CHAPTER 4
REQUIREMENT AND SYSTEM ANALYSIS

4.1 Introduction

This chapter continues with the discussion on the findings obtained through different methods and techniques used in the data collection process. From the data and requirement analysis, discussion and inferences were made while producing charts to illustrate the summarized results from the analysis of respondents’ feedback. Then, the framework of the proposed e-BSC system is outlined based on the requirements captured from the research methods. The requirements are analyzed functionally and non-functional in order to produce an effective workable prototype of e-BSC system.

4.2 Interview Findings

The results of the conducted interviews are analyzed and summarized into charts and tables for better understanding. The recorded interview answers or verbatim statements are attached in Appendix B (I). The following summary of the interview answers is divided into the two sections of analysis which are the University (Corporate) Level and the Faculty Level.

4.2.1 University (Corporate) Level

From the interview conducted with the representative of Strategic Planning Unit in UM, the provided verbatim statements provided were analyzed, summarized and separated into sections of subjects of discussion.
4.2.1.1 Mission and Vision Development Process in University of Malaya

From the answers received from the representative of Strategic Planning Unit, UM, it can be concluded that the University is working hard and taking its efforts to set up mission and vision statements which are agreeable by members of the university. While getting their assurance, this might also help to acknowledge them the objectives or goals of the university so that they are clear in mind what the expectations are on their contributions to the university.

![Diagram showing mission and vision development process]

**Figure 4.1 Mission and Vision Development Process in University of Malaya**

Figure 4.1 shows the stages of mission and vision development process that carried out by University of Malaya as explained through the interview with Strategic Planning Unit (SPU) of the University. Meanwhile, Table 4.1 below describes in detail every of the stages involved.
<table>
<thead>
<tr>
<th><strong>Table 4.1 Description of Mission and Vision Development Process</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strategic Planning Steering Committees</strong></td>
</tr>
<tr>
<td><strong>Review on Mission/Vision</strong></td>
</tr>
<tr>
<td><strong>Meeting</strong></td>
</tr>
<tr>
<td><strong>Introduction of KPIs</strong></td>
</tr>
<tr>
<td><strong>Final Draft</strong></td>
</tr>
<tr>
<td><strong>Refinement of Final Draft</strong></td>
</tr>
<tr>
<td><strong>Finalization</strong></td>
</tr>
</tbody>
</table>
4.2.1.2 New strategy formulation and Review on Existing Strategies

From the interview with the representative of Strategic Planning Unit, the overall process of new strategy formulation and existing strategies review were briefly explained. Members who involved in this process are Vice chancellor, Deputy Vice Chancellor, members of the strategic planning steering committee and some deans of faculties. Firstly, both external and internal evaluations are to be done before the formulation of new strategy. **SWOT** (strengths, weaknesses, opportunity and threats) analysis and **scenario planning** are used to evaluate prior in formulating new and reviewing existing strategies. Then, a list of strategy plans is produced to be approved by the board of directors. The input for formulating new strategy is the actual performance data gathered from crucial areas (research, publications and teaching performance). For instance, in the year of 2007, actual performance data was used to evaluate the staffs’ performance. Deans were asked to meet and reviewed their performance while to discuss targets for the year 2008. Other aspects are also taken into account as inputs used such as the current condition of market and performance of other universities. The press media might be one of the options in gathering the information in this case. Policy and plans issued by Ministry of Higher Education (MoHE) is also counted. In August 2007, MoHE came out with a Higher Education National Strategy Plan. Therefore, university strategy plan is to be ensured as it aligns and conforms to Higher Education Strategy Plan. Head of SPU unit was asked by vice chancellor to conduct workshop (leadership enhancement), for staff members of university who hold leadership (deputy dean, head of department, admin staffs, officer of certain grade to the level of deputy registrar) to voice out their opinions, views and feedback to the strategy planning. Top management communicates with participants and expected to cascade down what they have learnt to the people in their unit/section.
4.2.1.3 Role of Balanced Scorecard in University of Malaya

According to the representative from Strategic Planning Unit during the interview, KPIs of Balanced Scorecard in corporate level were presented to all the deans. While explaining the KPIs, vice chancellor explained the strategy of UM such as improving research and internationalization (getting more foreign lecturers and students). In terms of ranking, higher number in internationalization will score higher, but anyhow, it must also base on national objectives. National government policy announced number of foreign students need to be boosted up (restriction: dentistry, medical, medicine and law limited to certain number (< 5%)). In the current state, the performance evaluation is done manually where feedback is asked from various faculties for the data to be submitted to a central connection point. Since the year 2007 targets are set and the system was formalized for the whole university. Targets were proposed by strategic steering committee and presented to the various faculties for negotiation and feedback in order to refer to their staff members. Targets are set for the next 4 years. However, in the subsequent years, targets may increase in order to see gradual improvement overtime. The position of where we are compared to other universities and methodology of ranking is also being looked at in determining the components that carrying weight in deriving the ranking. (peer review – 40 %, recruiter review-20%, citation-20%, publication, internationalization – 5% for every staff and student). Through the process of negotiation and cascading down, it is expected they understand them and cascade it back up to sure there is no argument.

