

For example, the Category and Products tables in the Tasmanian Traders database have a one-to-many relationship

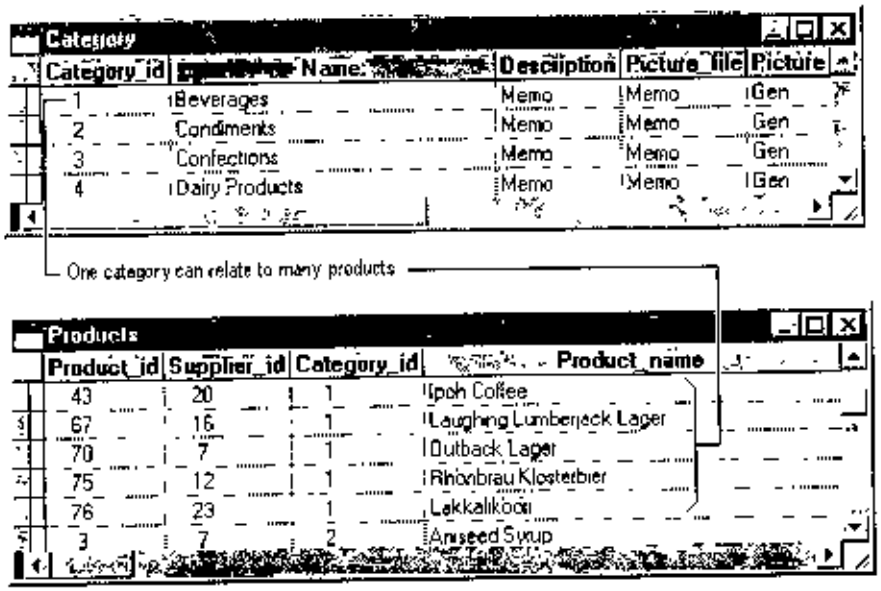


Figure 4.11: The Category and Products tables represent a one-to-many relationship.

◻ Many-to-Many Relationship

In a many-to-many relationship, a record in Table A can have more than one matching record in Table B, and a record in Table B can have more than one matching record in Table A. This type of relationship requires changes in our database design before we can correctly specify the relationship to Visual FoxPro or Microsoft Access.

To detect many-to-many relationships between tables, it's important that we look at both directions of the relationship. For example, consider the relationship between orders and products in the Tasmanian Traders business. One order can include more than one product. So for each record in the Orders table, there can be many records in the Products table. But that's not the whole story. Each product can appear on many orders. So for each record in the Products table, there can be many records in the Orders table.

The subjects of the two tables — orders and products — have a many-to-many relationship. This presents a challenge in database design. To understand the problem, imagine what would happen if we tried to set up the relationship between the two tables by adding the Product_id field to the Orders table. To have more than one product per order, we need more than one record in the Orders table per order. We'd be repeating order information over and over for each record that relates to a single order — an inefficient design that could lead to inaccurate data. We run into the same problem if we put the Order_id field in the Products table — we'd have more than one record in the Products table for each product. How do we solve this problem?

The answer is to create a third table that breaks down the many-to-many relationship into two one-to-many relationships. This third table is called a junction table, because it acts as the junction between two tables. We put the primary key from each of the two tables into the junction table.

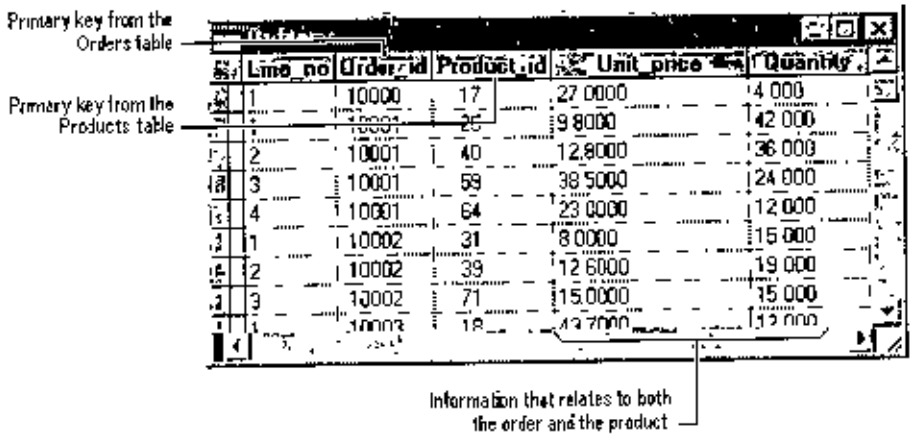


Figure 4.12: The Order_Line_Items table creates a one-to-many link between Orders and Products

The junction table might hold only the two primary keys from the tables it links together or, as in the Order_Line_Items table; the junction table might hold additional information. Each record in the Order_Line_Items table represents one line item on an order. The Order_Line_Items table's primary key consists of two fields — the foreign keys from the Orders and Products tables. The Order_id field alone doesn't work as the primary key for this table, because one order can have many line items. The order ID is repeated for each line item on an order, so the field doesn't contain unique values. The Product_id field alone doesn't work either, because one product can appear on many different orders. But together the two fields in the junction table always produce a unique value for each record. The junction table does not require its own primary key.

In the Tasmanian Traders database, the Orders table and the Products table aren't related to each other directly. Instead, they are related indirectly through the Order_Line_Items table. The many-to-many relationship between orders and products is represented in the database using two one-to-many relationships:

- The Orders and Order_Line_Items tables have a one-to-many relationship. Each order can have more than one line item, but each line item is connected to only one order.
- The Products and Order_Line_Items tables have a one-to-many relationship. Each product can have many line items associated with it, but each line item refers to only one product

◻ One-to-One Relationship

In a one-to-one relationship, a record in Table A can have no more than one matching record in Table B, and a record in Table B can have no more than one matching record in Table A. This type of relationship is unusual and might call for some changes in our database design. One-to-one relationships between tables are unusual because in many cases, the information in the two tables can simply be combined into one table. For example, suppose you created a table, called Ping-Pong Players, to track information about a Tasmanian Traders Ping-Pong fundraising event. Because the ping-pong players are all employees of Tasmanian Traders, this table has a one-to-one relationship with the Employee table in the Tasmanian Traders database.

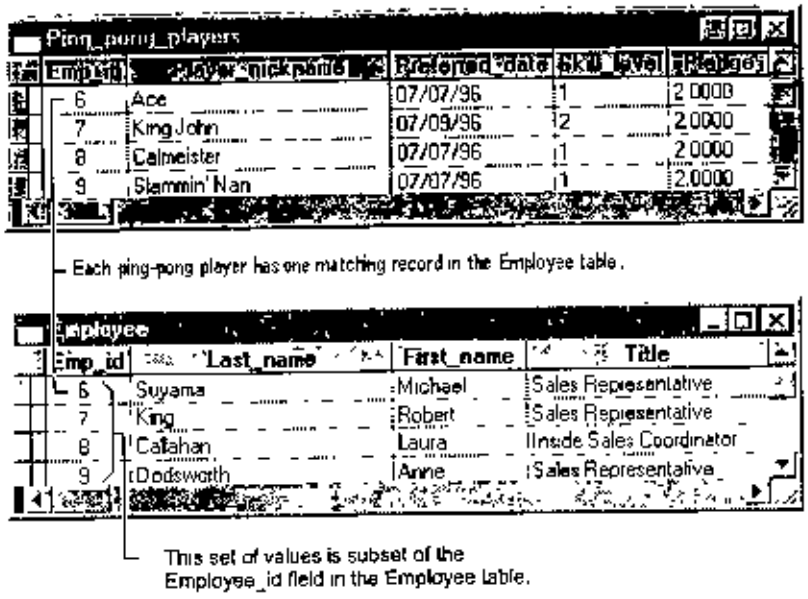


Figure 4.13: The Employee and Ping_Pong_Players represent a one-to-one relationship.

We could add all the fields from the Ping-Pong Players table to the Employee table. But the Ping-Pong Players table tracks a one-time event, and we won't need the information after the event is over. Additionally, not all employees play Ping-Pong, so if these fields were in the Employee table, they would be empty for many records. For these reasons, it makes sense to create a separate table.

4.5.5 Step Five: Refining the Design

Once we have the tables, fields, and relationships we need, it's time to study the design and detect any flaws that might remain.

There are several common pitfalls we may encounter when designing our database. These common problems can cause our data to be harder to use and maintain. The followings are signs that we should reevaluate our database design:

- We have one table with a large number of fields that don't all relate to the same subject. For example, one table might contain fields pertaining to customers as well as fields that contain sales information. We must try to make sure each table contains data about only one subject.

- We have fields that are intentionally left blank in many records because they aren't applicable to those records. This usually means that the fields belong in another table.

