CHAPTER 5.
FINDINGS CONCLUSIONS AND
SUGGESTIONS
5.1 Findings Conclusions and Suggestions

The researcher after undergoing an exploratory and descriptive study of Hospital Information System Software and visiting the hospitals found that the study was intensive and reveals interesting facts about the Hospital Information Systems provided by the software companies which are available in the market.

5.1.1 Major Findings

Findings Related to Software Companies:
30 software companies were visited and the developers filled up the questionnaires, and web sites of software houses were visited, which revealed features of the software developed for the hospitals with regard to modules available, features etc. The researcher has studied the software of 30 software companies for purpose of clarity as explained in Para 3.2.

5.1.2 Modules in the Software

The following modules are available for all major transactional functions of the hospital as explained in Para 4, all the software have following modules:
1. Registration.
2. OPD Management.
4. Appointment, Scheduling.
5. IP Billing(Insurance included).
7. ICU Management.
8. Auto Discharge, Transfer.
10. Patient Care Management.
12. Store Management.
15. Doctor Accounting.
16. HR Management.

Table 4.4 shows the various modules available in Hospital Management Software. On an average out of 18 modules each software company has any of these 16 modules. The modules which are not available in some software are Interfacing (EPBAX and Web-Enabled report).

In addition to these modules the other features and facilities like the following are available which are explained in Para 4.6:

1. Securities
   Logical: Software lock, Password Authentication, Access right.
2. Recovery and backup scheduling.
4. User Training.
5. Software Upgradation.
6. Software integration with the existing legacy software of the hospital.
7. Flexibility, to the changing needs of customers.
8. Software portability.
9. Meeting deadlines.
10. Unique features of software.
11. Forward & Backward scalability.
12. Hardware & Software requirement.

5.1.3 SOFTWARE COMPANIES

Type of Software
27.5% software companies have the facility to make Tailor made hospital management (HMS) software whereas 72.5% software companies have standard HMS software as seen in the Table 4.5.
5.1.4 Type of Securities
The following securities are available. Software lock is available in 100% companies, Password Authentication is available in 100% companies, Access Right is available in 100% companies, Hardware lock is available in 95% companies, Security guard is recommended in 90% companies, Card reader is available in 82.5% companies, Biometric is available in 72.5% companies. Fire wall is available in 100% companies according to the Table 4.6.

5.1.5 Recovery and Backup
92.5% the HMS software companies have provided recovery back up and 7.5% companies have not provided recovery and backup scheduling as per Table 4.7.

5.1.6 Generating Required Information on Time
77.5% software companies have provided the feature for generating required information for patients (schedule of doctors), 95% software companies have provided feature for generating required information for patients (billing details) as per Table 4.8.

5.1.7 Annual Maintenance Contract
A majority of 90% HMS software companies have annual maintenance contract for own HMS, 32.5% software companies have AMC contract for other software also as per the Table 4.9.

5.1.8 Software Upgradation
All of the HMS software companies have upgraded their software for HMS on a regular basis, 30% HMS software companies have upgraded their software in 0 to 6 months, 47.5% HMS software companies have upgraded their software in 6 to 12 months, 17.5% HMS software companies have upgraded their software in 12 to 18 months and 5% HMS software companies have upgraded their software in 18 months and above as revealed in Table 4.10.

5.1.9 Hours of training
20% companies provide training of 1 to 30 hours (5 days), 32.5% companies provide training of 30 to 60 hours (10 days), 40% companies provide training of 61 to 90
hours (15 days). 7.5% companies provide training of 91 hours & above (16 days & above) as per Table 4.18.

5.1.10 Integration with the Legacy system
67.5% software companies have integrated HMS software with the existing legacy software of hospitals whereas 32.5% software Companies have not integrated their HMS software with the existing legacy software of hospitals as seen in Table 4.11.

5.1.11 Mode of communication with clients
The mode of contact with the clients is, 100% companies communicate with clients through e-mail, 100% companies communicate with clients through Telephone, 57.5% companies communicate with clients by visiting the site as revealed in the Table 4.12.

5.1.12 Software Flexibility according to need of clients
95% software companies are flexible according to needs of customers whereas only 5% software companies are not flexible according to needs of customers as explained in Table 4.13.

5.1.13 Software Portability
All 100% software companies have HMS software portable across platforms according to Table 4.14.

5.1.14 Customer Satisfaction
100% software companies have declared that their customers are very satisfied as revealed in The Graph 4.16.

5.1.15 Meeting Deadlines.
77.5% HMS software companies have met deadline given by clients whereas 22.5% software companies have not met deadlines given by clients as per The Table 4.15.

5.1.16 Forward and Backward Scalability of HIS Software.
85% software companies have declared that they provide forward scalability, 72.5% software companies have stated that they provide backward scalability and 57%
software companies have declared that they provide both forward and backward scalability as revealed in The Graph 4.17.

5.1.17 Hardware requirements
As explained in Para 4.19. The following hardware requirements are given for HMS software of single user environment.

