CHAPTER 4

RESEARCH METHODOLOGY

4.1 OVERVIEW

Methodology refers to the identification and application of a set of processes, methods and tools that can consistently and predictably lead to software development success (Peckham and Lloyd, 2003). In this project, different methods were used to aid in the literature review, system development, system testing, data collection and analysis.

The processes, methods and tools used to meet the objectives of this project are illustrated in Figure 4.1 and described in subsequent sections.

![Figure 4.1: The research methodology for this project](image-url)
4.2 LITERATURE REVIEW AND SELECTION OF THEORIES

In this project, a review of the literature helps to provide information on issues concerning personality traits, leadership styles, career guidance and system development. Various sources such as the World Wide Web were used to obtain articles, journals, magazines and books on the relevant topics.

After the literature review is completed, the appropriate personality traits, leadership styles and career guidance theories will be adopted. This is explained further in Chapter 3.

4.3 REQUIREMENTS GATHERING

Requirements study is done to identify the features which need to be available in the application when it is delivered at the end of a project (Wiegers, 2006). In this project, the functional and non-functional requirements were gathered.

The functional requirements describe the functions that the system is supposed to perform from. Non-functional requirements describe the technical requirements of the system and other requirements that are not functional. All requirements are collected, documented, reviewed, and revised in an iterative manner. Detailed descriptions on the requirements gathering and analysis are documented in Chapter 5.

Figure 4.2 illustrates the requirements study approach of this project.
4.4 SYSTEM DESIGN

System design lays down the blueprint of the PL-Analyser system, which will form the foundation for the development of a good product. Chapter 5 documents the use case of the PL-Analyser system. This use case will then be detailed in Chapter 6 to produce the system architecture, database tables and stored procedure definitions, user interface designs, class diagram, sequence diagrams, activity diagrams. In the system design phase, the programming standards for the system will be set.

4.5 SYSTEM DEVELOPMENT

This project will adopt a variation of the system development life cycle (SDLC) methodology to meet the stated objectives. SDLC is a way of thinking about developing and implementing IT systems (Heldman and Cram, 2004). The SDLC methodology requires that analysis, design, development, testing, and deployment be done in a structured manner, thus ensuring that the deliverables meet the requirements.
To ensure that the layout, flow and functionality of the user interfaces are accurate, prototyping methods will be used during the development phase. Prototyping will increase the chances of first-time and long-term success of the application (McConnell, 1996).

A variation of the system development approach adopted in this project is illustrated in Figure 4.3.

![Figure 4.3: A variation of system development methodology used](image)

The process above was adopted from the traditional SDLC of analysis, design, develop and test phases (Evans, 2004). The analysis, design and deployment phases follow a linear path, while the crucial stages of development can be carried out interactively to reveal and immediately solve gaps in expectations. Testing is performed once development work is complete.

### 4.6 SYSTEM TESTING

System testing is important to ensure that PL-Analyser is production-ready (Loveland, 2005). Testing will be separated into functional and non-functional tests.
Functional tests will help ratify if PL-Analyser meets the requirements gathered during the requirements gathering phase. Functional tests will be performed based on a set of test scripts and with the help of a minimum of 30 volunteers.

Non-functional tests will help ratify if the components that make up PL-Analyser is capable of good performance and is able to serve a large number of users. Non-functional tests will also help to identify errors in coding, broken Web links and areas of the system that may pose security threats. Non-functional tests will be performed using tools such as Microsoft Application Centre Test and Web Link Validator.

The scope and results of the tests performed on PL-Analyser are documented in Chapter 7.

4.7 SYSTEM HOSTING

After the PL-Analyser system is subjected to functional and non-functional tests, the system will then be hosted on servers and open for user access. The PL-Analyser system can be hosted in two ways. The first and preferred way is to host the PL-Analyser system in a computer in the Faculty of Computer Science and Information Technology, in University of Malaya. However, if this preferred option is not feasible due to reasons such as unavailability of computers, then the second option can be chosen. The second option will be to host the PL-Analyser system using a third party Web hosting service.

4.8 DATA COLLECTION

Data collection will begin when PL-Analyser has been hosted successfully in a server. Owing to cost and time constraints, a minimum of 200 sets of data will be collected for analysis. In order to make this possible, data collection will be performed in the following ways:
i. Website publishing, whereby the PL-Analyser system will be hosted for public access. This is the primary data collection method as the PL-Analyser system will be more widely accessible. People will be invited to participate. Invitation for participation will be via emails, word of mouth and general advertisement on Web discussion groups and Web-based notice boards.

ii. Distribution of printed survey questionnaires to the general public. This is a secondary data collection method, and will only be used by participants who do not have the means to access the PL-Analyser Website. A sample of the questionnaire is contained in Appendix A.

4.9 DATA ANALYSIS

Data analysis will begin after the required 200 data sets have been collected. The results of data analysis are documented in Chapter 8. Data analysis will be performed under three categories:

i. Overall summary of the analysis will provide insight to the composition of the sample collected. The sample population will be broken down by religion, age group, management level, educational level and ethnicity. Participants will also evaluate the accuracy of the results of the analysis.

ii. Summary of the results of the analysis for individuals will provide insight on their personality traits, leadership styles and career possibilities. In addition, a series of trend chart can be used for analysis of traits and leadership styles of participants over time.

iii. Summary of the organisational analysis will focus on data breakdown of the participants within an organisation. Data reports are similar to the overall summary analysis. However, data scope will be focused on individual
organisation. Data collected will also be analysed to understand the distribution of participants’ scores within each organisation. Thus, every participating organisation can understand how their employees are scattered across a scale of capability when analysed by factors such as gender, ethnicity, age group, religion, educational level and management level.

4.10 SYSTEM DEVELOPMENT TOOLS AND TECHNOLOGY

The Web-based PL-Analyser system was developed based on a 3-tier architecture, which is explained in Chapter 6. Each tier has different requirements, and thus, it is necessary to select the tools carefully to develop the system. The tools listed in Table 4.1 were selected to develop the PL-Analyser system.

Table 4.1: Tools selected to develop PL-Analyser

<table>
<thead>
<tr>
<th>Application Tier</th>
<th>Tools selected for this project</th>
<th>Reason why tools are selected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating system</td>
<td>• Windows Server 2003.</td>
<td>• Tight integration with rules and presentation tier application.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Ease of deployment and maintenance.</td>
</tr>
<tr>
<td>Database</td>
<td>• MS SQL Server 2000.</td>
<td>• Easy to deploy.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Easy to manage database objects and maintenance plans.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Capable of handling estimated data load.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Good connection APIs with .NET programming tools.</td>
</tr>
<tr>
<td>Web server</td>
<td>• ISS 5.0.</td>
<td>• Pre-packaged with OS.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Good integration with operating systems.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Nimble programmability.</td>
</tr>
<tr>
<td>Programming tools</td>
<td>• Microsoft .NET.</td>
<td>• Extensive library, especially in the area of graphics processing.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Seamless integration to operating system and application servers.</td>
</tr>
</tbody>
</table>
4.11 SUMMARY

This chapter describes the methodologies adopted and the reasons for selecting it. This chapter also describes the strengths and weaknesses of system development tools and technologies, and justifies the tools selected to develop PL-Analyser.