- We have a large number of tables, many of which contain the same fields. For example, we have separate tables for January sales and February sales, or for local customers and remote customers, in which we store the same type of information. We should try to consolidate all the information pertaining to a single subject in one table. We may also need to add an extra field, for example, to identify the sales date.

As for example, each product in the Tasmanian Traders stock falls under a general category, such as Beverages, Condiments, or Seafood. The Products table could include a field that shows the category of each product.

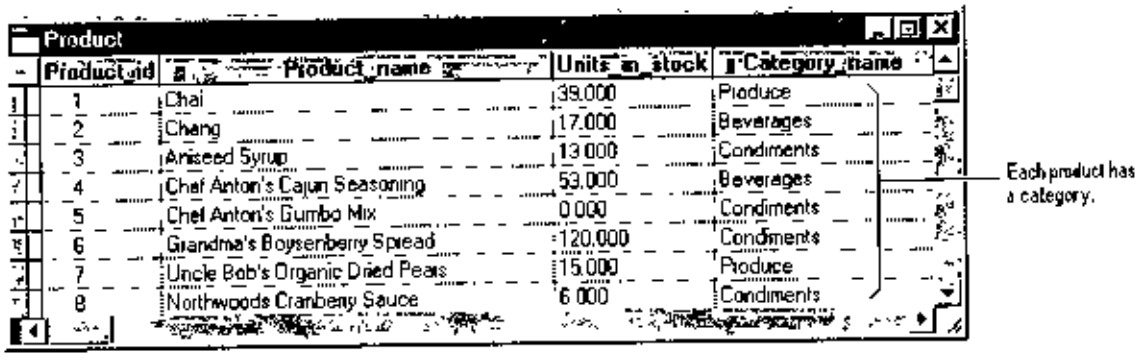


Figure 4.14: Refining the Product table with a Category_name field

Suppose that in examining and refining the database, Tasmanian Traders decides to store a description of the category along with its name. If we add a Category Description field to the Products table, we have to repeat each category description for each product that falls under the category — not a good solution. A better solution is to make Category a new subject for the database to track, with its own table and its own primary key. Then we can add the primary key from the Category table to the Products table as a foreign key.

4.6 DESCRIPTION OF NORMALIZATION

The logical design of the database, including the tables and the relationships between them, is the core of an optimized relational database. A good logical database design can lay the foundation for optimal database and application performance. A poor logical database design can impair the performance of the entire system.

Normalizing a logical database design involves using formal methods to separate the data into multiple, related tables. A greater number of narrow tables (with fewer columns) are

characteristic of a normalized database. A few wide tables (with more columns) are characteristic of an unnormalized database.

Some of the benefits of normalization include:

- Faster sorting and index creation.
- A larger number of clustered indexes.
- Narrower and more compact indexes.
- Fewer indexes per table, which improves the performance of INSERT, UPDATE, and DELETE statements.
- Fewer NULL values and less opportunity for inconsistency, which increase database compactness.

As normalization increases, so will the number and complexity of joins required to retrieve data. Too many complex relational joins between too many tables can hinder performance Reasonable normalization often includes few regularly executed queries that use joins involving more than four tables.

Sometimes the logical database design is already fixed and total redesign is not feasible. Even then, however, it might be possible to normalize a large table selectively into several smaller tables. If the database is accessed through stored procedures, this schema change could take place without affecting applications. If not, it might be possible to create a view that hides the schema change from the applications.

In relational database design theory, normalization rules identify certain attributes that must be present or absent in a well-designed database. There are few rules of normalization that can help to achieve a sound database design.

4.6.1 The Three Steps of Normalization

Beginning with either a user view or a data store developed for a data dictionary, the analyst normalizes a data structure in three steps, as shown in figure. Each step involves an important procedure, one that simplifies the data structure

The relation derived from the user view or data store will most likely be unnormalized. The first stage of the process includes removing all repeating groups and identifying the primary key. To do so, the relation needs to be broken up into two or more relations. At this point, the relations may already be of the third normal form, but more likely more steps will be needed to transform the relations to the third normal form.

The second step ensures that all nonkey attributes are dully dependent on the primary key. All partial dependencies are removed and placed in another relation.

The third step removes any transitive dependencies. A transitive dependency is one in which nonkey attributes are dependent on other nonkey attributes.

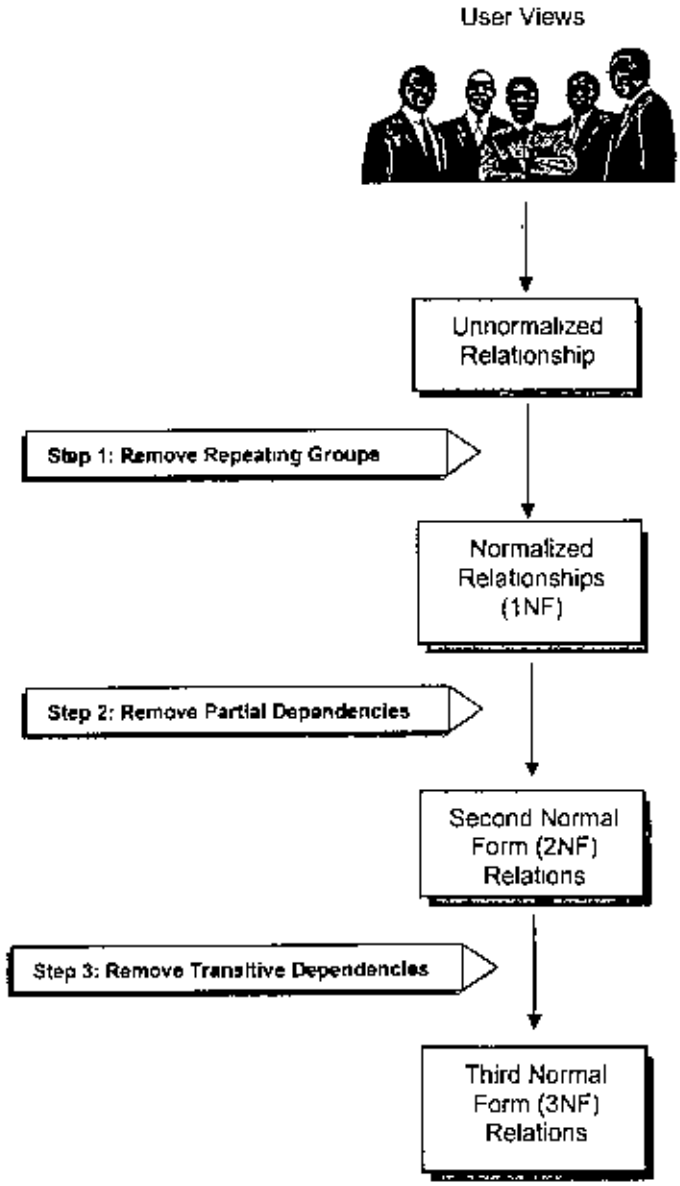


Figure 4.15: Normalization of a relation is accomplished in three major steps.

4.6.2 First Normal Form

- Eliminate repeating groups in individual tables.
- Create a separate table for each set of related data.
- Identify each set of related data with a primary key.

We cannot use multiple fields in a single table to store similar data. For example, to track an inventory item that may come from two possible sources, an inventory record may contain fields for Vendor Code1 and Vendor Code 2. but when we add a third vendor, problem arises. Adding a field is not the answer; it requires program and table modification and does not smoothly accommodate a dynamic number of vendors. Instead, we place all vendor information in a separate table called Vendors, then link inventory to vendors with an item number key, or vendors to inventory with a vendor code key.

4.6.3 Second Normal Form

- Create separate tables for sets of values that apply to multiple records.
- Relate these tables with a foreign key

Records should not depend on anything other than a table's primary key (a compound key, if necessary). For example, consider a customer's address in an accounting system. The address is needed not only by the Customer table, but also by the Orders, Shipping, Invoice, Accounts Receivable, and Collections tables. Instead of storing the customer's address as a separate entry in each of these tables, we store it in one place, either in the Customers table or in a separate Addresses table.

4.6.4 Third Normal Form

- Eliminates fields that do not depend on the key.

Values in a record that are not part of that record's key do not belong in the table. In general, any time the contents of a group of fields may apply to move more than a single record in the table, consider placing those in a separate table.

For example, in an Employee Recruitment table, a candidate's university name and address may be included. But we need a complete list of universities for group mailings. If university information stored in the Candidate table, there is no way to list universities with no current

candidates. The solution is creating a separate Universities table and linking it to the Candidates table with a university code key.

Adhering to the third normal form, while theoretically desirable, is not always practical. If we have a Customers table and we want to eliminate all possible inter-field dependencies, we must create separate tables for cities, ZIP codes, sales representatives, customer classes, and may other factor that may be duplicated in multiple records. In theory, normalization is worth pursuing; however, many small tables may degrade performance or exceed open file and memory capacities.