RAM: The HMS software companies have recommended at least 512 MB RAM is required for software.
Processor: At least 1.6 GHz. Dual Core is required for the software.
Hard- Disk: At least 80 GB Hard Disk is required for the software.
Operating System: The operating systems may be Windows XP Which is currently available in the market.

The following hardware requirements of server are given for HMS software of multiple user environment.

RAM: The HMS software companies have recommended at least 3 GB RAM for server.
Processor: At least 1.6 GHz. Dual Core.
Hard- Disk: At least 80 GB Hard Disk.
Operating System: Most of the HMS software companies have recommended the operating systems may be Windows XP.

5.1.18 Computerization in Hospitals
As explained in Para 3.2 the visits to the hospitals revealed important insights about the use of computer technology and the software’s specially designed for the hospitals, about training given to the users of the software and about the advantage the software gives in decision making to top management, and how it aids in giving better services to the patient. Record keeping becomes a lot easier. Providing of information to all levels of users for medical or administrative staff becomes the major advantage.
5.1.19 Opinion of Top management of Hospitals
5.1.20 Availability of Software
85.1% top management personnel have stated that HMS software is available in hospital whereas 14.9% top management personnel have stated that HMS software is not available in hospital as per Table 4.20.

5.1.21 Degree of Computerization
20% top management personnel have stated that all 18 modules are available, 37.5% top management personnel have stated that 15 modules are available, 27.5% top management personnel have stated that 11 modules are available, 15% top management personnel have stated that 6 modules are available according to Table 4.21.

5.1.22 Size of Hospital
20% top management personnel have said that they have 10-100 beds, 40% top management personnel have said that they have 100-200 beds, 35% top management personnel have said that they have 200-300 beds, 5% top management personnel have said that they have bed size 300 & above as can be seen in Table 4.22.

5.1.23 Availability of timely reports generated by software.
Table 4.26 concludes that 70% top management personnel have got the required reports on time and 30% top management personnel have not got the required reports on time by the HMS software.

5.1.24 Rating of Reports required
The top management personnel have rated the following reports as per Table 4.24.
1) Must have  2) Desirable  3) Can do without it.

Patient Report: 90% top management personnel have said must have, 7.5% have said desirable and only 2.5% have said that they cannot do without the report.

Supplier Report: 67.5% top management personnel have said must have, 20% have said desirable, 5% have said they cannot do without the report.
Findings Conclusions & Suggestions

**Doctor & staff Report:** 100% top management personnel have said must have, none have said desirable none have said they cannot do without the report.

**Insurance Report:** 82.5% top management personnel have said must have, 15% have said desirable, 2.5% have said they cannot do without the report.

**Company tie-up report:** 77.5% top management personnel have said must have, 15% have said desirable, 7.5% have said they cannot do without the report.

**Government Reports:** 55% top management personnel have said must have, 3.5% have said desirable, 10% have said they cannot do without the report.

**Pharmacy Report:** 92.5% top management personnel have said must have, 7.5% have said desirable, none have said they cannot do without the report.

**Bed Occupancy Report:** 90% top management personnel have said must have, 2.5% have said desirable, 7.5% have said they cannot do without the report.

**Accounts Report:** 97.5% top management personnel have said must have, 2.5% have said desirable, none have said they cannot do without the report.

**Surgery Report:** All 100% top management personnel have said must have, none have said desirable, none have said they cannot do without the report.

**Inventory Report:** 80% top management personnel have said must have, 12.5% have said desirable, 7.5% have said they cannot do without the report.

**Housekeeping and Mess Report:** 65% top management personnel have said must have, 20% have said desirable, 15% have said they cannot do without the report.

**Equipment maintenance Report:** 52.5% top management personnel have said must have, 27.5% have said desirable, 20% have said they cannot do without the report.
Blood bank report: 50% top management personnel have said must have, 30% have said desirable, 20% have said they cannot do without the report.

5.1.25 Most of the reports supplied by HMS software
92.5% top management personnel have answered in the affirmative about getting majority reports on time by the HMS software and 7.5% TOP management personnel have answered in the negative about getting majority reports on time by the HMS software as concluded in Table 4.25.

5.1.26 Availability and Decision making on the basis of reports
70% top management personnel have got most of the required report on time by the HMS software and 30% top management personnel have not got most of the required reports on time by the HMS software. Table 4.26 concludes that 70% top management personnel have agreed that the reports help in decision making 30% top management personnel have not agreed for the same as seen in Table 4.26.

5.1.27 Budget reserved for up gradation of software
A large majority top management personnel, 90% personnel have stated that they reserved some budget, whereas 10% they didn’t reserve some budget for the up gradation of software annually according to table 4.41.

5.1.28 Criteria for Choice of software
70% top management personnel have specified selection criteria economic feasibility, 10% personnel have specified selection criteria competition, 2.5% personnel have specified selection criteria friends suggestions and 17.5% has specified others selection criteria, as per table 4.28.