Gap analysis in comparing targets against actual performance is done at least once a year (12 months). At this point, users are restricted only to management level (vice chancellor, deputy vice chancellor, registrar, bursa, dean) but not to organizational staff
members. However, strategy map is distributed to all faculties for staffs to understand and to aware of the university’s strategies and the flow of each of them.

Each staff member in consultation with their immediate boss has their own individual KPIs. It is set by the staff together with the person that they report to and a superior which may be the dean and head of department. At faculty level, the dean will ensure every member (academician, admin and officer staff) has their KPI in paper. Currently, individual form can be downloaded online to be completed where weightage need to be implemented together for each KPI. Depending on dean, individual staff may have identical KPIs or may not as he/she should able to communicate his/her expectation in order to reach faculty’s target. Individual staffs should discuss with the dean of the achievable of targets. Reasonable number of KPIs depends on the faculty. Publication is the main challenge for all faculties. (2 articles/a book per person in a year-target for whole university, teaching). From the performance evaluation results, repercussion involve corrective actions are needed, but it is also depends on policy matter which to be decided by higher management of the university. In the individual KPIs evaluation, staffs who fail to achieve their target are requested to send in a written explanation. However, integration of individual members KPIs to corporate level is not be done yet, but intended to make it accessible to management of UM (vice chancellor, deputy vice chancellor).

4.2.1.4 Excellence in Academicians and Challenges

Excellence in academicians includes publication (quality and quantity of journal), research, teaching and attending conference. It is agreeable that BSC (and e-BSC) would be able to show some indicators of excellence of academicians depending of the content of evaluations. It is also been supported that the development of e-BSC would help to manage
and measure the performance excellence of UM and its staff especially academicians. However, there are current challenges that the University is facing that is people resistant to change and leaving their comfort zone. Besides, the rapid changes of leader lead to frustration of people as different leader has different perspective and leadership styles. Therefore, a suggestion will be setting strategy or target to incorporate with ISO 9000 in order to overcome this problem.

4.2.2 Faculty Level

With the similar set of interview questions which were transformed into Faculty Level posted to the previous dean and the current dean of FSCIT, their verbatim statements were summarized into different sections of discussion for better analysis of performance measurement at Faculty Level. Please refer to Appendix C (I) for the verbatim statements.

4.2.2.1 Strategic Planning Process

At faculty level, strategic planning process follows the strategic plan which is expressed officially in paper to the university management in 2005, rightly in every 5 years cycle which broken down yearly under certain factors. Hence for the years 2005-2009 the plan would have formulated in 2004. According to an interview with an academician who holds the position of dean previously, as dean is always changing in every 2 years, he or she does not take over or continue what have been planned and yet, propose a new plan which is contradictory to the initially proposed plan. Therefore, whoever holds the post of Dean or heads of department must study carefully and periodically gauge to monitor the level of achieving the plans.
4.2.2.2 Formulating New Strategy and Review on Existing Strategies

The last review of faculty’s Vision and Mission statement was done before the last ISO audit. It is highlighted that the statement must be ensured to support and aligned with university. Members involved in strategic planning of faculty include Dean, Deputy Deans Heads of Department and selected members of academic staffs by the Heads of Department. Inputs are centrally driven which are categorized in different aspects such as research directions, curriculum planning, student intake and performance, publications, human resources, infrastructure and facilities; and etc. Plans are derived from a drawback where this group of academic staffs brainstorm and figure out plans and its implementations. The flow of strategies is in two-way approach which is from MoHE to Universities, then from University Management to Deans. Deans will mobilize their faculty teams to formalize the plan and present it back up to management. The strategic plan would be in the form of written document and it is the job of the Heads to disseminate this to members of their dept. In some cases, sub-teams are formed within each department to figure out of how to implement, monitor and access the strategies. However, the Dean should make sure that this is done by heads of department so that academic staffs that are not in management teams are not marginalized.

