CHAPTER 3
METHODOLOGY

3.1 Introduction
In this chapter, the research method, population, sample, research instrumentation and data analysis are discussed. The information systems development methodology used to develop the e-BSC is also specifically described.

3.2 Research Methods
This research used a case study research design to perform facts finding procedures on the Faculty of Computer Science and Information Technology, University Malaya which was selected as the unit of analysis. The study used mixed methods, incorporating both quantitative and qualitative data-gathering methods, to obtain further information and requirements for the proposed system. For qualitative research, a review on the university’s official strategic planning documents, in depth interviews with the parties concerned and observation on the current staff PM system were conducted to produce necessary qualitative understanding of what methods of improvements that can be implemented. Meanwhile, for quantitative research, a cross-sectional survey was conducted on a sample representing the population of study.

3.3 Research Instrumentation
In order to understand the practice of the university, official strategic planning documents provided by the Strategic planning and Development Unit (SPU) of the Corporate planning Division in University Malaya (UM) were reviewed to have a better comprehension of the top management aspirations. Among the official documents reviewed was the university’s strategic steps, UM KPI/ Scorecard, UM strategy map,
UM corporate level scorecard. Please refer to Appendix B for the sample of the university’s official documents. To maintain the confidentiality of these documents, only the first page of each document is presented in the said section of the Appendices.

To further aid the research, primary data was also collected using interview and survey questionnaire as the main means of instrumentation for the data gathering process. An interview, using audio recording, consisting of 20 questions (Appendix C) was held with the SPU division of UM to obtain information regarding the strategic planning practice in the university. The open-ended questions entailed subject-matters concerning:

i. The strategic planning process practiced in UM, people involved and the role of the balanced scorecard in this process.

ii. Period for the strategic planning process.

iii. Period for formal review of performance and gap analysis.

iv. External and internal evaluation performed prior to formulating new or reviewing existing strategies.

v. Inputs used in formulating new and existing strategies.

vi. Method of cascading newly formulated strategies to all levels of staff.

vii. Setting KPIs for each academic staff (to be integrated into individual scorecards).

viii. Elements of process improvements in the subsequent years’ targets.

ix. Response and action taken for underperformance.

x. Obstacles faced during strategy formulation and execution.

xi. Obstacles faced in PM efforts.

xii. Constitution of an “Excellent Lecturer”.
xiii. View with regards to the development of e-BSC to manage and measure the excellence of lecturers.

xiv. UM’s hopes for an ideal PM system for lecturers.

The verbatim statements by the SPU division for the interview session are attached in Appendix D.

To obtain further clarifications, interviews with questions similar to those posted to the SPU were also conducted with a previous and the present dean of the Faculty of Computer Science and Information Technology (FCSIT) of UM to identify tactical planning methods performed at the faculty level. The responses obtained from all the interviews were used to analyse the consistency of information from all parties and observe if tactical planning at lower levels are parallel to top level aspirations. In addition to that, queries with regards to the constitution of an excellent lecturer were put forward to all interviewees to gain insight of the responsibilities of the academic staffs in the university. The questions put forward to the previous and current deans are shown in Appendix E. The verbatim statements by the deans for the interview session are attached in Appendix F.

Meanwhile, questionnaires were handed out to selected lecturers in FCSIT to seek potential end-user requirements for the proposed system. The findings obtained from the survey, interviews and questionnaires are discussed in Chapter 4. Meanwhile, an observation on the PM system used currently by the university was also carried out.
3.4 The Case Study

The Faculty of Computer Science and Information Technology (FCSIT) of UM was established in September 1994, prior to being a Computer Centre for teaching and research of Computer Science and Information Technology from 1969 to 1993. By 1997, the faculty established 4 departments namely Artificial Intelligence, Software Engineering, Information Systems and Library Science and Computer Systems and Technology. Currently, the faculty offers 4 Bachelor of Computer Science and Bachelor of Information Technology programs to undergraduates. On the other hand, there are 5 postgraduate programs offered namely Doctor of Philosophy, Master of Computer Science, Master of Information Technology, Master of Library and Information Science and Master of Software Engineering.

Based on current rankings from international rankings for educational institutions, local universities have to improve the current situation (Hamid, 2007). Measures have to be taken to ensure better performance is produced. Therefore, this study attempts to discover a method that can possibly solve the current situation.