5.1.29 Awareness about EMR (Electronic Medical Record).
From Table 4.29 we can see the top management’s awareness about the advanced technology like Electronic Medical Record is discussed where top management personnel, 82.5% personnel have stated that they are aware about EMR Electronic medical record, whereas 17.5% personnel have stated that they are not aware about EMR (Electronic medical record).
5.1.30 Implementation of EMR
52.5% personnel have stated that they have implemented EMR (Electronic Medical Record), whereas 47.5% personnel have stated that they have not implemented EMR Electronic Medical Record as per Table 4.30.

5.1.31 Contribution of Reports in decision making
Amongst top management personnel, 70% personnel have stated that the reports were contributing in decision making, whereas 30% personnel have stated that the reports were not contributing in decision making according to the table 4.26.

5.1.32 Users views on HMS software
The users of the HMS software in the hospitals which work generally in a dedicated EDP section have also given their opinion regarding the HMS software. 120 users constitute the respondents.

5.1.33 Availability of modules
Following modules are available as per Para 4.4 for Hospital Administration. As per Table 4.31, out of 120 users, for Registration :- 100% users are using this module, OPD Management :- 72.5% users are using this module, Casualty (Emergency) :- 75% users are using this module. Appointment Scheduling :- 80% users are using this module. IP Billing :- 47.5% users are using this module. Ward Transaction :- 55% users are using this module, ICU Management:- 64% users are using this module, Auto Discharge/Transfer :- 26.6% users are using this module, Operation Theatre :- 98.3% users are using this module, Patient Care Management :- 70.8% users are using this module, Clinical Support Management :- 22.5% users are using this module, Store Management :- 87.5% users are using this module, Financial Accounting :- 92.5% users are using this module, General Administration :- 75.8% users are using this module, Doctor Accounting :- 8.3% users are using this module, Patient Care Management:- 70% users are using this module HR Management :- 59.1% users are using this module, Decision Support System :- 70% users are using this module, (MIS) Report, Interfacing . EPBAX , Web-enabled report :- 75.8% users are using this module.
5.1.34 Modules sufficient for functioning.
42.5% users have said 10 modules are sufficient for functioning, 32.5% users have said 12 modules are sufficient, 2.5% users have said 3 modules are sufficient, 20% users have said 20 modules are sufficient, 2.5% users have said 3 modules are sufficient as seen in Table 4.32.

5.1.35 Number of Training Hours
15% users have received training of 1 to 30 hours (5 days), 40% users have received training 30 to 60 hours (10 days), 32.5% users have received training of 61 to 90 hours (15 days) 12.5% users have received training of 91 hours & above (16 days & above) as per Table 4.33.

5.1.36 Training provider
80% users have received training of HMS by software providers, whereas 25.9% users have received training of HMS by system administrators as per Table 4.34.

5.1.37 Satisfaction level by the training given
47.5% software users of hospitals are highly satisfied with the training provided to them. 30% software users of hospitals are satisfied with the training provided to them, 5% software users of hospitals are neither satisfied nor dissatisfied with the training provided to them, 10.8% software users of hospitals are dissatisfied with the training provided to them, 6.7% software users of hospitals are highly dissatisfied with the training provided to them as per Table 4.35.

5.1.38 Opinion about performance of HMS software
35.8% software users have rated the software as very good, 32.5% software users have rated the software as good, 15% software users have rated the software as average. 10.8% software users have rated the software as not so good, 5.8% software users have rated the software as poor as per Table 4.36.

5.1.39 Improvement in user’s performance by usage of software.
80.8% which is majority of software users have agreed that their performance in the hospital has improvement due to the usage of HMS software while 19.2% software
users did not agree that their performance in the hospital has improvement due to the usage of HMS software as indicated in Table 4.37.

5.1.40. Whether all aspects of hospital administration are covered by HMS software
64.2% software users stated that all aspects are covered in HMS software whereas the remaining 35.8% software users stated that all aspects are not covered in HMS software as indicated in Table 4.38.

5.1.41. Advantages of HMS software
According to Table 4.39 the following advantages are revealed.

Avoids Documentation: 20% software users have given rank 1 for this advantage, 12.5% software users have given rank 2, 5% users have given rank 3, 10% users have given rank 4, 21 users have given rank 5, 18% users have given rank 6, 15% users have given rank 7, 9% users have given rank 8.

Time Saving: 26.6% software users have given rank 1 for this advantage, 15% users have given rank 2, 17.5% users have given rank 3, 12.5% users have given rank 4, 1.6% users have given rank 5, 2.5% users have given rank 6, 5% users have given rank 7, 10.8% users have given rank 8.

Data is Systematic: 14.2% software users have given rank 1 for this advantage, 5.8% users have given rank 2, 10.8% users have given rank 3, 13.3% users have given rank 4, 19.1% users have given rank 5, 22.5% software users have given rank 6, 7.5% software users have given rank 7 for this advantage, 6.6% software users have given rank 8 for this advantage.

