

CHAPTER 3:

REQUIREMENTS CAPTURING

3.0 Requirements Capturing

3.1 Introduction

Chapter three namely discusses the methodology used in this research. Priority is given to research methodology, followed by data collection design, data processing and finally analysis on the outcomes. Quantitative method is used for this research where there is a description of data explaining the current status of this sort of system. The survey done has no hypothesis to test.

The purpose of this research is to collect data on patient history, collect relevant information on types of analysis important for the physician, other medical staffs and even the public. Therefore, it is a quantitative study. This method is suitable with the problem statements of the research.

Other than that, this chapter also describes the feasibility study for functional and non-functional requirements for the system to be developed based on the requirement analysis and specification.

3.2 Research Methodology

The research is based on the survey method. A survey is a retrospective study of a situation to try to document relationships and outcomes [Prileeger, 1996]. The data for research questions was obtained through questionnaires. To collect all the necessary data, the researcher had used three sets of questionnaires based on the problem statement. The questionnaires are sent to the recipient either via Electronic Mail or manually posted.

Face to face interviews were also conducted on the requirements phase. In order to gain the proper feedback from the interviews, a set of questions were prepared before hand. Other than having a fixed list of questions, which the user must answer, the interviews conducted were also flexible, whereby the researcher had a list of questions but pursued certain threads of discussion depending on the response of the user.

3.2.1 Data Collection

Data should be collected with a clear purpose in mind. Not only a clear purpose but a clear idea as to the precise way in which they will be analyzed so as to yield the desired information [Moroney, 1950]. Therefore the data was obtained using a standardized questionnaire that had been pre-tested. Interviews were conducted namely in the private and government hospitals.

The data was collected from doctors, medical assistants, nurses, and administrators in the Information Technology Department as well as the statisticians from the Statistical Department at the respective hospitals and clinics.

The consent to collect the relevant data in each selected hospital was obtained from the respective management. Permission to carry out research at the respective hospitals was obtained through the Medical Ethical Subcommittee, as some of the medical data are confidential. Malaysian Medical Association (MMA) was also approached for assistance and cooperation.

3.2.2 Form Design

Only one requirement gathering form was designed to gather all information relevant to develop a medical system with statistical package (STATA) incorporated. The questionnaire comprises of two sections. The questions of the first section are constructed to study the usage of statistical package. The second section is aimed at gathering comments and recommendations from the users of the current system at their respective medical centers.

The questions in the first section (i.e. Section 1) are of the close-ended type and open-ended type. The open-ended type of questions allows the users to give open comments or recommendations. The questions in the next section (i.e. Section 2) are of the open-ended type. Table 3.1 summarises the section title as well as the total number of questions formulated in each section for the requirements gathering form. A copy of the requirements gathering form is included in Appendix A of this report.

Table 3.1: Section Title, Question Type and Total Number of Questions in Each Section

Requirements Gathering Form			
Section	Title	Question Type	No. of Questions
1	Statistical Analysis	Close-ended and Open-ended	13
2	Overall Aspect of the System	Open Ended	5
Total No. of Questions :			18

3.2.3 Pilot Test

A pilot test was conducted to test the design of the requirements gathering form. This form was distributed to selected private clinics near University Malaya for review and comment. Based on the feedback received from the three sets of

requirements gathering form, revisions and changes were made. The questions were put in proper order, relevant questions were grouped together, and the format of the questionnaire was reconsidered. This is to ensure that the questions are relevant, simple, and easy to understand in order to answer appropriately.

3.2.4 Administration and Processing of Questionnaires

In a questionnaire survey, proper administration of the questionnaires is necessary. This is to confirm that there is high level of participation and cooperation. Prior to answering the requirements gathering form, a brief instruction was given to the responders regarding the purpose of the survey and type of the questions in the form. The answered requirements gathering forms were checked for completeness before conducting analysis.

The administrator at the computer/ IT department of the participating medical centers completed each set of questionnaire. The data from completed questionnaires were coded manually into the spreadsheet. Data derived from the questionnaires were collected, enumerated and presented in tables, figures and narrative. The data collection outcomes and analysis are presented at the section 3.3 below.

3.3 Data Collection Outcomes and Analysis

This section presents the analysis of the data collection outcomes of the eighteen requirements gathering form received. The number and percentage of the forms distributed and responses received from the participants' are shown in Table 3.2 below. The survey investigates the participants' views on the current system in

use at their medical centers. This includes the participants' comment on the functions/features of the current system, the security aspect, ease of learning and the limitations. Furthermore, the survey also investigates the participants' opinion on the statistical analysis.