It may be more feasible to apply third normal form only to data that changes frequently. If some dependent fields remain, we design our application to require the user to verify all related fields when any one is changed.

4.6.5 Other Normalization Forms

Fourth normal form, also called Boyce Codd Normal Form (BCNF), and fifth normal form do exist, but are rarely considered in practical design. Disregarding these rules may result in less than perfect database design, but should not affect functionality.

4.7 PROGRAMMING LANGUAGES

To understand computer software, we need a basic knowledge of the role that programming languages play in the development of computer programs. A programming language allows a programmer to develop the sets of instructions that constitute a computer program. Many different programming languages have been developed each with its own unique vocabulary, grammar, and uses.

4.7.1 Machine Languages

Machine languages (or first-generation languages) are the most basic level of programming languages. In the early stages of computer development, all program instructions had to be written using binary codes unique to each computer This type of programming involves the difficult task of writing instructions in the form of strings of binary digits (one and zeros) or other number systems. Programmers must have a detailed knowledge of the internal operations of the specific type of CPU (Central Processing Unit) they are using. They must

write long series of detailed instructions to accomplish even simple processing tasks. Programming in machine language requires specifying the storage locations for every instruction and item of data used Instructions must be included for every switch and indicator used by the program. These requirements make machine language programming a difficult and error-prone task. A machine language program to add two numbers together in the CPU of a specific computer and store the result might take the form shown in Figure 4.16.

4.7.2 Assembler Languages

Assembler languages (or second-generation languages) are the next level of programming languages. They were developed to reduce the difficulties in writing machine language programs. The use of assembler languages requires language translator programs called *assemblers* that allow a computer to convert the instructions of such language into machine instructions. Assembler languages are frequently called symbolic languages because symbols are used to represent operation codes and storage locations. Convenient alphabetic abbreviations called *mnemonics* (memory aids) and other symbols represent operation codes, storage locations, and data elements. For example, the computation X = Y + Z in an assembler language might take the form shown in Figure 4.16.

Assembler languages are still used as a method of programming a computer in a machine-oriented language Most computer manufacturers provide an assembler language that reflects the unique machine language instruction set of a particular line of computers. This feature is particularly desirable to *system programmers*, who program system software (as opposed to application programmers, who program application software), since it provides them with greater control and flexibility in designing a program for a particular computer. They can then produce more efficient software, that is, programs that require a minimum of instructions, storage, and CPU time to perform a specific processing assignment.

4.7.3 High-Level Languages

High-level languages (or third-generation languages) use instructions, which are called *statements*, that use brief statements or arithmetic expressions. Individual high-level language statements are actually *macroinstructions*; that is, each individual statement generates several machine instructions when translated into machine language by high-level language translator programs called *compliers* or *interpreters*. High-level language statements resemble the

Four Levels of Programming Languages	
These Programming language instructions might be used to compute the sum of two numbers as expressed by the formula X = Y + Z	
• **Machine Languages:** Use binary coded instructions 1010 11001 1011 11010 1100 11011	• **High-level Languages:** Use brief statements or arithmetic notations BASIC. X = Y + Z COBOL: COMPUTE X = Y + Z
• **Assembler Languages:** Use symbolic coded instructions LOD Y ADD Z STR X	• **Fourth-Generation Languages:** Use natural and nonprocedural statements SUM THE FOLLOWING NUMBERS

Figure 4.16: Examples of four levels of programming languages.

phrases or mathematical expressions required to express the problem or procedure being programmed. The *syntax* (vocabulary, punctuation, and grammatical rules) and the *semantics* (meaning) of such statements do not reflect the internal code of any particular computer. For example, the computation X = Y + Z would be programmed in the high-level languages of BASIC and COBOL as shown in Figure 4.16.

High-level languages like BASIC, COBOL, and FORTRAN are easier to learn and program than an assembler language, since they have less-rigid rules, forms, and syntaxes. However, high-level language programs are usually less efficient than assembler language programs and require a greater amount of computer time for translation into machine instructions. Since most high-level languages are machine independent, programs written in a high-level language do not have to be reprogrammed when a new computer is installed, and programmers do not have to learn a different language for each type of computer.

4.7.4 Fourth-Generation Languages

The term fourth-generation language describes a variety of programming languages that are more nonprocedural and conversational than prior languages. These languages are called

fourth-generation languages (4GLs) to differentiate them from machine languages (first generation), assembler languages (second generation), and high-level languages (third generation).

Most fourth-generation languages are *nonprocedural languages* that encourage users and programmers to specify the results they want, while the computer determines the sequence of instructions that will accomplish those results. Thus, fourth-generation are sometimes considered to be *fifth-generation* languages (5GLs), and are very close to English or other human languages. Research and development activity in artificial intelligence (AI) is developing programming languages that are as easy to use as ordinary conversation in one's native tongue. For example INTELLECT, a natural language. would use a statement like, "What are the average exam scores in MIS 200?" to program a simple average exam score task.

In the early days of 4GLs, results suggested that high-volume transaction processing environments were not in the range of a 4GL's capabilities. While 4GLs were characterized by their ease of use, they were also viewed as less flexible than their predecessors primarily due to their increased storage and processing speed requirements. In today's large data volume environment, 4GLs are widely used and no longer viewed as a trade-off between ease of use and flexibility.

4.7.5 Object-Oriented Languages

Object-oriented programming (OOP) languages like Visual FoxPro, Visual Basic, C++, and Java are also considered to be fifth-generation languages and have become major tools of software development. Briefly, while most other programming languages separate data elements from the procedures or actions that will be performed upon them, OOP languages tie them together into objects. Thus, an object consists of data and the actions that can be performed on the data. For example, an object could be a set of data about a bank customer's savings account, and the operations (such as interest calculation) that might be performed upon the data. Or an object could be data in graphic form such as a video display window, plus the display actions that might be used upon it. As for an example Figure 4.17 is shown the object consists of data about a customer's account balance and the basic operations that can be performed on those data.

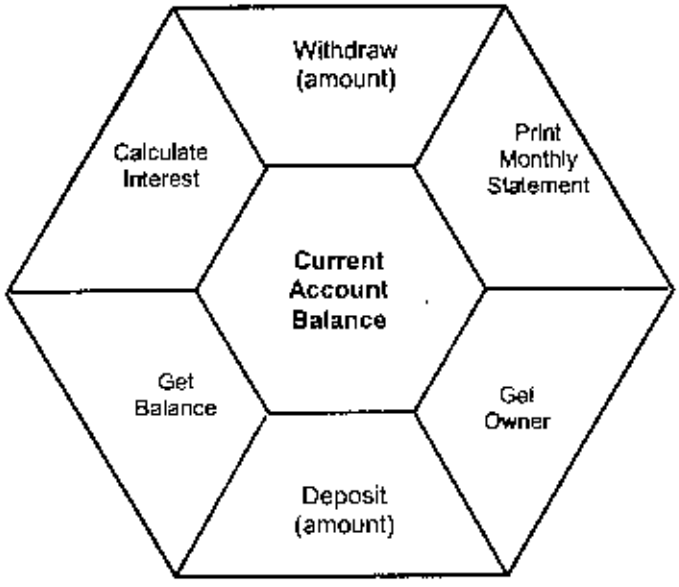


Figure 4 17. An example of a bank savings account object

In procedural languages, a program consists of procedures to perform actions on each data element However, in object-oriented systems, objects tell other objects to perform actions on themselves. For example, to open a window on a computer video display, a beginning menu object could send a window object a message to open and a window would appear on the screen. That's because the window object contains the program code for opening itself.

Object-oriented languages are easier to use and more efficient for programming the graphics-oriented user interfaces required by many applications. Therefore, they are the most widely used programming languages for software development today. Also, once objects are programmed, they are reusable. Therefore, reusability of objects is a major benefit of object-oriented programming. For example, programmers can construct a user interface for a new program by assembling standard objects such as windows, bars, boxes, buttons, and icons.

Therefore, most object-oriented programming package provides a GUI (Graphical User Interface) that support a "point and click", "drag and drop" visual assembly of objects known as *visual programming*. Figure 4.18 shows a display of the Visual FoxPro object-oriented programming environment.