User friendliness of software: 17.5% software users have given rank 1 for this advantage, 7.5 users have given rank 2, 26.6% users have given rank 3, 9.2% users have given rank 4, 6.6% users have given rank 5, 2.5% users have given rank 6, 20% users have given rank 7, 10% users have given rank 8.
**Reduces Medical Error:** 4.2% software users have given rank 1 for this advantage, 15% software users have given rank 2 for this advantage, 14.2% software users have given rank 3 for this advantage, 10% software users have given rank 4 for this advantage, 22.5% software users have given rank 5 for this advantage, 17.5% software users have given rank 6 for this advantage, 5.8% software users have given rank 7 for this advantage, 10.8% software users have given rank 8 for this advantage.

**Security of data & recovery:** 7.5% software users have given rank 1 for this advantage, 4.2 users have given rank 2, 15.8% users have given rank 3, 20.8% users have given rank 4, 26.6% software users have given rank 5, 11.6% software users have given rank 6, 2.5% software users have given rank 7, 10.8% software users have given rank 8 for this advantage.

**Data is easy to retrieve:** 0.8% software user has given rank 1 for this advantage, 6.6% users have given rank 2, 14.2% users have given rank 3 for this advantage, 9.2% users have given rank 4, 8% users have given rank 5, 22.5% users have given rank 6, 19.1% users have given rank 7, 20.8% users have given rank 8.

**Multi-User Environment:** 11.6% software users have given rank 1 for this advantage, 10% users have given rank 2, 15% software users have given rank 3, 7.5% users have given rank 4, 6 users have given rank 5, 14.2% users have given rank 6, 30% users have given rank 7, 6.6% users have given rank 8.

**5.1.42. Frequency of failure of HMS software**
47.5% software users mentioned that the HMS software fails once in a month, 25.8% users mentioned that the HMS software fails once in two months, 21.7% users mentioned that the HMS software fails once in three months, 5.0% users mentioned that the HMS software fails once in four months as per Table 4.40.

**5.1.43. Time taken by the software company to rectify the failure.**
43.3% software users have stated that the software vendor takes 1-2 days to rectify the software failure, 30.8% users have stated that the vendor takes 3-4 days, 16.7% users have stated that the vendor takes 4-6 days, 9.2% users have stated that the vendor takes one week & more to rectify the software failure as per table 4.41.
Doctors Views on HMS Software

5.1.44 Doctors get required information on time
90% doctors stated that they get required information on time whereas the remaining 10% doctors revealed that they didn’t get required information on time. In conclusion majority of the doctors get required information on time as shown in Table 4.42.

5.1.45 Software helps in medical management
97.1% doctors stated that the software help doctors in medical management whereas the remaining 2.9% doctors revealed that the software didn’t help doctors in medical management as shown in Table 4.43.

5.1.46 Medical error reduction
70% doctors stated that the software contributes in reduction of medical error whereas the remaining 30% doctors revealed that the software has not contributed in reduction of medical error as shown in Table 4.44.

5.1.47 Finding Patient Data (past and Present)
78.6% doctors stated that the software help doctors in finding Patient Data (past and present) whereas the remaining 21.4% doctors revealed that the software didn’t help doctors in finding Patient Data (past and present), as per Table 4.45.

5.1.48 Most helpful modules
35.7% doctors feel that the most useful module is Appointment, 27.1% doctors feel that the most useful module is Diagnosis, 24.3% doctors feel that the most useful module is Treatment, 12.9% doctors feel that the most useful module is none of the above as per Table 4.46.

5.1.49 Doctors Suggestions about features of software
5.1.50 Need to add modules in future.
- Referential diagnosis.
- Medical Imaging & RFID.
- Morgue Management.
- Electronic Medical Record (EMR).
• Voice recognition.
• Medication Management.
• PACS. (Picture Archival).

5.1.51 Patients views on computerization of Hospitals
As explained in table 4.101. The following issues were raised with the patients at various hospitals.
- Opinion about service quality provided by hospitals.
- Ease of getting various kind of information on-time.
- Efficiency of computerized system.

5.1.52 Opinion about service quality provided by hospitals.
65.8% patients have opined that the service quality provided by hospitals is excellent, 22.5% patients have opined that the service quality provided by hospitals is average, 11.7% patients have opined that the service quality provided by hospitals is poor as per Table 4.49.

5.1.53 Availability of timely information
As per Table 4.50, patients opinion about having got following information.

Doctor Appointment: 79.1% patients have stated that they get required information regarding doctors’ appointment on time.

Billing related information: 84.1% patients have stated that they get required billing related information on time.

Treatment related information: 59.1% patients have stated that they get required treatment related information on time.

Past records: 35% patients have stated that they get required information regarding past records on time.
5.1.54 Efficiency of Computerized System

24.2% patients have rated the efficiency as 0-20%, 21.7% patients have rated the efficiency as 20-40%, 21.7% patients have rated the efficiency as 40-60%, 15.8% patients have rated the efficiency as 60-80%, 16.7% patients have rated the efficiency as 80-100% as per table 4.51.