Table 3.2: Number and Percentage of Questionnaires Distributed and Responses Received From the Selected Medical Centers

Medical Centers	Number of Questionnaires Distributed	Percentage Distributed (%)	Number of Responses	Percentage Responded (%)
Government Hospital	12	37.5	8	44.4
Private Hospital	10	31.3	6	33.3
Government Clinic	4	12.5	2	11.1
Private Clinic	6	18.8	2	11.1
Total	32	100.0	18	100.0

Table 3.3: Survey on the Number and Percentage of Computer System Used and Statistical Analysis at the Medical Centers

Type of Survey	Number of Respondents		Percentage of Respondents		Number of Respondents		Percentage of Respondents	
	GH	PH	GH	PH	GC	PC	GC	PC
No. of centers involved in recording patient history manually	2	1	25.0	16.7	1	0	50.0	0
No. of centers that use computerized system to record patient history	6	5	75.0	83.3	1	2	50.0	100.0

No. of Medical centers that use statistical package to analyze data but the package is not incorporated to the system	6	5	100	100	1	1	100	50.0
No. of centers that have statistical package incorporated to the current Medical system	0	0	0	0	0	0	0	0

Keys: GH – Government Hospital, PH – Private Hospital, GC – Government Clinic, PC – Private Clinic, No. - Number

Based on the table above, conclusion can be made that 77.8% of the surveyed medical centers use computerized system to keep track of patient history. Participants' have also stated that besides recording patient history other relevant information such as patient's age, race, gender, earlier treatments, family history, medications and referring physicians were recorded.

A total of 72.2% participants' have marked yes for using a statistical package to analyze patient history. Most of the medical centers use the statistical package, SPSS to analyze their medical data. Only 7.1% of participants use the Microsoft Excel Spreadsheet to analyze the necessary data. According to the data collection outcomes, none of the participated medical centers have statistical package incorporated to the medical information system.

The number and percentage of those individuals involved in performing the analysis are shown in Table 3.4 and illustrated in Fig. 3.1. The individuals are referring physicians, consulting physicians, nurses, administrative staffs and others.

Table 3.4: Number and Percentage of Individuals Involved in the Analysis Process

Individuals Involved in the Analysis	Number of Respondents	Percentage of Respondents (%)
Referring Physician	5	27.8
Consulting Physician	8	44.4
Nurses	0	0
Administrative Staffs	3	16.7
Others (Medical Students, Researchers)	2	11.1
Total	18	100.0

Keys: Adm. – Administrative

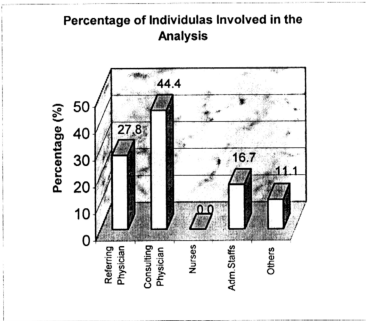


Fig. 3.1: Percentage of Individuals Involved in the Analysis Process

Fig. 3.1 above shows that of the eighteen participants, 5 (27.8%) referring physician, 8 (44.4%) consulting physician, 3 (16.7%) administrative staffs and 2 (11.1%) of others perform the statistical analysis. Other users here are medical students and researches related to the field.

A cross-analysis of the findings pertaining to the participants’ ratings on the level of usefulness of the statistical analysis and ease of carrying out the analysis is shown in Table 3.5 and represented graphically in Fig. 3.2 and Fig.3.3.

Table 3.5: Ratings on the Usefulness and Ease of performing analysis

	Very Useful	Useful	Moderate
Usefulness of statistical analysis	15 (83.3%)	2 (11.1%)	1 (5.6%)
	Easy	Moderate	Difficult
Ease of performing analysis	4 (22.2%)	12 (66.7%)	2 (11.1%)

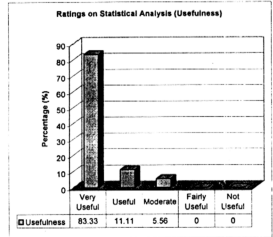


Fig. 3.2: Usefulness of Statistical Analysis in Current System

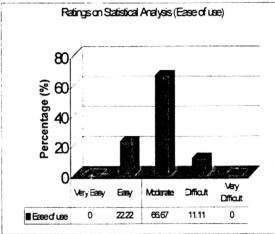


Fig. 3.3: Ease of Performing Analysis in the Current System

Table 3.6 below shows the findings on the questions in section two of the requirements gathering form. The questions are mainly on the overall aspect of the current system in participants’ organization. The ratings on the ‘ease of use’ of the current system are shown in Table 3.7.