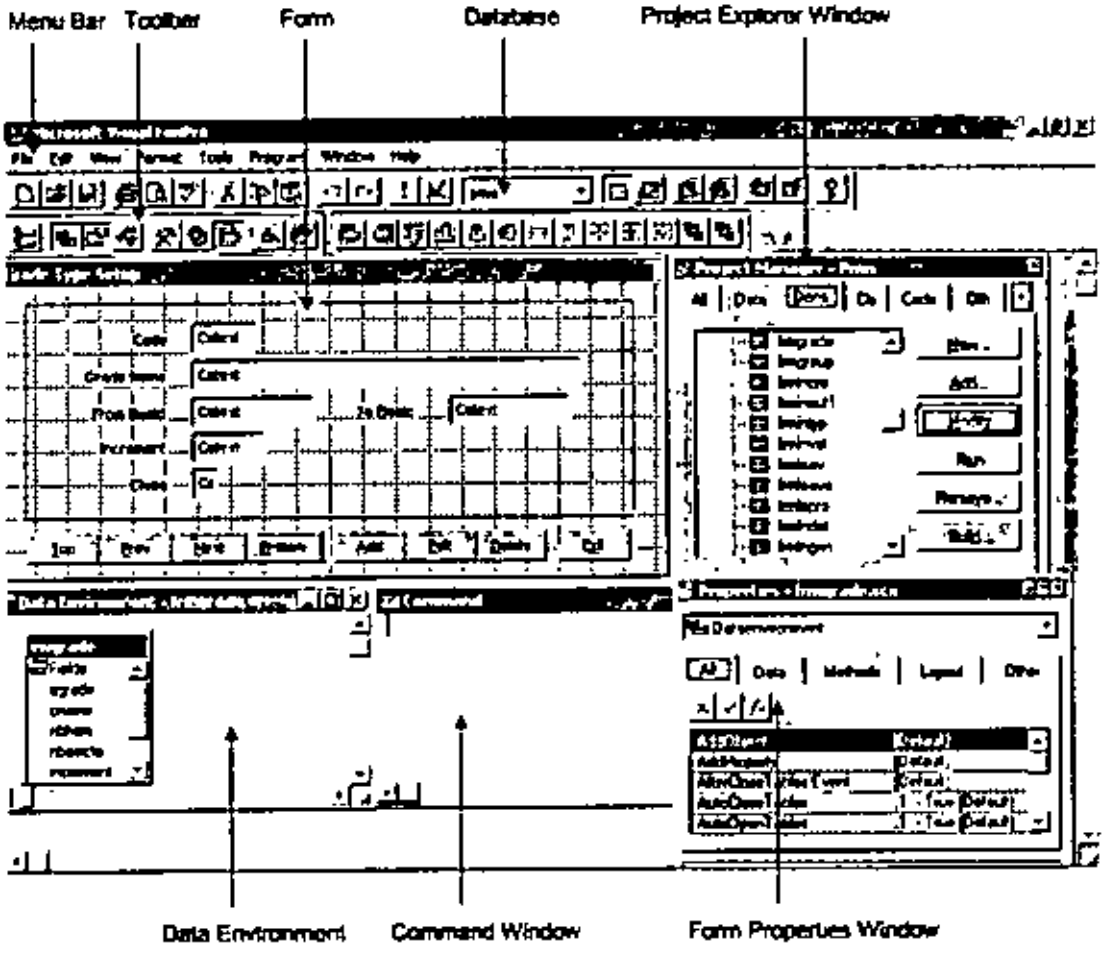


Figure 4.18: The Visual FoxPro object-oriented programming environment.

CHAPTER 5

BENEFITS FROM THE DEVELOPED SOFTWARE

5.1 ORGANIZATION DESIGN AND SYSTEM DESIGN

Ideally, system structure and organization structure go hand in hand: the way a system is designed supports and complements choices about how a business is organized. Too often, however, they can be in conflict.

A human resource information system includes more than just the computer-based technology. It also includes organizational practices and policies, paper-based forms of information flows, and decision-making procedures. Unless all of these components are in place, the computer-based part of the system cannot function. Thus, when someone talks about "installing an HRIS", they are really talking about a major organizational change initiative

Bangladesh Jute Research Institute (BJRI) is an R&D organization. For that reason here HR functions should be focused on research personnel related to research activities. Keep this point in mind, especial attention was given while making the modules of the developed software.

5.2 SYSTEM USED IN THE HR FUNCTION

The name of developed software is HR Assistant Plus. The software mainly consists of three modules, namely, Personnel Administration, Payroll Interface, and Attendance & Leave. All of these modules are especially designed for BJRI. HR Assistant Plus system uses a relational database. The relational database consists of entities and relations among them. Entities can be almost anything, such as people, or locations, or departments, or jobs. Relations are used to indicate which people have which jobs, in which departments, in which locations, and so on

The core structure of HR Assistant Plus is shown in Figure 5.1. The arrows in the figure indicate the benefits from the system through transaction of information. The most basic functions involve entering transactions (such as personnel information, time and attendance etc.) and creating reports (such as employees list, pay slip, absenteeism etc.). Automation of these basic tasks does more than just save direct labor and improve service; it provides the

core information needed for other systems. As shown in Figure 5.1, transaction-processing systems feed data into basic management reports, but they can also feed data into more sophisticated workflow and decision support systems

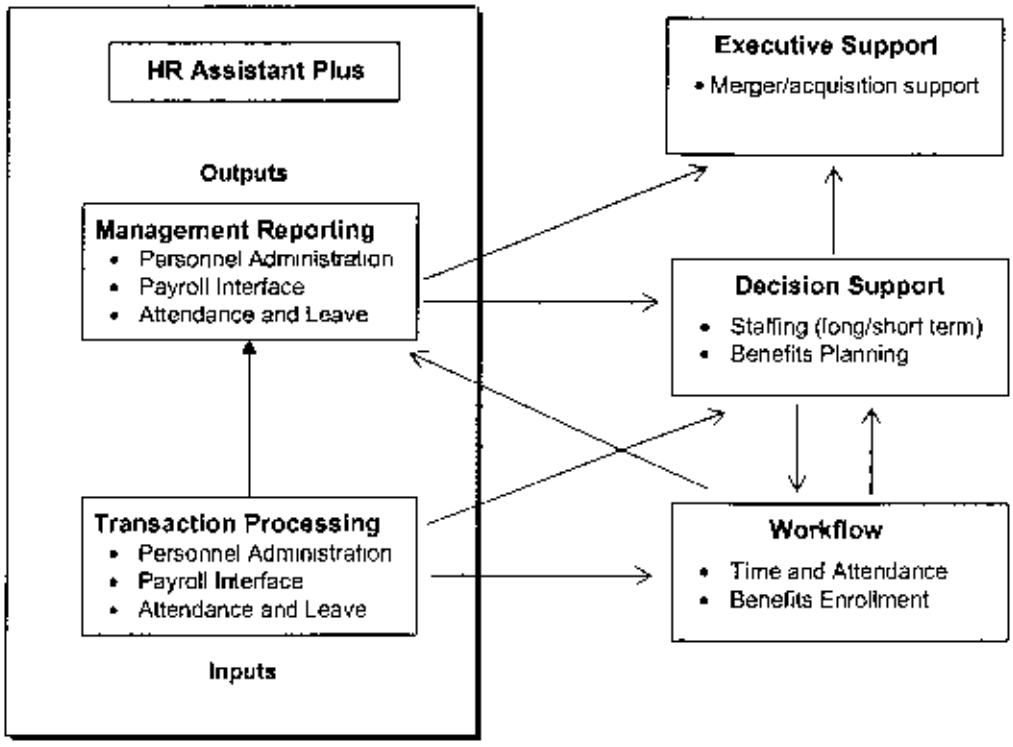


Figure 5.1: Core Structure of HR Assistant Plus

5.2.1 Transaction Processing in HR Assistant Plus

The system (HR Assistant Plus) reads the information from inputs and records these inputs into specific tables. After recruitment an employee entered the system by enter his/her personal data, designation, and grade in Personnel Administration module In this module all forms related to personnel are available. Figure 5 2 shows how transaction can be entered in Personal Data entry form in the system

Time and attendance data are an excellent example of where transaction processing feeds into other systems. The following information can be derived from the successful data inputs in Attendance and Leave module:

- Payroll: How much should be paid an employee during a specific time period?
- Leave scheduling: Has this employee accrued enough leave days?
- Absenteeism: How many employees are absent on a specific day?