5.2 Conclusions

Based on Study and Observations

It can thus be seen that deploying IT can help the medical profession in improving its quality of service and thus automatically increasing the preparedness and defensiveness. Of course, it is of vital importance that the software must have the right type of modularity and openness so that it is manageable, maintainable and upgradable. The hardware should also be reliable, available and have the necessary performance capacity. Certainly, computers with their intrinsic power can play a major role in a hospital. Computers can act as a communication link between departments and allows the common database to be shared by them. They can perform the complex task of matching, tabulating, calculating, retrieving, printing and securing the data as required. Well designed, integrated computer system can be a great tool in the hands of the hospital management in improving services, controlling cost, and ensuring optimal utilization of facilities.

5.3 Hospital Size

During discussions with hospital staff of all levels and on site observations many facts were revealed which need to be highlighted. Computerization involves a lot of investment of time, money and technology along with it the expertise which is required for the operation of technology. It has been clearly revealed in the pilot study itself that small hospitals having 30 beds and less do not have adequate need of computerization as the volume of data is small and the manual system serves the purpose well and it is not economically feasible. The smaller hospitals do not have the resources to go in for computerization, and in larger hospitals there is a need because of the huge volume of data which needs to be stored and maintained for various purposes as well there are adequate funds to implement the technology, they are also in a better position to hire expert personnel required for the smooth functioning of the
setup, and also ensure that they are trained to operate the software. The multi specialty hospitals having a large number of patients visiting, and a large volume of data so they feel the need to computerize processes, whereas hospitals with just a few departments like gynecology feel that since the number of times a patient may visit is maximum twice feel it unnecessary to implement HIS, and store any information regarding the patient and medical history on computer they would rather do it manually, also here the question of medico-legal cases does not arise. An accident hospital would register mostly medico-legal cases and may need special modules to tackle the same.

5.4 Technical Unawareness
In small hospitals Tally seems to be the favorite choice for computerizing account related data. MS-OFFICE with MS-ACCESS is the popularly used software for storing patient records and other typing and billing related requirements. Medical staff seem to be having barrier for using computerization majority doctors did not trust the data entry operators of the system.

5.5 Software Supplier Support
The doctors who were interviewed showed a lot of dissatisfaction regarding small time software vendors not supporting after sales service and hence a lot of frustrations were endured by them. The quality of after sales service of the software company should be very reliable.

5.6 Economic Recession affecting computerization
The recent economic recession had its toll on the small time software vendors who went through a tough time providing service to hospitals at that time and many hospitals suffered as a result, and the medical staff was very unhappy in that period.

5.7 Resistance to Technology
The senior doctors as is the case normally showed a lot of resistance to computerization, technophobia may be the reason. Acceptance of users to technology needs a lot of convincing and motivation as regards the advantages of computerization. The senior doctors were of the opinion that more than implementation of advanced technology it is very important that the person using the
system may be of immense intellect as is the requirement of medicos, else implementation of advanced technology, leaves us with poor results, as starting with data entry the user needs to be highly alert as the data scenario is very crucial involving health and well being of patients. Some of them showed dissatisfaction with users of the system who are non medicos.

5.8 Tailor Made Vs Custom Software
The hospitals mostly buy their software which is custom software from the big software companies in the market, only the small hospitals will look for a small vendor to make a tailor made package for only the most necessary modules to store data and information needs of the hospital, they are not ready to buy a more expensive software as also there is a lot of recurring and operating cost involved. And the EDP section of the hospital has computer staff doing data entry and other data management but with the assistance of the software vendor, as and when required. The doctors too have access to certain modules which they need to maintain themselves. Many top management personnel were also seen to operate the HIS themselves. Regular upgradation of software is done to incorporate newer features of the hospital as well as new technology. Data privacy and security issues are as per directives of the HIPPA compliance. Also the medical fraternity has directives from AIIMS for maintaining ethical practice which will include that of the data relating to medical patient history, which need high level of security.

5.9 Barriers in Implementation of HMS
Technophobia, lack of training and expertise among the workforce, inappropriate and poorly designed systems and user interfaces, and constant churn turnover are a few of the significant workforce and human factors in the healthcare industry.

5.10 Factors Affecting Computerization
Business-related barriers such as costs, complexity, depth, and size of the problem, disaggregating of the affiliated systems, lack of or unacceptable business models, return-on-investment ROI projections, and forecasting tools have caused a great deal of ennui and skepticism in the industry
5.11 Suggestions
The researcher after analyzing the scenario of hospitals and software houses has made an attempt to give an insight, as far as discrepancies and loopholes are prevalent in the current situation which will help in the overall implementation of technology and has given probable solutions which are simple to implement.

5.12 Integrated Solution
Effectiveness of health institutions, hospitals depend greatly on its goals and objectives, strategic locations, soundness of its operations and efficiency of management systems. To incorporate these factors a hospital Information System has to have total integrated solution for real time Hospital Management. The solutions may be comprehensively designed by expert Doctors and Health Care Specialist to work across any scale of Hospitals. Even the users who are non medicos may be given certain exposure to medical terminology so that there is no medical error from their side.

