Legacy Information System Development: Problems and Issues

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Abstract

The Information Communication Technology has improved the quality of services being provided by organizations beyond proportions. Another most distinguishing characteristic of ICT is the storage, retrieval, processing as well as the communication of Data. However development of Information System is always associated with many problems and issues. In fact resistance to change is a universally acknowledged fact but since the influence of ICT is felt at all levels therefore automation mostly meets multifold problems. It is because of this fact that despite distinct superiority of ICT still it is implemented in phased manner. Similarly the available technology also limits the working of the Information System. Other issues related with the development of the information are the developmental, operational besides security.

Keywords: Information System, Software Engineering, System Development

1.0 Introduction

The field of information systems deals with systems for delivering information and communications services in an organization and the activities and management of the information systems function in planning, designing, developing, implementing, and operating the systems and providing services. These systems capture, store, process, and communicate data, information, and knowledge. The systems combine both technical components and human operators and users. The environment is an organization or a combination of organizations. The process of Automation implicitly refers to the use of Information Communication Technology for the development of Information system. Automation of information systems in organizations has been a thrust area since several years now. With the introduction of new technologies and reduction in their cost the affordability of automation of organizations has grown significantly [Vassil Donev]. Competition between different organizations to provide better and prompt services too has drawn service provider organizations like financial organizations towards automation. Organizations which are dealing with huge volumes of data like preparations of results in an examination system too are opting for automation for its prompt processing. Similarly centralization of the Data of the decentralized systems like railway or airline reservation systems has made the automation compulsory in such organizations. Associated with the automation of any system there are several problems and issues which need to be addressed in order to make the whole process of automation truly successful and beneficial [L. C. Wee]. This paper discusses various problems and issues pertaining to information Information systems with regard to Developmental, Operational, Environmental, Technological and Security.

2.0 Developmental

These are the issues which are encountered during the development of an Information System. When a manual or an legacy information system is to be automated or upgraded, it involves completely a systematic process and is often mistaken to mere purchase of requisite hardware and the software. The development of the system is susceptible to several failures at each developmental stage. The development of the new system requires a very comprehensive view of the already existing system and also that of the proposed system. The development of automation system includes the procurement of the requisite hardware and preparation of the necessary environment for the installation of the hardware. Besides this the development of the need based software/code forms an essential part of the process. The selection of the proper hardware is one of the important issues in automation. The degree of Automation is determined by the availability of financial resources besides the will and determination of the management. It is also found that the systems are very rarely automated to optimum level in the first stage. This part deals with the section related to ‘Technological’ issues, whereas this section discusses the issues related to software development.

The main activity of software development within the total process of automation is itself a very crucial one and is susceptible to several types of errors. These errors are mostly out of incomplete analysis of the present system, imperfect design, and bugs in code writing, incomplete/insufficient testing and several others. One of the major initial activities in the Software Development Life Cycle is the requirement analysis whereby the present operations of the system are first studied and analyzed. The software engineering provides a complete guideline for the system analysis yet it remains a challenging task till date. Whereas the actual development involves the writing of the program but several other stages are involved which result in a significant overhead. The consequences of the incorrect or incomplete analysis
are always incorrect design. Similarly even if the analysis is done with proper care, errors may creep in during the design. Moreover, at what stage of Software Development Life Cycle the errors are discovered has a major impact. Unlike the development of other physical systems where the errors are detected primarily at initial stages, the errors in an information system may be discovered towards the end, when their removal is not only costly but also time consuming and involves complete redesign. As per statistics obtained from the industry, most software projects encounter critical errors and are likely to fail during the last 10% of their life cycle. This most of the times, leads to disastrous implications.

Different models of Software engineering have been proposed but in most of the real world situations no single model is applicable in totality. Similarly in most environments, complete requirement analysis prior to design, is practically not possible since requirements are never clear in the beginning. This results not only in incomplete or inaccurate requirements analysis but is also one of the factors in delaying the completion of the system in a predicted time schedule. Yet another issue related to the requirement analysis is the communication gap existing between the developers and the personnel of the organization for which the solution is developed. Despite use of several tools it is mostly observed that it is still time consuming and inaccurate. As has been mentioned, that several Software Development Engineering Models have been proposed by Software Engineering pioneers and amongst these, one popular strategy being the development of a prototype, which not only is very effective in requirement analysis but also gives a feel of the system under development and is hence one of the best sources of the feedback on requirements, user satisfaction, effectiveness of user interfaces, speed, accuracy and other related issues.

