CHAPTER IV

THE DESIGN OF AN INTEGRATED INFORMATION SYSTEM

1. Introduction
2. The features of an information system
3. Implementation of information system
4. Information processing techniques
5. Conclusion
INTRODUCTION.

An information system aims to gather, store, retrieve, disseminate and present information to the users of information. An integrated information system attempts to develop a comprehensive system to meet specific information needs.[1]

Several factors affect the development of information systems namely:[2]

1) a set of knowledge having specific characteristics such as volume and rate of change.
2) a set of information requirement and needs having similar and other characteristics
3) the interaction within and between these sets.

The design of information system assumes that the sets of information needs and information can be divided into subjects that corresponds to clustering of information, professions etc. This forms the basis for division and set of knowledge [3]. Thus the primary division of two sets namely 1) information users and 2) the information itself. It needs two different types of varieties of subjects categories. The results of interaction of these two sets of criteria give rise to variety of factors, products and services which results the information processing activity of a centre.[4]
Functions and the services of different types of information systems would be seen from the following chart-5:[5]

<table>
<thead>
<tr>
<th>Special Library</th>
<th>Documentation Centre</th>
<th>Referral Centre</th>
<th>Clearing Houses</th>
<th>Information Services Centres</th>
<th>Information Analysis Centres</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Collection Document</strong></td>
<td>M</td>
<td>M</td>
<td>0</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td><strong>Data/Information</strong></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>r</td>
<td>M</td>
</tr>
<tr>
<td><strong>Processing Document</strong></td>
<td>M</td>
<td>M</td>
<td>0</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td><strong>Data/Information</strong></td>
<td>r</td>
<td>0</td>
<td>0</td>
<td>r</td>
<td>M</td>
</tr>
<tr>
<td><strong>Storage Document</strong></td>
<td>M</td>
<td>M</td>
<td>0</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td><strong>Data/Information</strong></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>r</td>
</tr>
<tr>
<td><strong>Retrieval Document</strong></td>
<td>M</td>
<td>M</td>
<td>0</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td><strong>Data/Information</strong></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>r</td>
</tr>
<tr>
<td><strong>Dissemination</strong></td>
<td>M</td>
<td>M</td>
<td>0</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td><strong>Document</strong></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>M</td>
</tr>
<tr>
<td><strong>Data/Information</strong></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Republication Or</strong></td>
<td>0</td>
<td>M</td>
<td>0</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td><strong>Reproduction Document</strong></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Information Generation</strong></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Document Data/Information</strong></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Archive</strong></td>
<td>M</td>
<td>m</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Consultation And Advice</strong></td>
<td>r</td>
<td>0</td>
<td>r</td>
<td>r</td>
<td>r</td>
</tr>
<tr>
<td><strong>Replies To Inquires</strong></td>
<td>m</td>
<td>r</td>
<td>r</td>
<td>r</td>
<td>M</td>
</tr>
<tr>
<td><strong>Referral</strong></td>
<td>r</td>
<td>r</td>
<td>M</td>
<td>M</td>
<td>0</td>
</tr>
<tr>
<td><strong>Retrospective Search</strong></td>
<td>M</td>
<td>M</td>
<td>0</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td><strong>SDI</strong></td>
<td>m</td>
<td>m</td>
<td>0</td>
<td>m</td>
<td>m</td>
</tr>
<tr>
<td><strong>Serves Visitors</strong></td>
<td>M</td>
<td>0</td>
<td>0</td>
<td>r</td>
<td>m</td>
</tr>
<tr>
<td><strong>Conducts Seminars &amp; Conference</strong></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Conducts Research</strong></td>
<td>m</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Translation Services</strong></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>r</td>
</tr>
<tr>
<td><strong>State Of Art Report</strong></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Critical Reviews</strong></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Critical Compilations</strong></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

M = Major activity, m = Minor activity, r = Rare Activity, 0 = No activity.
Thus the information system is a complex network of facilities which collects, process, store, make available for retrieval and disseminate scientific technical information intended to meet the needs of the users in industries, research institutes, educational institutes, Government sectors etc. Ideally such a system should provide for effective information transfer that meets the need of the whole community of the users in some optimal fashion at a minimal cost to the society.

In general the development of large scale information systems requires the consideration of two factors. 1) Organisational and 2) Technical. Then the certain considerations which ideally should be common to all to design and to be part of any system design objectives.[6] These considerations are:

1) The design and structure of the information system should have maximum flexibility.

2) Design should promote effective co-operation between all sorts of service within the system.

3) The information technical personnel and technological resources should be utilised in an optimal fashion.

4) The design should promote in greater compatibility and standardisation.

5) Exchange of information between different information systems should be facilitated.
2. THE FEATURES OF AN INFORMATION SYSTEM.

The features of an information system can be analysed from the following points:[7]

Predictability
Measurability
Complexity
Specification, estimation and verification.