5.13 HMS helps Research
The research regarding hospitals becomes easier as the electronic medical records and also other data are available in electronic format which will make clinical research and all other medical and non medical research on all aspects of hospital information a lot more easier, as all data is available and any researcher has easy access to it.

5.14 HMS enhances Data Warehousing and Data Mining
The computerization will not just assist in storing of records but will also mean having the data available for research. The idea is to optimize patient care and record all case papers. But it throws up several other interesting aspects like clinical research and access to all sorts of data. The research students, doctors and industry at large will greatly benefit from this kind of storage of data records as this will be available for ready reference and analysis for any kind of medical and general research and for reference for government agencies for medico-legal cases and other related research.
5.15 **HMS a base for ERP- EMR (Choosing the HMS)**

There is a huge number of HMS software available in the market. The hospital could start from purchasing the basic modules and can increase the modules to be computerized as time passes and may finally go in for ERP EMR which is the need of the hour. Also medical imaging integration, artificial intelligence based expert systems online medical diagnosis and treatment, referential diagnosis over the internet, is the higher end availability which if incorporated may be a boon for efficient hospital management. Report generation, aiding decision making is fine as per observations. Computerization reduces medical error to a large extent. Adherence to HIPAA and EDI (Electronic Data Interchange). Usage of wireless application protocols (WAP), personal digital assistants (PDA’s), and mobile and wireless handheld devices and appliances that healthcare practitioners and doctors can use very effectively in a variety of ways. The developments in the micro and remote sensing capabilities, including geographical information systems GIS, global positioning systems GPS, and telemonitoring, will lead to exciting possibilities for ubiquitous real-time surveillance and monitoring systems that will have enormous implications for personal and public health professionals. Unfortunately, often the outcome of computerization of healthcare struggles is that healthcare organizations are left with redundant or non-compliant technology or are confused by the variety of choices and conflicting marketing claims.

5.16 **The researcher suggests a variety of ways that technology can be incorporated including:**

1) Using networked systems that can increase efficiency in business and administrative tasks,

2) Adopting common platforms and applications standards for streamlining the business processes,

3) Combining data warehousing and intelligent systems for reductions in the incidence and severity of errors,

4) Accessing enterprise-wide data sources that allow for improvements in the quality and quantity of products and services, improvements in the efficacy of care, and added value through improved efficiencies and mining the data and information,
5) Using systems that allow for decision support through business modeling and simulations,
6) Deploying enterprise-wide communication systems that enable education, training, and continuing education,
7) Developing linkages with members of the healthcare supply chain, and implementing end-to-end tracking and monitoring systems for the management of illnesses and diseases.

5.17 Information available due to HMS (Right to Information).
The process of computerization is helping the fifth objective of information providing to a very large extent, as users from all level of management even the patients are getting all the required information doing full justice of providing information. The recent law of right to information is enabled effectively due to all the data being available as a central repository in the HMS which can be retrieved and given to the seekers of the information whosoever may seek it, including the patients, government officials, police department, Income Tax people etc.

5.18 Computerization of small hospitals.
These hospitals do not have multi specialty divisions and have bed size of less than 100, so the requirement is not high, but even then they could computerize some major functions like admission, diagnosis & treatment and billing if not all the functions. Many software companies are providing facility where the hospitals can buy a few if not all the modules of the HMS as the need may be and upgrade the HMS as and when the need arises.

5.19 Suggestion to software companies.
Hospitals mainly being non-profit organizations catering to patients which is no doubt a noble task. Considering this and the limited budget many hospitals have reserved for automation, the software houses may price their software reasonably and this will not only lead to an increase in the number of clients the software house gets in the form of hospitals also the hospitals will be able to avail of the technology advantage, enabling them to serve patients better.
5.20 HMS Makes Hospitals More Hospitable.
The hospital may adapt itself to the changing demands with changing times. The ambience of the hospital may be such that patients entering the hospital may feel satisfied. This can be brought about by improvement in infrastructure like garden, color schemes in rooms that improve healing, educative posters and literature suitable to appropriate age group of patients. Such infrastructure improvements go a long way in attracting patient’s comfort level. Basic services like ambulance, wheel-chair, trolleys, oxygen, water, hygienic surrounding may be available and maintained properly. Reduction of waiting time also is important for making hospitals hospitable, and using the HMS software will definitely help in reduction of waiting time leading patient care.

5.21 HRD - Job Rotation Policy benefiting computerization
Quality of the service depends upon the efficiency and intelligence of the staff. Selection of staff for the healthcare organization has to be done very cautiously. Outpatient services including that of emergencies and casualty services which project the hospital’s image in the public may be very efficient and curative. Rotation of jobs may be done at fixed intervals so that everyone knows all the jobs. The service may be so good that the patient’s may recommend the hospital to others. The medical staff also could be encouraged to use the HMS software instead of only the EDP section who are now operating the HMS. The users could also learn more about the functions of the hospitals and get familiar with the medical terminology.