**System Development Cycle**

A major issue related to the requirements analysis is that as the system evolves the user requirements, in certain environments, change very frequently and hence these changes have to be reflected in the information system, under development. Hence, the need for requirement analysis and the importance of choosing an appropriate Software Development Process Model is an important issue. In this context, process models like Incremental model, Spiral model and a combination thereof with prototyping can prove to be of strategic importance. An intelligent, project-specific approach with proper decision making can be of vital importance.

With the advent of networking technologies, Client/Server computation and distributed computing, decisions related to the system architecture have become of vital importance. This step is crucial and unless well informed, technically sound decisions are taken at this stage, an overall smooth functioning of the system and the consequent overall increase in system efficiency cannot be obtained.

Next to the above, comes the issue of process of design and coding, followed by testing and implementation. The design of the system determines the foundation of its quality. The user friendliness, flexibility, capability to work under extreme loads, scalability and several such issues are the parameters at the design stage. The Software engineering here again gives some broad outlines but no mathematical formulae exist which can ensure a perfect design. It is because of that different professionals come out with different designs. The professionals over a period of time gain experience which enables them to develop better designs. A large number of languages and tools exist for coding but in most of the cases no single language or the tool is meeting the requirements comprehensively. In fact the selection of a language is always an issue and here again it is observed that it is the competence of professionals and not suitability of the language which determines its selection.

**3.0 Operational:**

Once the Automation system is established its real testing comes when in the operational phase. Considering the fact that both employees as well as the people are acquainted with the manual system, it takes them some time to tune themselves to the automated system. One of the major issues which come in the way of smooth functioning of the system is the format of data inputs. The professionals managing the automation system should not be led by the natural tendency
to retain the existing formats of the manual systems in all situations but should rather give due thought to these formats and design them afresh as per the suitability of the proposed automated system.

Other important operational issue is dealing with the resistance inherent to the automation (change). This resistance is from within the system by the employees who were managing the manual system and is hence highly dangerous. Normally people working in an organization oppose the process of automation can be categorized into three types depending upon the reasons for resistance:

a) Those who get scared that their importance would be reduced due to automation of the system. This is because in an automated system operations are mostly structured and role of a person is limited to follow the queries asked by the system.

b) Those who feel that their vested interests and the resultant wrong practices are going to get affected by automation. This is because the automation of a system introduces transparency and generally exposes corrupt practices. It also reduces the chances of tampering or misuse.

c) Those who just feel that they cannot learn the technology and feel insecure and redundant. This is because with an automated system new terminology and practices are involved which are quite alien to them.

Careful dealing of the situation helps to gain the confidence of the (a) and (c) section of the people concerned however threat to successful computerization always remains from serial personnel listed at (b). In such environments any kind of error gets highly exploited and in such environments it is always suitable not to rush to total automation in one go.

As already pointed out new types of errors are introduced in the system out of automation and some of them are introduced in the operational phase. If we consider a data entry based automated system where the operators are used for making the data entry then very rarely fool proof data entry systems can be developed. Then associated with that data entry is the validation and verification of the data entered. Systems where the volume of data entry is huge like a financial organization or a University Examination System, in such cases the validation and verification of the data entered is one of the most important issues. In fact double data entry system where data is entered twice and then processed to identify the errors introduced during data entry is used frequently however this doubles the efforts of data entry and several other processing efforts are made.

Once an automation system is designed and implemented it always follows the same procedure which has been conceived at the design time. If often happens that administrators set dead lines for the outputs and expect that short cuts can be made in an automated system the way they are possible in a manual system. Under such conditions even the professionals who have designed and developed the system try to adopt the short cuts but ultimately such ventures result in failure or serious errors are introduced in the outputs. The reasons for such consequences are clear as in manual system things are much clear and under control at all the stages and hence allow short cuts also. In comparison in an automated system things become clear at later stages and operational flexibility is always restricted.

The regulated and stable power supply is the backbone of an automated information system and determines the life of the equipment. This also affects the productivity of the system. This being a priority issue, it has to be given proper thought. Decision being mostly between having a large number of uninterrupted power supplies of relatively smaller power rating or having a few UPS’s of very large size and high power rating. Typically, overall rating of the power equipment should be 30% higher than the total consumption of the power.