4.2.2.3 Performance Measurement at Faculty Level

The performance of faculty is usually being measured under the aspects of teaching performance, research quantity and quality, publication and dissemination of knowledge, networking and consultation work, faculty committee work and training and personal development. These are dispersed under the Dean, Deputy Dean and Heads of Department. According to one of the interviewees, at this moment, the tracking of BSC achievement is ad hoc and not yet being implemented in a flexible and effortless way which result
frustration to staffs. Therefore, it is hoped that there will be an approach which staffs able to make updates to their activities and performance periodically and yet, as a source to be used by dean, heads of department and deputy head of department to collect information for the purpose of reporting.

4.2.2.4 Target and KPI settings

As explained by academicians during the interview, targets are set centrally right now. However, different sets of BSC are derived for different levels of academicians such as lecturers, senior lecturers, associate professors and full professors. The allocation of scores and weights are different for every staff. Besides, there must also be difference between different faculties such as Arts, Social Sciences, Sciences, Technology and Medical Sciences as their nature of jobs are different.

KPI are set to be high as it should in order to measure quality but not quantity. The university management does not finalize or limit a set of required KPI. They allow faculties to set it by their own. Unfortunately, this has led to confusion where some of them take this opportunity to lower down the standards as to encourage more people to possibly archive the minimum KPI standard. It is voiced that KPI must be centrally driven so that the university can achieve what it aims. The University Management plays as important role in emphasizing on this but not the faculties as this is practiced in the private sector.

Gap analysis in comparing the targets against the actual performance is not being done at the faculty level. Right now, the challenging point is to have a clear formulation of accurate KPI. From the results of performance measurement, reward is to be given
accordingly and there must be room for negotiations especially for those who are under
performing. Face to face negotiations would be a good idea but however, it has never been
implemented.

4.2.2.5 Excellence in Academicians

From the interview with an academician who holds the position of dean previously, she
opined that excellence in academicians is meant by performing in a way above the normal
level. For example, a lecturer who scores above 4.5 student’s evaluation for 3 years, then
he or she is considered to be an excellent lecturer. Another example is when an
academician able to publish more than the number of refereed journal article set for his or
her KPI, it shows that he or she can be considered excellent. Other than that, excellence
should also be reflected at every level, the department, the faculty and the university level.
For instance, if the university targeted 1,000 refereed journal articles in this year, the
departments in the faculties should have made the contribution and provide its clear
indication in reports at the various level. It is hoped to have a system which can generate
good report output from the load of information entered by staff.

4.2.3 Analysis results of Strategic Planning Practice in University Malaya from data
gathering methods

From the analysis of the answers given in both interviews, the consistency of the given
answers is compared. It is found that there is contradiction exists between the expectations
from the higher level and the understanding of lower level staff. This clearly shows that the
objectivity of strategic cascading towards the lower level is an unsuccessful one. Besides,
the strengths and weaknesses of the strategic planning practice in UM are discovered and
listed as below:
Strengths:

- Academicians are allowed to decide the relevant KPIs to be applied according to their insights of their own level of contributions which gives them flexibility.
- Frequent revision of strategic planning process enables a close study and awareness of the strategies
- Involvement of various level of staffs in the strategic planning processes and establishment to encourage participation

Weaknesses:

- Ineffective or poor cascading process of top management mission, vision and objectives down towards lower level of staffs
- Most manual work need to be done which takes more processing time and delay improvement actions
- No restrict number of KPIs may result staffs to take this opportunity to choose the minimum number that ineffectively reflects their performance achievements

4.3 Survey Findings

The survey questionnaire forms were started to be collected from all the respondents in three weeks time after the distribution. The received answers were studied and analyzed through statistical and qualitative analysis.

4.3.1 Statistical Analysis

Data collected from survey questionnaire was analyzed by exporting it directly to SPSS software that was used for statistical analysis. These results are analyzed in overall for both studies of individual performance planning and measurement; and performance planning
and management of lecturers. Unnecessary variables were deleted during data cleaning process in order to filter and obtain accurate and reliable data. The feedback and opinions from respondents were captured and visualized into graphs and charts for clearer understanding. This is to get better implication from the feedbacks and the number of agreement or disagreement from respondents provides the support towards a discussed issue. The findings are summarized into different sections to have a better understanding of respondents’ feedback or opinion for different subject.

i. **Section 1: Awareness of University’s/Faculty’s mission and vision**

Figure 4.2 shows the percentage of attentiveness among respondents towards the revision of University’s mission and vision. The highest percentage of the respondents state that last revision was made within the past 6-12 months while a lower majority claimed it happened within the past 6 months.