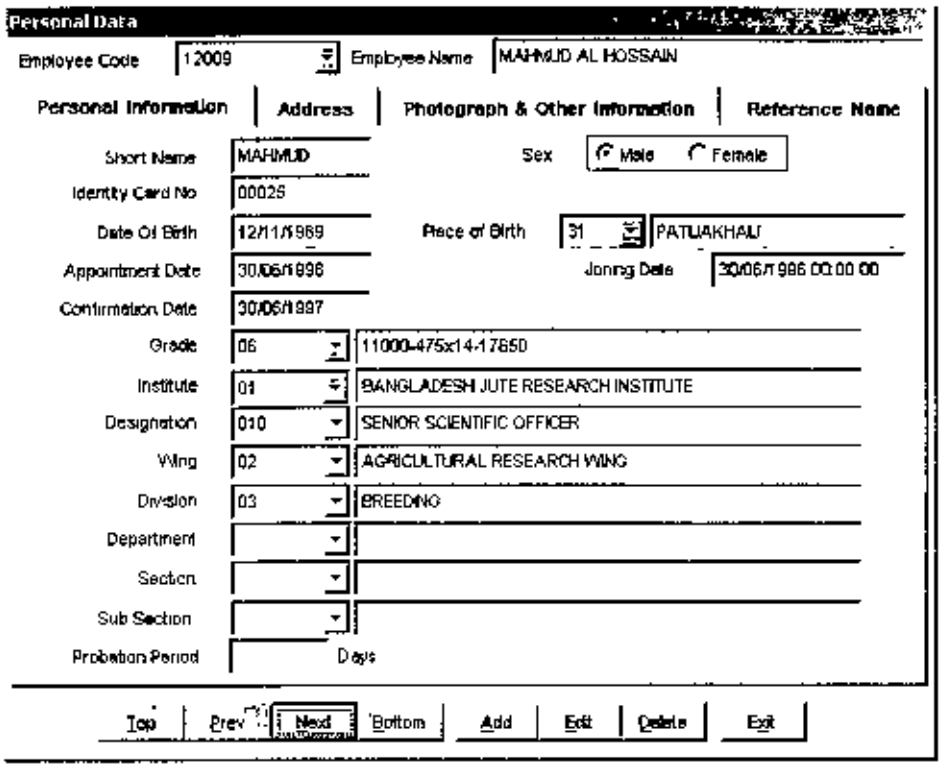


Figure 5.2. Personal Data entry form in HR Assistant Plus.

Figure 5.3 and Figure 5.4 are shown the Daily Attendance entry form and Leave Application entry form of the Attendance and Leave module respectively.

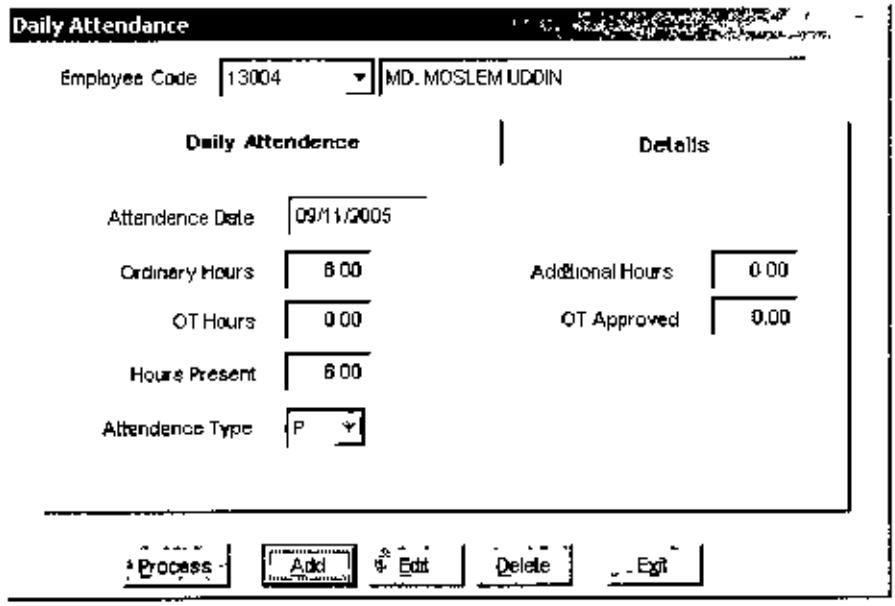


Figure 5.3 Daily Attendance entry form in HR Assistant Plus.

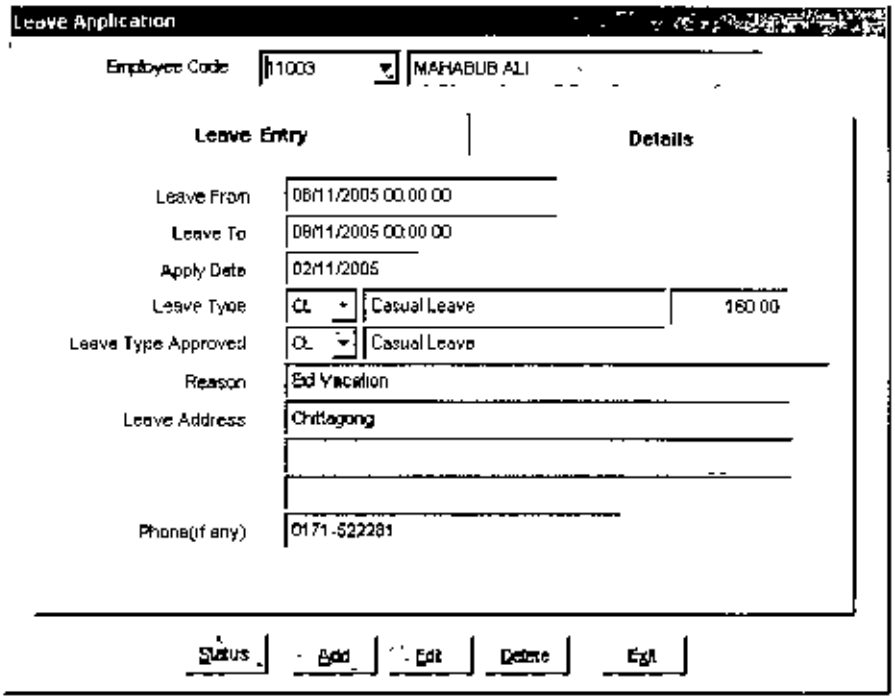


Figure 5.4: Leave Application entry form in HR Assistant Plus.

5.2.2 Management Reporting Systems in HR Assistant Plus

The generation of standard reports is a basic function in any human resource information system. The data accumulated as result of transactions is stored and used as the basis for reports. For example, a Attendance and Leave module could be used to generate reports on sick time utilization by department, or to identify areas with high absenteeism. A major reason for installing information systems in the human resource function is to facilitate this kind of reporting. In addition to standard reports, even the most basic HRIS allows customized or ad hoc reporting. The system can be generated four categories of reports namely, Personnel, Payroll, Attendance, and System setup's reports. The ability to produce such reports is quite valuable because it facilitates improved decision-making.

Figure 5.5 is shown the Personnel report screen of the system.

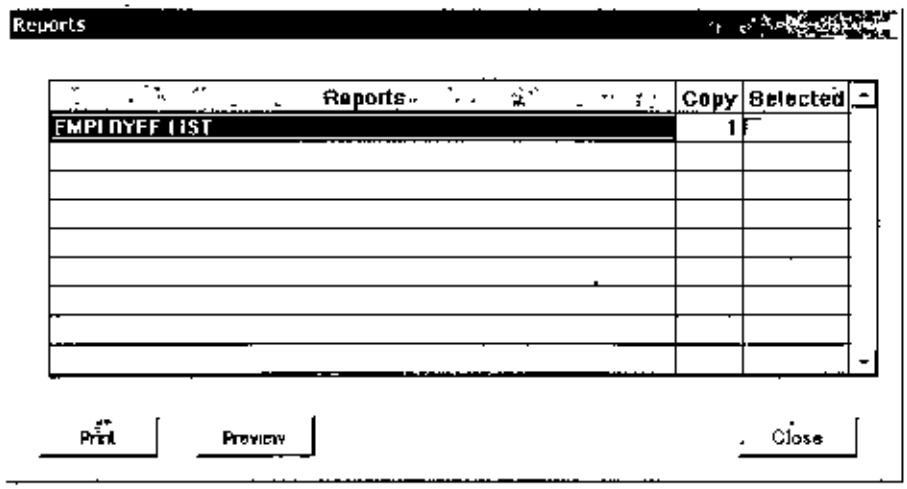


Figure 5.5. Personnel report screen in HR Assistant Plus.

5.3 BENEFITS FROM THE SYSTEM

The growth of information systems in human resources makes sense because:

- Storing, retrieving, distributing and reporting information is a practical necessity in nearly every aspect of human resource administration.
- The cost of information technology continues to decline.
- The quality and availability of HR software continues to improve

Indeed, there is vast array of different products on the market that can be used to support core tasks such as applicant management, benefits, compensation, and more. While some specialized applications will always require customized development, it is increasingly possible to purchase ready-made solutions to HR technology problems. HR data can be valuable by itself, its utility in management decision making is greatly enhanced when it is combined with data from other functions.

The HR Assistant Plus can bring the benefits in the following systems:

5.3.1 Workflow Systems

Office automation or "workflow" systems are used to support work process where more than one individual is involved. When forms or paperwork must be transferred from person to person, or department-to-department, workflow systems can facilitate the routing and transfer.