2.1 Predictability.

One of the main users of the models is to predict the behaviour of a system on systems output in response to certain inputs or certain changes in the internal information system. The construction of models which could be used to predict systems between on how dense the conceptual fabric of empirical laws and theories reflecting various dependent variation and parameters that are operating the system. Empirical science which study information or processes that are much less developed and or knowledge of loss of sufficient generality involving concepts of time and effect.[8]

2.2 Measurability.

It has been claimed that science begin with measurement. Science advances in theory and technology of measurement. In particular discovery of scientific laws and theories in their abstracts and measurable forms constitutes the backbone of predictive models. This presupposes the capability to measure
quantitative properties which occurs in various modes of such laws. Unfortunately, the capability to measure information and its various forms as well as the capability to measure their variable is yet to be accomplished scientifically. Importance of information studies is considerably becoming closer to the capability of physicists or chemists or hardware engineers to measure what is of prime concern to their endeavour. Except for measurement of providing or physical carrier of information such as signal propagation velocity, wave amplitude or channel capacity which have been developed in the physical science. Most other aspects of measurement in particular measurement of semantic information and measurement of pragmatic information are not at all well developed.[9]

The inability to measure effectively important variables of semantic or pragmatic nature has a negative effect not only on the design of unpredictable models but on modelling of information systems. It also limits significantly our capability to implement efficient optimisation procedures in the system design.[10]

In the design of information system the criteria of performance often applied in practice or cost of processing, time required to perform an activity, optimal utilisation of certain resources and activities. In the design of information system effective performance criteria such as minimal cost is a function of selected important variables, namely quality of information, retrieval precision or relevance. Such
performance criteria will be reliable only to the extent that
the variables appear in it are satisfactorily measurable. As a
simple example if the performance criteria for an information
system is to deliver highly selective information of top value
relation to the needs of the users. It serves as a minimum cost.
This criteria could be effectively used in modelling or design
optimisation if and only if there were well developed procedures
and methods to measure information value. But as we have seen
this variable as well as most of the others which naturally would
appear in preferable criterias are exactly the ones which are
difficult to measure.[11]

2.3 Complexity.

It goes without saying that information system is a complex
system in every respect. It is complex because of its size and
variety of different components it encompasses namely; the
documentation centres, libraries, archives, data collection
facilitators, communication functions, networks and distribution
centres. It is further complex because of the intricate system
of information it embodies the interaction among its facilities
resulting from information processing and other operational
requirements, interaction between information users and the
system interactions between regulatory and other Governmental
agencies and the system. Interaction between suppliers of
information, information acquisition and information processing
facilities. Finally it is complex because of variety of
intangible factors involved such as; institutional/organisational
structure, cultural influences, human factor considerations and
the like. Needless to say modelling such a complex system, drastic simplification, consequently established theories of phenomena under investigation are at least sufficiently well founded theories and hypothesis indicating the maximum permissible indicators in the construction of models are necessary for successful modelling. It has been shown that the effectiveness of modelling increases substantially if the series different of similarity factors used in modelling procedures. They may be used in the construction of modelling and the transfer of its results to the system being modelled. But such a theory is yet to be developed in modelling such complex system and the process involved in the information system.[12]

2.4 Specification, Estimation & Verification.

In addition to the considerable difficulties in deciding which variable out of the great multitude present in the information system should be considered in constructing the system model or construction of modular modes involving function diversity decision regarding from the specifications of function relationships, the degree of dependence or independence, the function of mathematical equations etc. Further more variables which play the role of parameters in the mathematical model of a system need to be estimated because of the model is properly specialised. It will still not give the quality system or real system without estimating parameters. Unfortunately, many of the parameters of the information system are difficult to estimate either because of measurement problem which have been measured
earlier or because of difficulty of obtaining sufficiently a representative data for good estimation.[13]

The last but not the least there is a difficult problem of verification of information system model. Because of wide reaching simplifying assumption, which need to be made into modelling systems. It is necessary to correlate the precise criticality in odds to verify whether the model is sufficiently good representative of the actual system. But such criteria besides being are to confirm or often impossible to apply in practice.

Their application may be too costly and more important. They may either require too long time for reliable implementation. Otherwise because of suspected jumping to conclusions derived from data which is not sufficiently representative.[14]

Thus it is discovered that, there are some basic problems and difficulties involved in the design of the information system. Some select approaches towards developing a model of information system have been discussed. But unfortunately there is no simple and easy way of solving the design problem by a single method known so far. Therefore this process asks for a challenge to develop an information system model which can help approximate an ideal information system.[15]
3. IMPLEMENTATION OF INFORMATION SYSTEM.

The development of an information system and its implementation requires some of the following requirements that are necessary for implementation.[16],[17]

1) Variety of information in the knowledge or information gathering phase.

2) The ability of associate the information to its utility phase.

It is obvious that variety of information should be collected and stored in the information system. Because this is what the user wants in the area of which the expertise is decentralised.

Since variety of information from many information suppliers has been collected and stored and many of these are independent ones which are not being connected it is necessary for the information system for various connecting system and provide a processed information at the utilisation phase.