5.22 Staff Training leading to efficient use of HMS software
Periodic training may be given to the appropriate staff and it may be on a concurrent basis. Training, right from induction of staff, may be given so that they understand the organization, the nature of work, the systems and procedures to be followed. This instills a sense of commitment in the staff. Quality circle may be implemented in every hospital. This offers a fertile ground for staff to learn new things and the management can get feedback based on which improvements can be made. A committed staff can give excellent results to the organization. Refresher training may be imparted to the staff from time to time to enhance their skills with the latest technologies by way of workshops and seminars.
5.23 **HMS enhances Patient Relationship Management (PRM).**

The importance of patient in service delivery is to educate and reward patient. As the hospitals are equipped with patient data in detail, they could be used appropriately on different occasions. Hospitals may make a note of next check up and inform the patient about it while planning future course of action. Reminders may be posted to patients regarding follow-up checks through alerts on the e-mail, mobile phones etc. This strengthens the bond between the hospital and the patients. Rewards can follow in terms of patronage, and reputation of the hospital for timeliness of treatment in the eyes of public will be enhanced. Most hospitals do not follow the practice of patient feedback after discharge. This has to be taken compulsorily to enable the management to gauge service quality and improvement in service if any.

5.24 **HMS an aid for Medical Tourism.**

The use of HMS software with the advantage of Electronic Medical Record, Medical Imaging, can be easily transferred across the globe for opinion of other experts in other countries helping Medical Tourism in a big way, which will help our country to generate revenue in the medical field. Until a few years ago, the healthcare industry had not consolidated its position as it is today. The advancement in healthcare delivery technology coupled with low cost as compared to the western countries has put India on the medical tourism destination of many countries. Cost of healthcare in the United States is ten times that of the cost in India. Moreover, patients have to wait for a long period for operation due to shortage of specialist doctors considering their geographical spread. That is not the case in India. Pune has an advantage as a low cost, high-quality center for healthcare. This cost advantage would not only bring direct purchase of healthcare, but would encourage spending on travel, lodging and boarding thus earning precious foreign exchange. This message could be spread through the many embassies India has in foreign countries.

5.25 **HMS helps ISO 9002 Accreditation.**

ISO 9002 use a structured and user-friendly set of systems, which allows staff at all levels of the hospital to follow simple procedures. It is self-audit & inculcates discipline that is expected at the industry level. This makes the complex tasks easy and efficient. Hospitals may strive for accreditation of ISO 9002 so that their image at the national and international level is enhanced and recognized. Moreover, various
Findings Conclusions & Suggestions

health insurance companies require such accredited hospitals on their panels to deliver their cashless settlement plans due to transparency. Government may lay broad guidelines on basic minimum requirements of hygiene to standardize hospitals. Most of the wards in the government hospitals are over-crowded and patients have to sleep on the floor. Government must ensure that hospitals are planned 10 years ahead in sight and provide for extensions accordingly. Allocation of funds to augment these plans may be done on realistic basis. Automation of all hospital information will streamline the processes making accreditation a lot easier.

5.26 **HMS an aid for Pandemic Preparedness.**
Health departments across the country may form health exchanges HIE’s to share data to support nations public health needs and for early detection and rapid response to potentially catastrophic infectious disease outbreaks and other public health emergencies like the recent swine flu epidemic.

5.27 **Legacy System Interoperability.**
The major cost factor in implementing HIS is the interoperability with legacy systems the HIS may enable easy interoperability between the parts of information which are already automated.

5.28 **The use of HMS for Digital dictation software, Medical Transcription & Voice Technologies.**
The HMS may incorporate digital dictation voice recognition for the doctors and other staff of hospitals to enter data accurately and thereby reducing medical error, reducing time for correspondence, medical transcription. This reduces time of entering data as well as verification.

5.29 **Validation and Verification of safety critical software.**
As the patient data requires a high amount of privacy and security in addition integrity (correctness) of data is very important and also data entry mistakes must be checked, so the programmers and users must have a process of certification as they are using software which is critical and the data should not have following anomalies:

a) Data which appears timely and accurate but is not.
b) Data that is not posted- incomplete record.
Findings Conclusions & Suggestions

c) Data posted to the wrong patient.
d) Errors in computerized protocols and decision support tools and reports.

5.30 Patient Protection and Affordable Care Act (PPACA).
Emphasis on transparency and new standards regarding reporting about quality, patient and consumer safety, efficiency and ties with insurance companies, increased focus and scrutiny of business practices and compliance with the new regulations will benefit patients and also lead to profitability. Security measures should be maintained as per the HIPAA act.

5.31 HMS based Health Portals
A web enabled health portal may be facilitated at district levels and public health data capturing on a monthly basis, as against other data collection systems that provide health related information after long intervals of time, must be incorporated. An initiative of the ministry of health and family welfare, the Health Management Information System (HMIS) interface therefore, involves health officials at the district and state level uploading health-related data on a monthly basis on the HMIS portal online. The HMS software will help in obtaining success for this type of portal, with online access. This will facilitate information sharing between all stakeholders in healthcare.