Once an individual has been selected for hiring, there are several steps required to initiate the employment relationship. This may include verification of eligibility for employment, benefits enrollment, and so on. A simple transaction processing system could be used to record certain steps in this process (e.g., contact information, benefits enrollment, etc.), but a workflow system is intended to support the process from one step to the next.

5.3.2 Decision Support Systems

Decision support systems rely on transaction data as well, but they go further than simply reporting information; they typically incorporate rules, formulae, or specialized displays that are designed to help end users make decisions. Decision support systems can be as simple as spreadsheet or a graph, or they can incorporate complex optimization procedures.

Scheduling and staffing are areas where decision support can be especially useful. In scheduling, a routine question is how many people to schedule for a given time period. If there are seasonal variations, or changes in workload due to increasing or decreasing sales, it may be helpful to have a model that recommends the number of people in each job category that should be scheduled. Supermarkets and other retail operations use these systems to schedule cashiers, baggers, and so on.

5.3.3 Executive Support Systems

Some organizations provide decision support for top management, as well. The difference between so called executive support system and traditional decision support is not just the rank or title of the people using the system. While traditional decision support systems are usually directed at fairly well defined, narrowly focused problems, executive support systems bring together data from diverse sources to help assess broader strategic questions. Human resource issues figure prominently in some of these decisions.

For example, if an organization is trying to decide where to locate a new facility, it is helpful to have comparative data on the availability of the relevant occupational groups, prevailing wages, education levels, labor standards, and so on When considering a merger or an acquisition, labor costs (including pensions and benefits) are usually a significant concern. The ability to provide timely, accurate information is one way that the HR function can become a more valuable strategic partner in top management decision making. When seen from this perspective, human resource information systems take on added significance.

CHAPTER 6

CONCLUSION AND RECOMMENDATION

6.1 CONCLUSION

It is easy to think of HR information systems in terms of the hardware and software packages used to implement them and to measure them by the number of workstations, applications, or users who log onto the system. The most important elements of an HRIS are not the computers, but the information. The focus of any comprehensive HRIS should be on information validity, reliability and utility first and on automation of the process second.

Human resource information systems are complex. They are also expensive to implement, expensive to maintain, and they require a commitment on the part of the organization to work in particular ways. For these reasons, it is important not to rush in and install the best-looking system that comes along. In weighing the alternatives, it is important to look carefully at system benefits. The most obvious benefits arise from direct savings (e.g., reduced labor cost, less paperwork) and from "intangibles" such as better decisions. However, intangible benefits can be hard to document. It is usually much easier to specify the costs. In this situation, some HR systems can be difficult to justify on economic terms alone.

Increasingly, organizations are realizing that they need modern human resource systems just to stay in business. To some extent, this is driven by increasing globalization, which is a strategic choice. But as operations span multiple legal and economic boundaries, very sophisticated systems are required even for seemingly simple tasks, such as computing total labor costs (i.e., when employees in various locations have different taxes, different benefits, and are paid in different currencies). Also compliance with legal requirements requires careful documentation. Technological changes also drive the need to implement new HR technology. If the personnel records system runs on a mainframe that is being taken out of service and replaced with network of personal computers and servers, it is time to start investing on a new system.

Extensive effort was undertaken to incorporate all the relevant modules of a standard HRIS in the software that was developed for BJRI as part of this thesis work. It is important to emphasize that information systems are more than just collections of computers and databases. Rather, they become part of the fabric of the organization. Systems affect the job descriptions and decision-making responsibilities of the individuals who use them. Systems

can enable new workflows, new structures, and new jobs. In doing so, old workflows, structures, and jobs need to be abandoned. For this reason, information technology is rarely neutral. Almost inevitably, it tends to create winners and losers. So, when we find ourselves getting infatuated with latest and greatest new technology, it may be worthwhile to step back and get a little perspective.

The biggest impediments to reaching the full potential of HRIS in a government organization like BJRI are lack of money and top management support. Other problems include the availability of applications/solutions to HR users and system designer's lack of HR understanding. Today, literally thousands of HR computer applications are available from consulting firms, software houses, and the organization's own system developers. However, the vast majority of such applications focus on administrative tasks, rather than decision support While supporting decisions is more difficult, it also seems to offer the greatest opportunity to affect the HR profession. Future developments in HRIS must and will address this area

6.2 RECOMMENDATION

- The success of a software depends on how coherent it is with the organizational system. So it requires time for a software to show its full potential in a particular environment. For that reason, any HRIS software will also take time to succeed. Users of the system should find out the anomalies during the implementation stage. Any anomaly at the beginning stage is easy to resolve and user's cooperation can reduce the implementation time of the system.

- It is usually difficult to replace a manual system with a computerized system because of resistance from the employees concerned This is more true for a government organization like BJRI. In spite of resistance from the employees, BJRI authority should be firm to implement HRIS for the sake of long term benefits. Employees can be motivated to adopt the system through proper training and orientation.

- The use of an HRIS is a continuous process. Installing the system is not the end of the process. The system should be continuously improved and modified as the situation requires. Once BJRI authority decides to implement the HRIS, they should make a deed with the developer of HRIS in order to ensure continuous improvement of the system.

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APPENDICES

APPENDIX - A

Job Categories in BJRI

Code	Name	Class	Short Name
001	DIRECTOR GENERAL	01	DG
002	DIRECTOR (AGRICULTURE)	01	DIR. Ag
003	DIRECTOR (TECHNOLOGY)	01	DIR. Tech
004	DIRECTOR (JUTE-TEXTILE)	01	DIR. JTPDC
005	CHIEF SCIENTIFIC OFFICER	01	CSO
006	DIRECTOR (ADMINISTRATION & FINANACE)	01	DIR. ADMIN
007	PRINCIPAL SCIENTIFIC OFFICER	01	PSO
008	SYSTEM ANALYST	01	SYS. ANA.
009	DEPUTY DIRECTOR	01	DD
010	SENIOR SCIENTIFIC OFFICER	01	SSO
011	PROGRAMMER	01	PROG.
012	SCIENTIFIC OFFICER	01	SO
013	ASSISTANT DIRECTOR	01	AD
014	JUNIOR PROGRAMMER	01	J. PROG
015	ASSISTANT ENGINEER	01	AE
016	PUBLICATION OFFICER	01	PO
017	AUDIT OFFICER	01	AO
018	PRO CUM PS	01	PS DG
019	LIBRARIAN	01	LIB.
020	MANAGER (GENE BANK)	02	MAN.
021	FIELD INVESTIGATOR	02	FI
022	SECURITY OFFICER	02	SCR. OFF.
023	SUB ASSISTANT ENGINEER	02	SAE
024	AUDIT SUPERINTENDENT	02	AUD. SUP.
025	ASSISTANT LIBRARIAN	02	ASSTT. LIB
026	SALESMAN	03	SLS. MAN
027	HEAD ASSISTANT	03	C. ASSTT.
028	ACCOUNTANT	03	ACCONT.
029	SCIENTIFIC ASSISTANT	03	SA
030	FIELD ASSISTANT	03	FA
031	STENOGRAPHER	03	STENO.
032	COMPUTER OPERATOR	03	COM. OPER.
033	UPPER ASSISTANT	03	U. ASSTT.
034	UPPER ASSISTANT CUM CASHIER	03	U. A. C.
035	STORE KEEPER	03	STR. KEEP.
036	TRANSPORT ASSISTANT	03	TRAN. ASST

Code	Name	Class	Short Name
037	AUDITOR	03	AUDT
038	CATALOGER	03	CATLGR
039	STENO TYPIST	03	STNOTYPE
040	GREEN HOUSE SUPERINTENDENT	03	GH SUPER
041	REFRIGERATION MECHANIC	03	REF. MECH.
042	JUNIOR FIELD ASSISTANT	03	JFR
043	SENIOR MILL MECHANIC	03	S. MIL MEC
044	HEAD MECHANIC	03	H. MECH.
045	HEAD ELECTRICIAN	03	H. ELECT.
046	HEAD BOILER MECHANIC	03	H. BOL. ME
047	SENIOR BEAMER	03	S. BEAM.
048	SENIOR WEAVER	03	S. WEAV.
049	CARPET WEAVER	03	CAR. WEAV.
050	SEED TESTER	03	SEED TEST.
051	LDA CUM TYPIST	03	LDA TYPE
052	LDA CUM RECORD KEEPER	03	LDA REC.
053	ELECTRICIAN	03	ELEC.
054	MECHANIC	03	MECH.
055	MASON	03	MASON
056	CARPENTER	03	CARPENT.
057	DRIVER	03	DRIVER
058	TELEPHONE OPERATOR	03	TEL. OPER.
059	EMAM	03	EMAM
060	TRACTOR DRIVER	03	TRAC. DRV.
061	SPINNER	03	SPINNER
062	PUMP OPERATOR	04	PUMP OPER.
063	BOILER MECHANIC	04	BOIL. MECH
064	DUPLICATING MACHINE OPERATOR	04	DUP M. OPR
065	DESPATCH RIDER	04	DES. RIDER
066	PLUMBER	04	PLUMBER
067	FITER	04	FITER
068	SENIOR MACHINE OPERATOR	04	S. M/C OPR
069	ELECTRICIAN	04	ELECT.
070	CASH SARKAR	04	CASH REG.
071	STORE HELPER	04	STR. HELP.
072	LIABRARY ATTENDANT	04	LIB. ATND.
073	LABORATORY ATTENDANT	04	LAB. ATND.
074	BEAMER	04	BEAMER
075	WEAVER	04	WEAVER
076	KNITTER	04	KNITTER
077	DRYER	04	DRYER

Code	Name	Class	Short Name
078	PRINTER	04	PRINTER
079	WELDER	04	WELDER
080	ASSISTANT MACHINE OPERATOR	04	A. M/C OPR
081	MLSS	04	MLSS
082	MALI	04	MALI
083	GUARD	04	GUARD
084	SWEEPER	04	SWEEPER
085	MASON HELPER	04	MASON HLP.