![Revision of Mission and Vision](image)

**Figure 4.2 Revision of Mission and Vision**
Meanwhile, from Figure 4.3, it shows that not all academicians have the full understanding of the mission and vision set by the university. This is reported from the survey data where there exist answers from respondents that they do not agree University have well-understood Mission and Vision.

Figure 4.3 Understanding of Vision and Mission of the University/Faculty

This reveals that the academicians are not been well-focused to the mission and vision of the University especially through the obtained answers that signify the existence doubt or uncertainty among them. Indirectly, this implies that the current activities of academicians are not visibly being aligned strategically to the University’s mission and vision that causes vagueness and academicians are just performing as what they are needed to do. Therefore, it is believed that the current performance measurement methods unable
to provide a clear view to the academicians of how their contribution supports the University’s goals if they do not have.

ii. **Section 2: Analysis of current performance system**

The chart (Figure 4.4) shows different measurement techniques used previously or currently in measuring the performance of individuals. Given a list of performance measurement techniques, respondents were allowed to select more than a technique, whichever applicable to the current or previous performance measurement methods with the indication of the how long each technique has been used. As demonstrated in figure below, one of the choices of all respondents was KPI. This firmly proves that KPI is agreeable to be an effective performance technique to be used with the targets setting stands as the highest percentage rate and being used recently. Without doubt, it provides the confidence that the integration of KPI into performance scorecard, that is the BSC, can be implemented easily into performance measurement system. The integration is needed as by KPI itself, it does not provide a clearer view of how it is linked or aligned to the vision, mission and strategy of the organization. Meanwhile, Performance appraisals are second highest choice of measurement techniques that comprises 45% of the respondents. Appraisals are commonly used as to review the final performance results between the individuals and appraisers.
When respondents were asked of their opinion regarding the quality or effectiveness of the system that they are using currently, more than half of the total respondents felt that the current system is suitable but it does not reach the satisfied level of effectiveness and improvements are needed to be done. This is shown in Figure 4.5.

Meanwhile, the remaining respondents felt that the current performance measurement system is unsuitable and unable to perform appropriate performance measurement.
Therefore, this study researches the weaknesses of the current system while proposing e-BSC system that able to increase the effectiveness of the performance measurement.

In suggesting to put BSC performance measurement as an online system, efforts were taken to seek for respondents’ agreement on this implication. Figure 4.6 shows the results achieved from the respondents to distinguish whether their current performance measurement is fully computerized, partially computerized or not computerized at all.

Figure 4.6 Computerization of Current Performance Measurement System

Figure 4.7 Agreement in the Development of A Fully Computerized Performance Measurement System
The biggest portion of respondents answered that the current performance system is just partially computerized and the smallest number of respondents which is 10% replied that it is fully computerized. In relate to this matter, a question was brought up to ask respondents’ agreement to develop a fully computerized performance measurement system which is believed would be beneficial for users in a different aspects. From Figure 4.7, it can be seen that almost all the respondents agreed to develop an online BSC performance system which will serve many advantages such as improvement in efficiency and speed except for one respondent. This may because of the respondent is used to the current system and consider it as functioning sufficiently.

To discover whether higher management does perform any follow up actions after the performance measurement has been done, a question was raised to inquire respondents that meeting or discussion is carried out in reviewing the performance measurement results. Positively, Figure 4.8 shows a high percentage of replies stated that these actions are performed and it proves that performance review is emphasized and yet, it is one of the step to be done for the effectiveness of performance measurement.

![Figure 4.8 Meeting/Discussions in Reviewing Performance Measurement Results](image)

Figure 4.8 Meeting/Discussions in Reviewing Performance Measurement Results
During the review, discussions are made between the academician staff and the management to reason for their underperformance or to communicate needs. Therefore, the results of performance measurement must be formed in a straight-forward and yet, meaningful way to ease the discussion or review between the higher management and academicians.

Figure 4.9 shows the percentage of agreement among respondents whether or not, the current performance measurement system able to achieve the specified labeled strengths which are detailed in Table 4.2.