5.32 IT in Telemonitoring & Telecommunication devices
The in-home telemonitoring uses telecommunications devices placed in patients’ homes to take their vital signs every day. Using a voice and text prompt, a telemonitoring system keeps track of a patient’s vital signs including heart rate, oxygen levels, blood pressure and weight. The vital sign measurements are transmitted via a regular telephone line back to a computer at the Hospital. The information is monitored and reviewed by a registered nurse dedicated to that task each day. Staff can see how patients are doing in their homes from the home office on days that they don’t visit the patient. In turn, abnormalities are caught before they are full-fledged problems.
5.33 Sharing patient safety data.

Surgical complications drop at hospitals that share patient safety data. The collaboration of hospitals in terms of identifying and disseminating information about best practices is actually a much more effective way of improving quality than just relying on each hospital alone to come up with what they think is a way to improve quality. More hospitals sharing data is urged.

5.34 SUGGESTED SOFTWARE DESIGN

The researcher after analyzing the total scenario of hospitals and software houses has attempted to give an insight, as far as discrepancies and loopholes are prevalent in the current situation which will help in the overall implementation of technology and has given probable solutions which are simple to implement. Effectiveness of health institutions, Hospitals depend greatly on its goals and objectives, strategic locations, soundness of its operations and efficiency of management systems. To incorporate these factors a hospital Information System has total integrated solution for real time Hospital Management. The solutions may be comprehensively designed by expert Doctors and Health Care Specialist to work across any scale of Hospitals.

5.35 A hospital needs an integrated Solution, which

- Helps in Efficient Management of the Hospital.
- Enhances Patient Care.
- Improves work efficiency.
- Improves Central Control.
- Eliminates the chances of any Pilferage.
- Enables the Growth of the Hospital.
- Fully informs the Vital Information of the Hospital.
- Provides lesser dependency on middle & Lower Management. Full control on the staff.
- Take corrective actions based on the data instantly.
- Helps you to Plan any future activity.
- Ultimate Aim – Better Patient Care with Efficiency.

It must provide a wide range of knowledge-based and technology based solutions for hospitals, healthcare institutions, and service providers in the government as well as
private sector. These services include consultancy for Hospital Planning and Management, Medical Audits, Quality Accreditation Processes, Business Process Re-engineering with Change management, Work Flow Optimizations, and Total computerization. The core competency is in its in-depth understanding of issues related to providing quality healthcare services and evolving processes and best practices which are incorporated in its comprehensive and integrated healthcare information solutions:

5.36 **Suggested modules in a HMS software**

The researcher suggests following module in addition to the existing modules in the HMS.

- Hospital / Clinic Management Systems.
- Electronic Health Records Systems.
- Lab Information Management Systems.
- Radiology Information Systems.
- Picture Archival & Communication Systems.
- Tele-radiology & Tele-medicine.
- RFID solutions for security and tracking.

5.37 **The HMS must cater to the following**

- Chain of Hospitals and Clinics and Medical Colleges.
- Chain of Laboratories & Diagnostic Centers.
- Chain of Blood Banks.
- Hospitals & Clinics.
- Laboratories & Diagnostic Centers.
- Blood Banks.
- Super-specialty surgical Centers.
- PACS integrated with LIS/ HIS/ EMR.
- Digital ECG storage and review.
- OT/ OT light camera / C-arm./ Endoscope image integration.
5.38 **User Training for efficiency of usage of HMS**
Since the medical staff is not well versed with computer technology, awareness programs and orientation are highly recommended to begin the process of computerization. Then the reservations they have may be cleared highlighting the advantages of computerization, and how it would be the ideal tool for Better Patient Care with Efficiency. The proper usage of HIS may be given to hospital staff at all levels.

- Provide motivational lectures on the use of computers.
- Train the entire staff over the web and save on training costs while still having the same high quality training and support.
- Training Webinars online training using internet.
- Hybrid Training comprises of training over the web and also at the site.
- Have part of your training onsite at your facility or the software house and the rest online.
- Provide online help manuals.
- Provide ample manuals.

5.39 **Scope for Further Research**
- The researcher in this study has only considered computerization of transactions of basic modules in hospitals.
- The purely medical processes and their computerization is beyond the scope of this research and concepts like medical imaging, computerized online diagnosis, artificial intelligence based expert systems for online diagnosis, referential diagnosis, telemedicine and integration into the Electronic Medical Record of Hospital Information Systems is scope for further research can be a very interesting study.
- The Unique Identification Number for each citizen which is to given to each person will include medical data of citizens. This incorporation can also be studied. Also the area which is restricted to Pune could be expanded to other cities in the country.
- RFID and BIOMETRICS in hospital management is an interesting area of research.
- Medical tourism is an upcoming area which can be explored.
Financing healthcare by the insurance company and other finance companies and their role can be an area of exploratory research.