3.5 Demographics for Survey Questionnaire

For the survey questionnaire, the population for this research include lecturers serving in public higher learning institutions. Since this is case study on providing new means of measuring the performance of lecturers in a higher learning institution, only FCSIT was selected as the unit of analysis to observe the requirements of and the response to the proposed system. A judgment sample of lecturers in FCSIT who currently hold or previously held positions of head of departments in the faculty were selected for the survey besides lecturers who have served in the faculty for at least 3 to 5 years were chosen to participate in the survey.
Unlike random sampling where given a population size, there is equal opportunity for any element in the population to be selected, judgment sampling is done using the discretion of the researcher. Judgment sampling sometimes called a non-probability sample or purposive sampling uses the researcher’s personal judgement in selecting the participants for the survey based on certain characteristics (Fraenkel and Wallen, 1990). The basis for selecting judgment sampling over random sampling is to ensure accurate and representative information is gathered for the research area (Marshall, 1996). The sample for the study had to be lecturers who have served a minimal of three years in the faculty, have held leadership positions and most of all, are well aware of the practice in the faculty and the current and previously used staff PM systems. In addition to that, the current and previous head of departments among the selected participants would provide necessary information from the point of view of staff performance reviewers.

With judgment sampling, the interpretation of the results will also be useful for the qualitative understanding of the issues studied where drawbacks as well as strengths of the current PM system can be examined. As stated by Deming (1966, p. 11), ‘The usefulness of data from judgement-samples is judged by expert knowledge of the subject matter and comparisons with the results of previous surveys, not from the knowledge of probability’. The author also mentioned that in pilot researches, it is typical and more practical for judgement sampling to be carried out to get an estimate of how receptive and feasible the research will be, as demonstrated by the research conducted by The Paul Coverdell Prototype Registries Writing Group (2004) and Tuoghy (2003). Instead of using a full-fetched probability survey, a trial survey would be adequate for pilots due to the reason that a completely unbiased random sample may
result in providing responses that do not truly represent the target population (Kish et al., 2003, p. 10).

Further research can be conducted after the end of this study by carrying out a survey on random samples of all lecturers in UM to compare the results of the case study and results from the subsequent survey. By doing so, probable biasness in the case study can be eliminated if the results from the subsequent survey are consistent with the initial results.

3.6 Format and Purpose of Questionnaire

The main purpose of the questionnaire distributed among selected lecturers is to collect information with regards to the satisfaction with the current PM system used in the university in addition to identifying potential strengths and weaknesses of the system, from the point of view of the users.

The questionnaire contains 4 sections, where:

i. Section 1 has 4 questions detailing respondents’ personal information and the length of service in the university.

ii. Section 2 consists of 1 question with sub-questions detailing the awareness of the university and faculty’s mission and vision.

iii. Section 3 consists of 10 questions which attempt to analyse the current PM system used in the university.

iv. Section 4 comprises of 8 questions which attempts to determine what constitutes excellence in lecturers and respondents’ preference towards the method of measurement used in the e-BSC. In this section, respondents’ opinions were also enquired about the need for the e-BSC to enable better
PM and the preference towards the method of performance being measured through the e-BSC approach.

Please refer to Appendix G for the sample questionnaire. Thus, the findings from the responses received are used to form the end-user requirements for the proposed system.

3.7 Data Collection Procedure

Initial data collection efforts included reviewing official university strategic planning documents (i.e. UM strategic steps, UM KPI/Scorecard, UM strategy map, UM corporate level scorecard) provided by SPU to understand the practice in the institution. This provided adequate knowledge to proceed to the interview sessions and prepare for the survey questionnaire.

For the interviews, one-to-one question and answers sessions were held with the SPU as well as current and previous deans of FCSIT. The interviews were recorded and reviewed later while incorporating researchers’ additional remarks. Meanwhile the survey questionnaires were administered to 20 lecturers selected based on the number of years of service in the university and leadership positions held. The questionnaires used in the survey were distributed to the selected lecturers who were briefed of the objectives of the survey and their role as the users of the proposed system. The lecturers were also informed of the possibility of them being requested to take part in a follow-up system evaluation procedure for the e-BSC prototype. The selected participants were then given a short interval of time, specifically 2 weeks to complete the questionnaires. Consequently, the completed forms were collected by hand.
An observation on the current PM system was also conducted to determine its strengths and weaknesses while assessing its suitability for lecturers in UM in terms of addressing the complexity of the profession. To do so, potential users were requested to demonstrate how the system worked and information required from the lecturers in different instances. Following that, sessions were conducted among the researchers to discuss and propose improvements that may suppress the prevalent weaknesses in the current system and therefore use them in the system development process for the proposed system.

3.8 System Development Methodology

The systems development methodology selected for this research is prototyping. The prototyping methodology involves developing a temporary estimated model of how the final system should look and work. In terms of functions, the prototype would only encompass selected operations that best reflect the purpose of the proposed system and to quickly gather user feedback on its effectiveness as a performance management and measurement tool.