![Figure 4.9 Strengths of Current Performance Measurement System in the University](image)

**Figure 4.9 Strengths of Current Performance Measurement System in the University**

| Promotes better communication between higher management with staff | n=Number of Respondents |
| Promotes staff morale | Agree | Disagree | Unsure |
| Provides evaluative information on your overall performance | 8 | 7 | 1 |
| Promotes accountability for performance | 9 | 7 | 4 |
| Promotes the effectiveness of alignment towards university’s/faculty/s strategies | 10 | 6 | 3 |
| Provides clear expectations on your overall performance | 7 | 4 | 12 |
| Encourages and supports staff to have positive work and develop skills | 4 | 8 | 7 |
| Promotes excellence and effectiveness in work and performance | 4 | 8 | 5 |
| Total Respondents (N) = 20 |

| Identifies staff development needs | Agree | Disagree | Unsure |
| Provides opportunity for promotion and career development | 8 | 6 | 6 |
| Provides an environment in which ideas for improvement are encouraged | 2 | 7 | 11 |
This intends to discover if the current performance measurement system able to serve its purpose while effectively promote better improvements among the staffs. In following to these results, the proportion of respondents’ selection is analyzed and drawn into a pie chart which is illustrated in Figure 4.10.

![Figure 4.10 Proportion of Selection for the Strengths of Current Performance Measurement System](image)

**Figure 4.10 Proportion of Selection for the Strengths of Current Performance Measurement System**

It is shown that the proportion of disagreement more than agreement is the highest among the three categories. This means that the current system could not provide the mentioned functionality and this leads to the conclusion that the current system is probably unable to achieve the stated strengths. Therefore, the new proposed system should able to cater these matters and fix the weaknesses of the current system.

To analyze the rate of complexity or learnability of the current performance measurement system, 65% of the respondents felt that it is at the level of moderate rate while there is 5% of them opined that the current system is very complex to be used as illustrated in Figure 4.11.
It is important to develop a system which is easily understandable by users so that they know the correct flow of the performance measurement processes and enable accurate data to be obtained. This must be highlighted during development of the new proposed performance measurement system.

**Figure 4.11 Complexity/Learnability of Current Performance Measurement System**

To seek whether BSC is commonly known among the academicians, respondents are asked if they are aware of BSC. From the statistics of answers obtained in Figure 4.12, it can be seen that lecturers are not highly aware of the BSC concept. This might be one of
the reasons for followed-up disagreement results when they are asked if they are agree with the division of performance evaluation to be done according to BSC perspectives, which demonstrated in Figure 4.13.

**Figure 4.12 Awareness of BSC Among Academicians**
Although the University has attempted to implement BSC in their current performance measurement system, unfortunately not all of the target users are well-understood of the implemented performance concept. Other than lecturers, the number of senior lecturers, associate professors and professors who agreed with this suggestion is more than those who disagreed.

Figure 4.14 shows the ratings obtained among the respondents to seek for their agreement in developing the e-BSC system. A total of 35% of them strongly agreed and 55% agreed to the development of e-BSC system. This agreement has captured the total of 90% opinion of the respondents and this shows that there is substantial support from the potential users for this development. Meanwhile there is only slightly small number with the percentage of 5% respondents disagreed and 5% neither agreed nor disagreed.
4.3.2 Constitution of Excellence in Academicians based on Level of Importance

Based on the analysis of the answers from the interview and survey, the components that constitute to the excellence of academicians are discovered which are illustrated in Figure 4.15. It can be deduced that publications place the highest level of importance, followed by research and teaching. Professional development and administration duties are
ranked to be lesser importance in the context of the constitution of excellence among the academicians.

**4.4 Findings from Documentation Analysis and Observation of Current Performance Measurement System**

To achieve a better understanding, official documents provided by Strategic Planning Unit are analyzed. An example of University’s Strategy Map gives a clearer identification of the actual process flow in the current situation. It shows the cause-and-effect connections from the defined missions and visions to the strategy objectives at the University’s Level. Besides, literature review of the related topics are conducted to seek for more information and to distinguish what are the past researches have been done and the current researches being done by the experts. An attempt also has been made to relate these literature review findings to the topic of study.

Meanwhile, current performance measurement system is observed to hunt for its strengths and weaknesses. Below are the strengths and weaknesses the current performance measurement system which has been identified:

**Strengths of the Current System:**

The current performance measurement is simple and easy to use. It is directive where performance measurement form for academicians is available online. Staffs are required to download and print the form. Then, they need to fill up the form with the details of their achievements and manually, submit it to their respective appraiser to be evaluated. With the use of manual form, it allows no particular restriction for the staffs’ input which allows them to enter as many performance achievements as they have and promote the ease of
data insertion. Besides, the manual spreadsheet is easily be kept as a backup record of their performance achievements.