Evaluation Form

SCIENTIST'S PROFILE FOR EVALUATION FOR PROMOTION FROM PRINCIPAL SCIENTIFIC OFFICER (PSO) TO CHIEF SCIENTIFIC OFFICER (CSO)

(To be filled by the reviewer)

1. Reported period:
2. a. Name:
   b. Father's/Husband's name:
3. Designation:
4. Institution:
5. Date of joining in the present position:
6. Date of first joining in service:
7. Date of birth/age:
8. Educational career:

Degree/Diploma Certificate	Class/Grade /Division	University/Institute /Board	Year

9. Field of Specialization:

10. Additional qualifications/ : training acquired in Bangladesh and/or abroad (List of all short-term training, not included in educational career. Give dates and duration of course)

11. Experience:
    a. Year of Service at H.Q.
    b. Year of Service at Outside Station

12. ACR for the Last Five Years (To be supplied by the Head of the Institutions.)

13. Performance:
    Publication (Reprints of all publications are to be enclosed)
    i. No. of full paper as the Principal Author.
    ii. No. of full paper as Co-author.
    iii. No. of Books/Monographs/Bulletins Published as Principal author.
    iv. No. of Books/Monographs/Bulletins Published as Co-author.
    v No. of papers presented in the Seminar/Symposium/ Workshop.

14. Participation in Technology Development and Transfer Activities

Name of Technology Developed	Present Status of Adoption	Remarks

15. Research Program(s)/Project(s) Building and Execution

Name of Research Program(s)/ Project(s) developed	Implementation Status	Remarks

16. Management of Research Station/Program(s)

Name of Research Station/ Program(s) Managed	Present Status	Remarks

17. Monitoring and Evaluation

How many Programs were Monitored/Evaluated	Monitoring/ Evaluation Report	Remarks

18. Preparation of Technology Transfer Modules

How many Technology Transfer Modules/ Prepared	Modules Adoption Status	Remarks

19. Participation in Task Force/Action Plan etc.

Name of Task Force/Action Plan Participated	Present Status	Remarks

20. Participation in Technology Transfer Systems like Regional and District Committees

How many Regional and District Committees Meeting Attended	Name and Date of Participation	Remarks

21. Supervision of M.S,/Ph.D. Research Programs

How many M.S,/Ph.D. Program Supervised	Title of Research Program(s)	Remarks

22. Research Achievement Including any Outstanding Contribution

APPENDIX- B

USER MANUAL

1. Login to the System

To Login to the HR Assistant Plus, you have to double click the *Hris Icon* 

on your file folder.

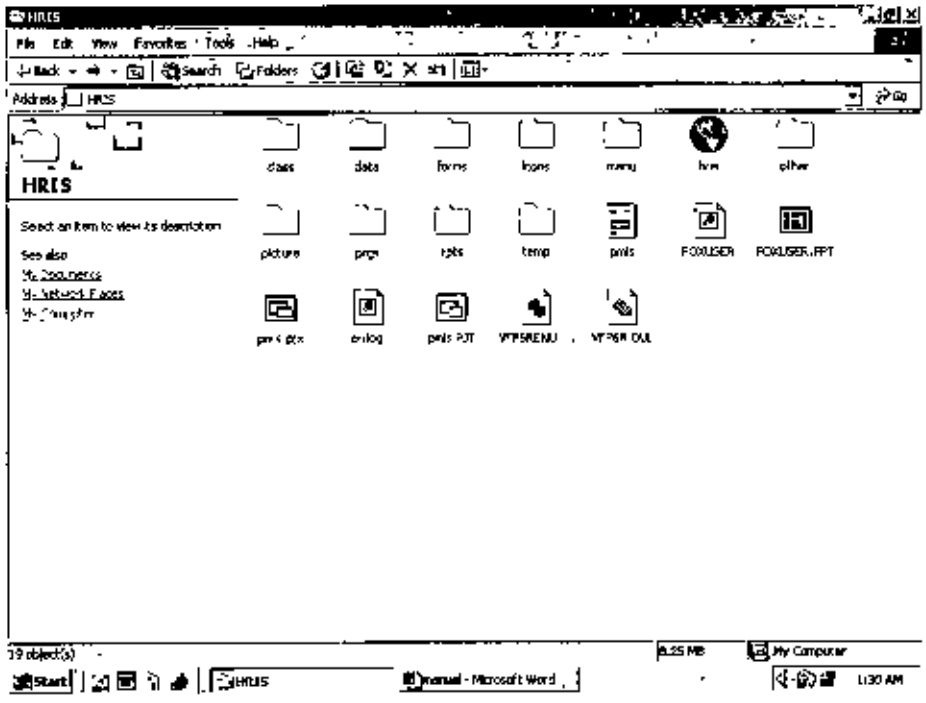

Figure I: HRIS files in a selected folder

You will see the Splash Widow, at the beginning of the program

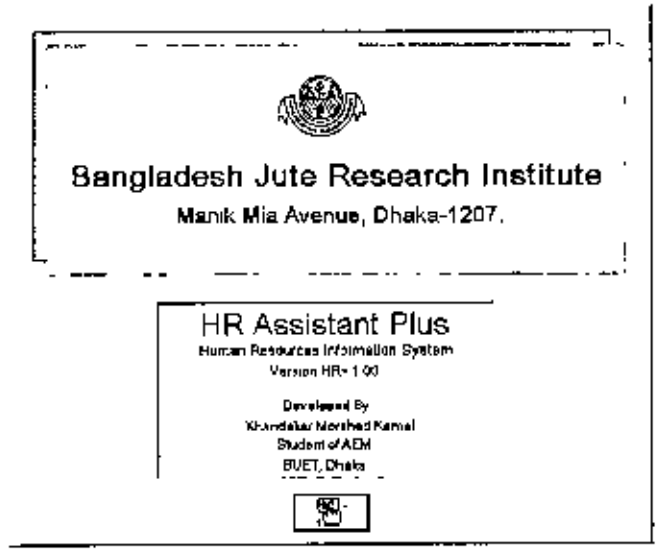

Figure II: The Splash Window

In the Login Window, you have to do the following to log into the system.

Figure III: Login Window

a. Type your User Name and Password, then press the *Ok* button to enter into the system, otherwise press *Exit* button to leave the system.
b. Only valid User Name and Password get access to the HR Assistant Plus system. Otherwise, Invalid User Name or Invalid Password message will appear and restrict the access to the system.
c. There are two types of users for the system.
    i. Admin: the Administrator, who have no restriction.
    ii. User: the User, who have limited access in the system.
d. The User Name and Password are case sensitive. So *Admin* and *admin* are not the same.

After successful login, you will see the *Main Menu* of the system.