The rationales for choosing prototyping are:

i. The model places emphasis on user involvement in the development of the proposed system. By having user feedback, requirements can be quickly and effectively collected to ensure that the final system will fulfil the needs of potential users. For that reason, the system requirements can be easily verified with users.

ii. Development effort for the final system would be significantly reduced since the user interface has been developed according to users’ requirements using the prototype.
iii. By building a prototype, the suitable technology to support the finalized system can be easily identified. As the requirements are elicited during the development of the prototype, the system platform is determined and evolves to ensure that the final system will deliver its purpose.

iv. The prototype provides a simple platform for users to test the constructed user interface. By having a simple system for users to visualize, it would be easier to comprehend and conceptualize how the finalized system will work in the long run.

v. The iterative nature of the model sanctions modifications or enhancements to be made to further add improvements as the prototype is developed. At each increment, users are encouraged to provide feedback with regards to the design of the prototype. Given that feedback is received earlier, the possibility of the prototype being rejected is lower for the reason that modifications are continually made to suit the needs of users.

The type of prototype that will be developed for this project is a Functional Prototype. A Functional Prototype is a model that is rapidly developed to accomplish data gathering, demonstrating, testing and assessing the proposed functionality for the system. By implementing a functional prototype, critical user interface elements and essential system functionalities are prioritized to demonstrate the effectiveness of the e-BSC towards improving the management and measurement of academic staff performance.
Figure 3.1 was illustrated for this study to demonstrate the software prototype development steps used for e-BSC.

Every stage entails thorough actions to be taken to ensure that the proposed system is developed to fulfil its purpose. The following describes the steps taken in each stage:

i. **Stage 1: e-BSC Requirements Analysis**

   In the initial stage, the requirements for e-BSC are elicited and are gathered through primary data collected from the document analysis, survey questionnaires,
interviews and observations conducted. Following that, the information gathered is analysed to provide input for the subsequent step.

**ii. Preliminary Design for e-BSC**

In the next step, a preliminary design for the system framework and architecture is made. The software design will take into account processes, inputs and outputs required to perform the proposed functionalities for the system. Besides that, a recommended user interface design is also made during this stage to give an introduction of the “look and feel” of the proposed system using Macromedia Dreamweaver MX 2004 and PHP as the scripting language to communicate with the Apache web server. Meanwhile, the chosen database server for the proposed system is MySQL. Manipulation of database server and the actual databases is made through the easy to use web application, phpMyAdmin.

**iii. Develop Initial e-BSC prototype**

In the third stage, the initial prototype developed will be reviewed and evaluated by selected users to suggest modifications and enhancements that the prototype may require. At this stage, a close relationship is maintained with the users to ensure all concerns and issues are well communicated.

**iv. Revise and Enhance e-BSC**

Following that, the prototype is revised and enhanced according to the feedback received in the prior step. The revised prototype will then be re-evaluated by the users to check for ambiguities that may have been overlooked. Stages iii and iv are repeated until a firm approval is received by the users with regards to the functionality and user interface of the system.

**v. e-BSC Prototype Complete**

At the last stage, new specifications for the proposed system are properly documented where new objectives for the system are highlighted.
3.9 Conclusion

In this chapter, the research methods selected for the research were discussed. This research primarily uses document analysis, survey questionnaires, interview and observation for facts finding purposes. The systems development methodology selected is prototyping as it offers numerous benefits which are well suited for web-based applications. In Chapter 4, the results from data gathering will be discussed to establish the requirements definition and the proposed design and framework for the e-BSC system with the corresponding user interface. Table 3.1 is a summary of the research instruments used, groups involved in data gathering and the objectives in each procedure.

Table 3.1 Summary of Research Methodology Employed

<table>
<thead>
<tr>
<th>Method</th>
<th>Group Involved</th>
<th>Objectives (obtain information regarding)</th>
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<tbody>
<tr>
<td>Document Analysis</td>
<td>Official UM Strategic Planning documents (provided SPU)</td>
<td>• strategic planning practice in the university (UM strategic steps, UM KPI/Scorecard, UM strategy map, UM corporate level scorecard)</td>
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<td></td>
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<td>• top management goals</td>
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<td>Interview</td>
<td>SPU</td>
<td>• strategic planning practice in the university (people involved, period of formal review, inputs for formulating new strategies, KPIs for lecturers, etc.)</td>
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<td></td>
<td>• constitution of excellent lecturer</td>
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<tr>
<td>Interview</td>
<td>Current and previous deans of the Faculty of FCSIT</td>
<td>• strategic planning practice at the faculty level</td>
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<tr>
<td></td>
<td></td>
<td>• consistency with strategic planning practiced at university level</td>
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<td></td>
<td></td>
<td>• constitution of excellent lecturer</td>
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<tr>
<td>Questionnaires</td>
<td>Cross-sectional purposive / judgement sampling on:</td>
<td>• awareness of UM and faculty’s vision and mission</td>
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<td></td>
<td>Previous and current head of departments</td>
<td>• strengths and weaknesses of current PM system</td>
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<td>Academic staffs who have served at least 3 to 5 years</td>
<td>• user requirements for the proposed system</td>
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<td>Observation</td>
<td>Current PM system</td>
<td>• analysis on the strengths and weaknesses of the system</td>
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<td>• Suitability for lecturers in UM.</td>
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