**Weaknesses of the Current System:**

Based on the observation of the current performance system, it is found that academic staffs are not clear and have fully understanding of the actual processes in measuring their performance. Most of them are just performing all the required steps for duty completion without knowing the exact objectives behind. Besides, the current system practices a confusing way in filling up the performance measurement forms that may create high probability of mistakes made by the staffs. With this, it may produce inaccurate performance results. In addition, score is calculated manually which needs much effort and time.

It can be seen that the current system poorly promotes the alignment and cascading of top management scorecard down towards the academicians’ scorecard. There is no proper alignment or cascading process which obviously channel the strategic objectives of the University to the lower level of academic staffs. Besides, most of the communication processes are done verbally which takes longer time and more effort as meeting appointments need to be made. The final performance results are not shown in detail which disallows the academic staffs and appraisers to have a clear review of the performance achievements. This would unable appropriate judgment and decision-makings to be made in order to take any necessary action plans with regards to the inadequate information of the performance results.
4.5 SAS Seminar and Roundtable Discussion

After attending the seminar and roundtable discussion organization by SAS, important discussion outputs are noted and to relate them to the context of this research. The outputs are recorded, analyzed and summarized into different subjects and the details of each subject are discussed in the following.

4.5.1 Evolution of Measurements

Performance Management in financial perspective has been evolving from bookkeeping to accounting management and finally to shareholder value in the late 20th Century. However, shareholder value also covers strategic and operational perspectives which include methods of balanced scorecard, business reengineering process, customer satisfaction, competitive advantage, comparative benchmarking, operational improvement, capabilities and competencies as realizing performance is not shown just from the aspect of financial. Data and information is increasing and more effort is needed to derive knowledge.

4.5.2 Performance Measurement challenges

KPIs are vague, hazy and unclear to every level. It is difficult to set accurate and determine suitable number of indicators. Staffs are unclear of the actual definition and how measurement is done. Besides, higher management has improper management skills and has too high expectations on the employees which are unattainable within the period of time that has been set. Management may have little understanding of staffs’ duties and not all levels are ready for the performance management plan. Matters of availability of cleansed and required data which is not timely is also taken into account. Poor
communication between employees causes ineffective interaction and poor understanding on the condition and situation of each working staff. Other challenges are rapid changes of environment and the best approach of alignment in resources and strategy.

4.5.3 Cultural obstacles that public sectors face in Performance Measurement efforts

Staffs are too comfortable with their current condition and resist make any changes. Objectives and strategy are not well defined which result giving vague impression to employees. Besides, organization’s vision and mission which set by higher management are not well-understood and employees are doing just for the sake of doing. Management may too hectic in other aspects which neglected staffs performance which cause lack of supervision and commitment from them.
4.6 Individual Performance Planning and Measurement for Academicians

Figure 4.16 demonstrates the suggestion of processes to be undertaken by academicians for individual performance planning and measurement.

![Figure 4.16 Steps for Individual Performance Planning and Measurement](image)

**Figure 4.16 Steps for Individual Performance Planning and Measurement**

Initially, academicians should plan their performance achievements such as setting the goals or targets to identify their contribution to the job performance and self development. This provides a good frame of discussion and agreement for both appraiser and academician in relates with the academician’s performance plan. Besides, it encourages the academician to have a focused career development plan while be prepared to face the new responsibilities. After a well and satisfied plan has been distinguished, academicians can begin to carry out their tasks and perform accordingly to reach each initialed goal or target. Their achievements are to be recorded and appraisers can
continuously monitor their performance over time. Performance measurement is done after
the academician has completed fulfilling his or her tasks within the required period of time.
At this stage, appraisers are required to do the evaluation and to measure the workload of
the academicians if they are underperform, reaching the minimum requirements or doing
excellence in their work. Results are to be reviewed by the academicians and their
respective appraisers after the measurement process is done in order to identify the
strengths and weaknesses of the academicians’ performance compared to what have been
planned or targeted. Besides, it also measures how well the academician is moving
forward. From there, necessary follow-up or action plans are taken for the improvements
of academicians’ performance such as training and development programs. Then, the
process continues with new performance cycle where changes are need to be made to the
initial plan in subsequent to the results analyzed from the last performance measurement.