Table 3.6: Ratings on the Current System

Survey Questions in Section 2	Number and Percentage of Responses		
	Yes	No	No Comments
Essential feature current system should have	4 (22.2%)	5 (27.8%)	9 (50.0%)
Essential function current system should have	5 (50.0%)	7 (38.9%)	6 (33.3%)
Consideration on security feature	13 (72.2%)	2 (11.1%)	3 (16.7%)
Limitation in the current system	3 (16.7%)	9 (50.0%)	6 (33.3%)

Among the suggested functions and features that should be included in the current medical system are statistical analysis, reporting, sorting, and billing. Some participants have also commented on the limitations of the current system. The limitations include poor security measure, slow processing, and difficulty to carry out analysis.

Table 3.7: Ratings on the 'Ease of Use' of the Current System

Ratings	Very Easy	Easy	Moderate	Difficult	Very Difficult
Ease of Use	1 (5.6%)	5 (27.8%)	7 (38.9%)	4 (22.2%)	1 (5.6%)

Participants rating on the 'Ease of Use' of the current system in their organization are represented graphically in Fig. 3.4.

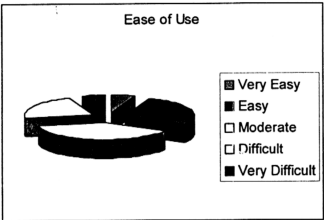


Fig. 3.4: 'Ease of Use' of the Current System

The survey results of the Requirements Gathering Forms, were used as a prerequisite for the following sections. The limitations of the current system were considered in developing the AZ-PHis system. The following sections describe the functional and non-functional requirements of the system to be developed.

3.4 Requirement Analysis

A requirement is a feature of the system or a description of something that the system is capable of doing in order to fulfill the system's purpose [Pfleeger, 1998]. A requirement not only describes the flow of information to and from the system but also the constraints on the system's performance. Requirement elicitation is critical part of the process. This is because variety of techniques should be used to determine user's need and customer's want. Requirements identify the *what* of the system where else the design identify the *how* of the system.

Requirements definition is a complete listing of everything the customer expects the proposed system to do. It represents an understanding between customer and developer of what the customer needs or wants and it is usually written jointly

with developer. On the other hand, the requirement specification restates the requirement definition in technical terms appropriate for the development of a system design. Fig. 3.5 shows the process of determining requirements.

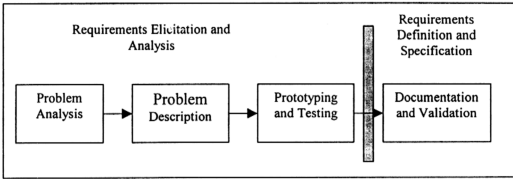


Fig. 3.5: The Process of Determining Requirements

Requirement Specifications

The requirements of AZ-Phis system can be divided into two categories. They are functional requirements and non-functional requirements. Functional requirements describe how the AZ-Phis system applications interact with its operating environment. On the other hand, non-functional requirements are the limitations on the system that narrow the choices that can be made for implementation.

3.4.1 Functional Requirements

A functional requirement describes an interaction between the system and its environment. Since the requirement describes a system's behavior, hence the functional requirement also explains *how* the system should behave when given certain stimuli.

An authentication and authorization process is vital to this system to protect its database from the non-authorized user. In order to access patients' data in the administration section, a user identity and password are required. This process is necessary to establish a secure communication between the user and the server.

Administration Section

The administration section of AZ-Phis system consists of six primary modules:

- Registration Details Management
- Discharge Details Management
- Payment Summary
- Change Password
- Add/Delete User
- Analysis Using the Statistical Package, STATA®

Each of these main modules contains sub-modules as a functional requirement of the Analyzing Patient History System. The key functions are as follows:

1. Registration Details Management

The purpose of this module is to input patient data or create new record. This module also allows the administrative staff to update existing data and delete records that are not wanted.

2. Discharge Details Management

Allows the administrator to add discharge details for the particular patient. This includes details on patient history. Data pertaining to the discharge details can also be updated or deleted if necessary.