In order to affect such association case based reasoning has been applied to user memory of the relevant past cases (experiences) to interpret or solve a new problem case. Key technical elements involve cases and past experience (memory) ways to retrieve them and get it indexed and assess their relevance. Similarity or difference as the case may be and as much as the various techniques to modify the past experience have been analysed. Although indexing is the basis of this method it
is practically impossible to select appropriate indices in order to retrieve past relevance experience because the task in this field are rather broad in scope and somewhat ill-structured.

Issues of Implementing Information System.

The following six major issues are involved in the implementation of information system

3.1 The Problem Selection.

Selecting suitable problems are dominant is the important task for success for information system.

3.2 Collaboration With Suppliers of Information.

The distinguishing feature of an information system is that it cannot be successfully implemented without a collaboration of group of information suppliers.

3.3 Information Processing Techniques.

Many techniques and tools have been developed for processing information. The system should have access to pick and choose any one of the tentative available information processing.

3.4 Users of the System.

Users are sometimes reluctant to use the system which they have not created. Therefore it is necessary for users to think and they have participated in developing such a system.
3.5 Updating System.

Since information is growing in volume, size and varies continuously, it is necessary to keep it updated for continuous usage by its users.

3.6 System Improvement.

Since information system uses new technologies, new tools, techniques and consequently new current ways of integration of all this into a system is very much necessary.[18]

3.5 STRATEGIES FOR SUCCESSFUL IMPLEMENTATION OF INFORMATION SYSTEM

Strategies for information system implementation covers the following steps;

4.1 Planning.

4.2 Problem selection. - An information system should try to encompass large complex multi-speciality field of achieve requirement of variety of information.

4.3 Information gathering. - A give and take principle can be used to achieve collaboration of knowledge supplier, it is because suppliers are users of the information system.

4.4 Information processing techniques. - Some new techniques should be created to connect in different and separate specialities. Some of the techniques can be listed as follows:

1) Information base - That stores expert knowledge.
ii) A computer influence function which users use its knowledge base logically.

iii) Human associate ability - Which users uses the knowledge base intuitively.

iv) User commitment - the goal of let the user think they have developed the system is easily achieved in the information system design. Since the users are also information suppliers and the information system as a core system the users can think that they have built the system. Therefore user participation in the concerned management is of more importance.

v) System maintenance practice - Updating of information system is based on users needs for updating knowledge and the development of new knowledge in the universe of knowledge.

vi) System improvement - it is recommended that the information system users intake system improvement based on the feedbacks received about the system. In this way you can connect to the information suppliers as the persons who use information itself. Of course they should also correct some of the information which can cover the areas which can help to the community itself.
5. CONCLUSION.

In short an information system should be able to provide the correct information to the users of the system. It should be capable of keeping up to date information and develop search strategies on information standards which can be used for an information system. Based on the conceptual framework provided for the information system operations, we shall now discuss the resources needed for organisation of such a service. The use of information technology is discussed in the next chapter.
REFERENCES

1. DAVIS (G B) AND OLSEN (M H).
   Management information systems

2. EPISKOPOU (D M) AND WOOD HARPER (A T).
   Towards a framework to choose appropriate information system approaches.
   Computer Journal, 29; 1986; 3.

3. FELDMAN (P) AND MILLER (D).
   Entity model clustering: structuring data model by abstraction.
   Computer Journal, 29; 1986; 3.

4. HIRSCHHEIM (R).
   Information systems epistemology: An historical perspective.

5. RAO (V) AND ZUNDE (D).
   Technique of modelling large scale science and technology information systems.
   New Delhi, DSIR, 1980.

6. OLLE (T W) AND et al. Eds.
   Information systems design methodologies: Improving the practice.
   Amsterdam, North Holland, 1986.

7. ZUNDE (P).
   Modelling natural science and technology information systems (NSTIS): Problems and prospects.
   New Delhi, DSIR, 1980.

8. PORTER (M E) AND MILLAR (V E).
   How information gives you competitive advantage.

9. LYYTINEN (K).
   A taxonomic perspective of information systems development: Theoretical contracts and recommendations.

10. JAYARATNA (N).
    Normative information model based systems analysis and design (NIMSAD): A framework for understanding and evaluating methodologies.
11 PARSONS (T) AND SHILLS (F).
Towards a general theory of action.
Massachusettes, Harvard University Press, 1951.

12 TEICHROEW (D) AND HERSHEY (E A).
PSL/PSA : A computer aided techniques for structural
documentation and analysis of information processing
systems.

13 FITZERALD (G) AND et al.
Feature analysis of contemporary information methodologies.

14 KLEIN (H K) AND HIRSCHHEIM (R A).
A comparative framework of data modelling paradigms and
approaches.

15 LAND (F).
Evaluation of system goals in determining a design strategy
for a computer based information system.

16 WILSON (B).
Systems, concepts, methodologies and applications

17 DAVIS (W S).
Systems analysis and design : A structured approach

18 MADDISON (R N), Ed.
Information systems methodology,