4.6.1 Three Stages of Individual Performance Planning and Measurement Process

The requirements analysis result gives an implication of the suggestion to put the
Individual Performance Planning and Measurement process into three stages. Planning is
done initially where expectations are set, while measurement is done at the final to
evaluate the individual’s performance. Therefore, in between these two processes, there is
an intermediate stage named tracking, where academic staffs perform and appraiser
monitors their performance. The flow of the performance planning and measurement
process is illustrated in Figure 4.17. In following of that, Table 4.3 displays the details of
each process and the role who involved in each stage.
Figure 4.17 Three Stages of Individual Performance Planning and Measurement Process

<table>
<thead>
<tr>
<th>Role</th>
<th>Stage 1: Contracting</th>
<th>Stage 2: Tracking</th>
<th>Stage 3: Evaluation</th>
<th>Performance Review</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic Staff</td>
<td>✓ Plan and set own targets</td>
<td>✓ Update Performance Achievements</td>
<td>-</td>
<td>✓ Review Performance Evaluation Results</td>
</tr>
<tr>
<td>Appraiser</td>
<td>✓ Agree/Disagree to staff’s performance plan</td>
<td>✓ Keep track and monitor staff’s progress</td>
<td>✓ Give evaluation scores</td>
<td>✓ Review Performance Evaluation Results</td>
</tr>
</tbody>
</table>
4.7 Proposed Performance Measurement Framework in University

Based on the findings, a framework is established to structure the basis of the Performance Measurement for University as shown in Figure 4.18. This framework is synthesized for the overall performance measurement of the University which includes the performance planning for individual academic staffs.

Figure 4.18 Framework of Performance Measurement in University

At the University level, a strategy map is developed by transforming vision and mission into a set of strategies objectives which are connected by cause-and-effect relationships and categorized into the four Balanced Scorecard perspectives; Financial, Customer, Internal Business Process and Learning & Growth. Based on this strategy map, a corporate scorecard is created where Key Performance Indicators (KPIs), targets and initiatives are set accordingly for each strategy in every BSC perspective.
Meanwhile, at the Faculty level, an internal strategy map is developed as well as aligned to the University’s strategy map and consequently created the academician scorecards. All KPIs are discussed and negotiated among steering committee members, vice chancellor, faculties and academicians for agreement. During the initial stage of the scorecard development, academicians carry out their performance planning by distinguishing and setting their achievable targets or goals that they intend to reach. Performance planning is the first step of the performance measurement process. After the plans have been set, academicians can begin to record their achievements throughout the tracking period. Tracking period is meant for academicians to insert and update their performance achievements into their scorecard database. Meanwhile, appraisers and the academician can keep monitor and observe the performance progress. This is to provide hints and alarming the appraisers and academicians the status of the performance. At the end, the performance achievements of the academicians will be measured and produces performance data of each individual academician.

The performance data obtained from individual scorecard is analyzed by the Faculty to come out with the overall performance result. The analyzed results will be reported to the University as the input for the University’s performance evaluation. However, this study limited the research until the performance measurement of individual academician at the faculty level.
4.7.1 Process of Cascading Strategy Objectives in BSC Perspectives (Performance Planning)

Prior to the performance measurement process, performance planning should be done in order to set the initial goals and targets. The planning is required to acknowledge the academic staffs what they need to do with regards to the expectations of the top management. From this, academic staffs can schedule and be prepared to allocate the time and plan ahead their achievements to obtain the defined targets. Figure 4.19 is outlined to demonstrate the process of strategy objectives cascaded down to the lower staffs in the performance measurement system. This is to ensure that there is a clear alignment of the performance measurement processes with the University’s vision and mission.

Figure 4.19 The Process of Strategy Objectives Cascading in BSC Perspectives
The process begins with the translation of University’s vision and mission into strategy objectives which are connected by cause-and-effect relationships while categorizing them into the four BSC perspectives. Academic measures are then defined accordingly for each strategy objective that lays within the aspects of teaching and administrative loads, research/publications and other contributions to the society. These measures are translated into key performance indicators (KPIs), as chosen by all respondents in the questionnaire as one of the main techniques used in their current performance measurement system. Performance measurement of individual academicians is suggested to be done in three stages which are contracting, tracking and evaluation while using the pre-defined KPIs as the performance measures. The initial contracting stage involves the target agreement for both academician staffs and their respective appraisers while to notify the academicians of their responsibilities. In the following tracking stage, it provides the ease to monitor how well each academician is doing within a period of formal performance review. At the end, when the tracking period ends, the academicians’ performance will be evaluated by their respective appraiser or superior and finally, produces the final performance report.