3. Payment Summary

This module is to keep information on payment after the patient has been discharged. The reason of discharge is also stated here.

4. Change Password

An administrator is able to change the password if he/she wants to. To enhance security aspects, the password has to be confirmed.

5. Add/Delete User

An administrator can add new user or delete a current user from the system. This function enables the administrator to keep track of the current users of the system.

6. Analysis Using the Statistical Package, STATA [Stata, 1999]

Provides the solution for performing various analyses such as linear regression, ANOVA, Robust, and Correlation. It assists the user in analyzing the patient history faster and efficiently.

Client Section

The client section consists of five main modules as below:

1. Search by Registration Number or Identity Card Number

Users are able to search for patient ward by entering the registration number or identity card number of that particular patient.

2. Keyword Searching

This module allows user to enter word(s) to be searched by name or patient history. The keyword searching can be done either on general or specific race. If the option specific race was chosen then the race has to be specified.

3. Report Generation

Generate reports that will aid decision-making of physicians, nurses, medical students and researchers.

4. Display Charts

Line, bar or pie charts can be produced to analyze patient history by gender, age, race, and disease. These charts simplify the analyzing process and give a clear overall picture.

5. Bookmark Facility

Allows users to login or logout into the bookmark section, insert bookmark on the particular patient details using patient ID, and edit bookmark if necessary. The edit bookmark function includes the deletion of the bookmark.

6. Help Function

A user can use the help facility to seek help on provided modules.

The functional requirement for integration of all these modules is that all these modules provide their services in an integrated environment. The integration covers the flow of data among the systems used and front-end integration. The front-end integration includes the user interface integration. Integration should also allow modules to be added in future in order to increase the usefulness of the system.

3.4.2 Non-Functional Requirements

A non-functional requirement or constraint describes a restriction on the system that limits the choices for constructing a solution to the problem arise. The

constraint usually narrows the selection of language, platform, implementation technique or tools; however, the selection is made at the design stage, after the requirements have been specified. The following are key non-functional requirements for the Analyzing Patient History system.

Portability

Portability refers to the capability of the system to operate on various platforms regardless of manufacturer or operating system. The implementation of Analyzing patient History System involves integration of many tools and uses component-based technologies provided primarily by Microsoft. Therefore, the portability of the system applications is dependent upon the support of these technologies by various platforms. At this moment, due to the restrictions on support of these technologies, the implementation of AZ-Phis system is restricted to the Microsoft Windows platform. However, this situation might change in the future as support for Microsoft technologies grow.

Reliability

[Schneidewind, 1972] defines software reliability as the probability that a program will operate successfully for at least time "t." The application system. software and hardware shall be reliable and shall not cause unnecessary and unplanned downtime of the overall environment. Each time an error is detected, it should be successfully rectified in order to improve the reliability of the system.

Maintainability

Maintainability is the ease with which a program can be corrected if an error is encountered, adapted if its environment changes, or enhanced if the customer desires a change in requirements [Pressman, 1997]. Effort should be taken to locate and fix an error that occurs in a program.

Flexibility

Flexibility refers to the system's ability to adopt new technologies and resources as well as implementation in changing environments. As the project's implementation is based on client server architecture, it will be easy to modify the operational program.

Usability

The application systems shall be easy to use. They shall enhance and support rather than limit or restrict business process. Human interfaces shall be intuitive and consistent within themselves in purpose and use.

User Friendliness

If a program is not "user friendly" it is often doomed to failure, even if the functions that it performs are valuable. Therefore, the user interfaces of the system should be easy to understand and user-friendly.

Scalability

Scalability refers to the ability of the system to migrate to machines of greater or lesser power, depending upon the need, without much change to the underlying components. Due to client-server application and chances to enhance the system to web-based application, the scalability issue can be addressed rather well by separating the key modules. Each module can run on separate machines that can be expanded or contracted as well as run from within a single machine. Database scalability issues can be resolved using distributed database architecture.

Unity of Environment

The Analyzing Patient History System must appear to the user as a single working environment and not an amalgamation of distinctly separate units. As such there must be a standardized interface design as well as standardized method for function invocation by the user.

3.5 Summary

This chapter overall views the requirements capturing process. This includes research methodology for data gathering and result analysis as well as the requirement analysis. Requirement analysis is mainly on the requirement specification, which can be divided into functional and non-functional requirements.