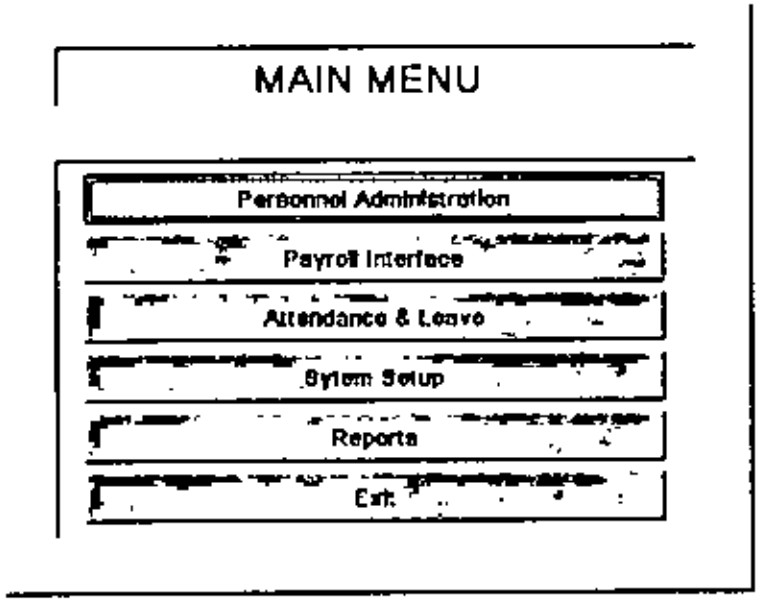

Figure IV: Main Menu

2. Inputs to the System

There are four inputs module, namely, Personnel Administration, Payroll Interface, Attendance & Leave, System Setup, and one is for outputs of the system, i.e. Reports are available. According to the organization requirements, again each module consists of several forms/screens.

You will find the following Navigation Buttons almost every screen of the system.

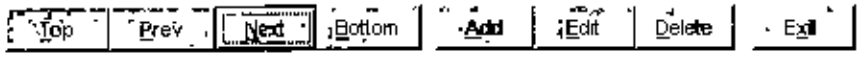

Figure V: Navigation Buttons

The function of the each button is described below.

Button	Description
Top	Moves record pointer to first record.
Prev	Moves record pointer back one record.
Next	Moves record pointer forward one record
Bottom	Moves record pointer to last record.
Add	Adds a new record to the end of the table.
Edit	Allows user to change values in current record.
Delete	Deletes current record.
Exit	Closes form.

Figure VI: Function of the Navigation Buttons

Data Entry

In the same window, you can add new data, edit existing one or delete a whole record.

A. Adding New Records

To add a new record, you have to:

i. Click *Add* button. This will automatically create a new blank record. You have to enter appropriate data or pick it from a combo box.

ii. Click *Save* button to save it.

iii. Click *Revert* button to delete the new record, if you haven't clicked *Save* yet. Once saved, a record can be deleted by Administrator only.

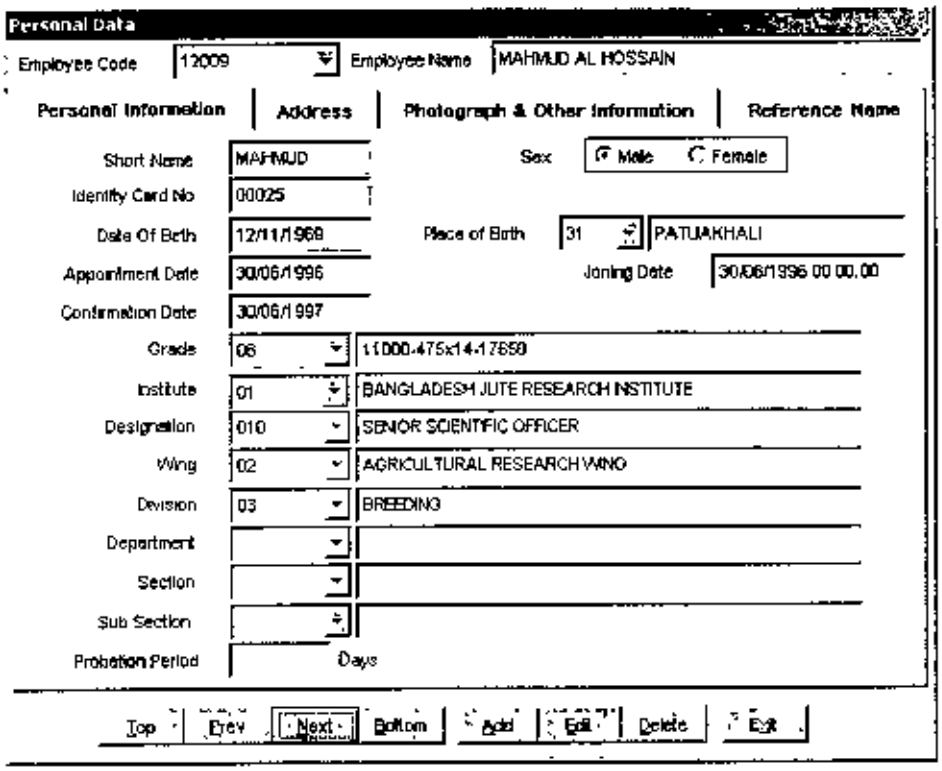

Figure VII: Personal Data entry form in HR Assistant Plus

iv. At the beginning, the new entry must be started from the Personal Data screen (Figure VII) in Personnel Administration module. During the entry, Employee code, Name and Grade must be put in appropriate place for the first time. After entry the Employee Code and Name, you will find it all screens in the system.

B. Editing Existing Record

To edit existing data, you simply navigate to it, Click the *Edit* button and change as necessary, after changing press *Save* button. The Employee Code cannot be edited.

C. Deleting Existing Record

Open the entry that you want to delete, click *Delete* button for deleting the entire record. Only the Administrator can access this command.

2. Outputs from the System

Generating reports are the main outputs from the system. From Main Menu select the Reports menu. In Reports menu is shown in Figure VIII. You can select all kinds of reports this menu.

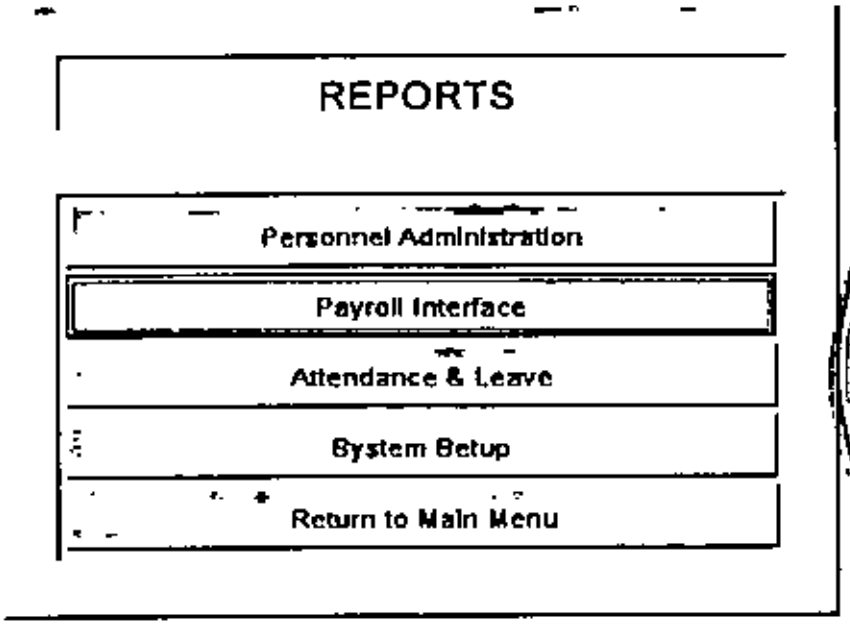

Figure VIII: Reports menu in HR Assistant Plus.

The generation of standard reports is a basic function in any human resource information system. The data accumulated as result of transactions is stored and used as the basis for reports. After successful entry to the system you can generate the selective reports from the menu.

Figure IX is shown the Personnel report screen of the system.

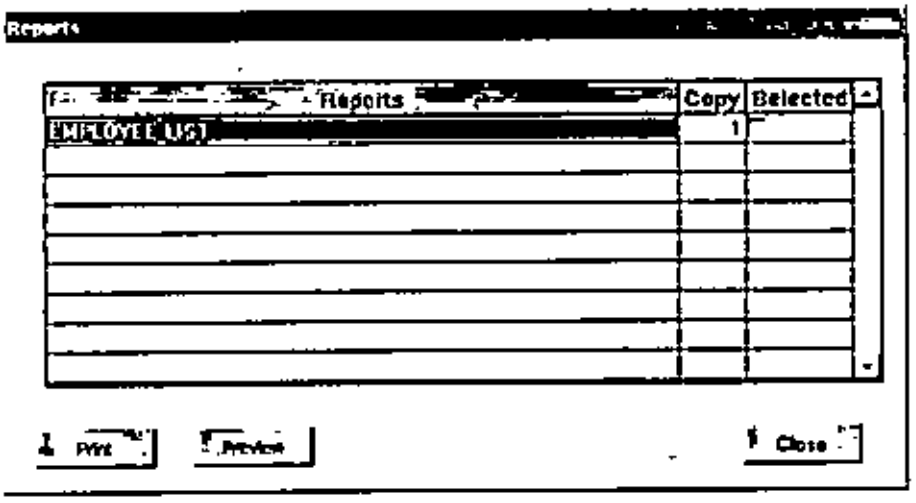

Figure IX: Personnel report screen in HR Assistant Plus.