4.0 Environmental:

The environment of an automated system consists of the professionals involved in the operation of the system in different capacities ranging from operator to the superior most officers, other officials of the organization associated directly or indirectly with the system and the infrastructure and environment of working. Then associated with every system are the external entities which too have influence on the functioning of the system. Broadly speaking we can categorize the environment as a) Working Environment and b) User Environment. The working environment would therefore consist of professionals, infrastructure directly related with the development and implementation of the Information System whereas the user environment would involve the general users and the associated infrastructure of the Information System. Dishonestly at professional level is not an exception. Another issue in the normal functioning and development of the Information System is observed if the system is headed at any level in the hierarchy by a non professional person. In such situations the performance of the system is badly affected and development of the system is questioned.

5.0 Technological:

Issues related to the technological limitations are numerous. Some of these are feasibility of establishing an appropriate sized network, its topology, setting up of suitable servers within it, limitations of hardware in terms of size (in case of storage media), speed (in case of processors, printers and network equipment) and resolution (in case of scanners and display devices), limitations of the available software viz operating systems, programming languages and DBMS’s. Issues related to data back-up policies, prevention of data corruption, viruses and system crashes, hacking and unauthorized access and power failures pose major challenges to the system technologically.

Presently the focus has shifted from the decisions related to the PC configurations, which was a crucial one some time back due to the significant reduction in the costs of basic hardware. With the popularization of LANs for even
small to medium sized enterprises, the focus has shifted more towards the decisions related to LAN topologies, server configurations, the appropriate selection of printers and power system backups and the selection of software [R.F.J. North, D.M. Strain & L. Abbott]. Similarly depending upon the level of automation other devices like scanners, storage and Backup devices may also form an essential issue.

There are huge variations in the principal of operation of printers, their structure, their cost as well as speed. Depending upon the volume of printing and other printing requirements, intelligent decisions about the procurement of printers can be taken. Mostly high volume printing is required very occasionally otherwise on average printing requirements in most of the automation systems are of routine nature. In such cases the procurement of the medium range line printers is suggested however in case the volume of printing is predominantly high at most of the times then procurement of high speed printers are suggested.

6.0 Security

While information systems provide users greater access than ever to vast information resources, these same systems are subject to threats that jeopardize the privacy and confidentiality of sensitive information, the integrity of data, and the availability of critical information system resources. Effective security is needed to ensure the confidentiality of medical records, to maintain the integrity of a financial transaction, and to protect intellectual property [J. Euzenat].

The security of the system forms one of the main concerns in the present scenario. It is found that the networks established by the organizations are used for providing internet facilities also which results in hooking the system to the global network. Similarly to disseminate the information and provide other services to the concerned connecting the system to the global network has become essential. This exposes the system to all sorts of threats and requires a series of measures involving substantial investments to protect it from being un-authorized accessed and tampered.

Information security or information Communication technology (ICT) security has long been considered to consist of three main objectives: the preservation of the information’s confidentiality, integrity, and availability. Donn Parker, a founding father in the field of information security, has also suggested adding to the list of objectives authenticity ("the valid representation of that which it is intended to represent") and utility ("the state of being useful or fit for some purpose and designed for use or performing a service") [PARK91].

Confidentiality, or the prevention of unauthorized disclosure of the information, has been the primary security objective of many of the security efforts. The Trusted Computer Security Evaluation Criteria (TCSEC) has confidentiality as their primary concern. One normally thinks of the actual information as being the concern for protection. In a communication system, though, in some cases, knowing who is communicating can be as sensitive as what is being communicated. The frequency and volume of communication could also be very sensitive. Unauthorized disclosure may be accomplished through:

- wiretapping or eavesdropping,
- unauthorized access to the information in the Information System either by unauthorized users (for example, hackers) or by authorized users accessing information to which they are not authorized,
- Printouts of sensitive information sent to unattended printers in public areas, or
- Large amounts of information leaving the organization on storage devices.

The availability objective is generally seen as ensuring that the system is available to authorized users when needed. In life-support systems, for example, the availability objective is paramount. The recent widely published incidents of the Internet worm and the large-scale telephone outages in major metropolitan areas demonstrate the implications of denial of service. To date, little research has been done on availability concerns.

7.0 Conclusion

The development of Information System is an important activity in an Organization. In most of the situations the development of the system is considered merely the procurement of hardware and the software. However on the other hand the development of an Information System is always a process and requires its own time for successful implementation. Switch over from an existing manual system to a computerized one involves many risks if professional approach is not made at different stages of implementation. Despite resistance to change which has been one of the strongest impeding factor for the growth of the Computerization many other factors have prevailed which has forced the organizations to adapt to the available technologies.

8.0 References