By using this proposed cascading process, the vision and mission of the University can be effectively communicated down while having all the four BSC perspectives being emphasized for all the performance measurement activities. This strategically top to down alignment able to clear shows how the staff’s contribution could support and commit to the University’s vision and mission in the exact perspective.
4.8 The identification of potential users of the proposed e-BSC system and their responsibilities

From the requirement and system analysis, the potential users of the proposed system are identified. The responsibilities or tasks for each user are distinguished and are shown in Table 4.4.

Table 4.4 Responsibilities of Each Potential User

<table>
<thead>
<tr>
<th>User</th>
<th>General Responsibility</th>
<th>Detailed Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Administrator</td>
<td>System management and maintenance</td>
<td>• Complete knowledge of how the system works.</td>
</tr>
<tr>
<td>Faculty Dean</td>
<td>Faculty Performance Planning and Management</td>
<td>• Select the KPIs from the university scorecard to the faculty scorecard for performance planning at the faculty level.</td>
</tr>
<tr>
<td>Academic Staff</td>
<td>Individual Performance Planning</td>
<td>• Contract individual scorecard with set targets.</td>
</tr>
<tr>
<td>Appraiser</td>
<td>Performance Evaluation</td>
<td>• Track the performance progress by individual staff, department or faculty.</td>
</tr>
</tbody>
</table>

4.9 Functional and Non-Functional Requirements

Functional requirements are the fundamental requirements that specify the system must able to perform while non-functional requirements describe the behavior of the system, the constraint upon the behavior and the system’s quality characteristics.
4.9.1 Functional Requirements of e-BSC System (Requirements Capture)

Figure 4.20 demonstrates the functional requirements of the proposed e-BSC system.

![Use Case diagram of e-BSC System](image)

**Figure 4.20 Use Case diagram of e-BSC System**
A use case diagram of e-BSC system is outlined which is shown in Figure 4.20 and it demonstrates the functional requirements of the system from the analysis of the captured requirements. Below are the identified functional requirements of e-BSC system in general and different modules:

**A. General**

i. **Authentication (Sign In System)**

When the user first enters the login page, the system should able to perform user validation by checking if the username and password entered by user are matched. Queries are sent to get the required data from database if any matches are found. If there is no return result, an error message will be prompted to user which indicates information is not found in the database. On the other hand, if validation shows success, the user should be directed to their respective module.

ii. **Change Password**

For security purpose, system should allow users to change their password for time to time. When a user’s account is first created, his/her password is initially set by the system administrator. After passing the password to the user, he/she should change their password for confidentiality purpose. Besides, from time to time, users are encouraged to change their password to increase the level of security.

iii. **View Notice**

A notice section should be created for users in the system. This is to allow any messages or announcements to be passed over to all the respective users from time to time. This is important especially if there is updates need to be made or the respective users need to be informed for a certain news, actions or information.
B. **Staff Module**

i. **View Personal Information**

In the staff module, system is supposed to display information of the individual staff for viewing purpose. This is let the individual staffs know the details of their information especially their appraisers’ information and their action status. It is important to ensure the system is having the correct information of the individual staffs so that all the performance measurement processes are meant to the correct person.

ii. **Request Change Target**

During the contracting process, if the individual staff feels that the target set by the faculty is hardly to be reachable, he/she is allowed to make request for target change to their respective appraisers. This request will be forwarded to his/her appraisers to get their approval for the requested target of the selected KPI. If the request is approved, the system will automatically update the target of the KPI in the staff’s contract. Individual staffs are also allowed to make this request during the tracking process.

iii. **Update Personal Achievements**

Before users are allowed to update their personal achievements, they are required to contract their individual KPIs. Contracting is the first process of performance measurement in this system which to ensure the academician staff agrees with the KPIs settings (including the target and weightage settings). When the staff has agreed with all the KPIs setting, the system should provide a button to let the staff to click on for confirmation. After confirmation has been done, the individual staff can begin to update the personal achievements such as addition, updates or deletion of records that is the performance tracking process. In this process, the
system should allow the staffs to insert, edit and delete their performance achievements before the final performance submission.

iv. Submit Final Performance Report

After staffs have completed inserting their performance achievements into the system, the system should provide a button of final performance report submission to confirm that the staffs are ready to be evaluated.

v. View Performance Measurement Results

After final report submission has been made by the individual staffs, appraisers are expected to give their evaluation scores to the staffs. When the appraisers have done their evaluation, the calculated scores are kept in the system. By this, the individual staffs should able to view the results of their own performance so that they can identify their current performance status and where they should improve or keep up.

vi. View Help File

Help file is important to guide the individual staffs to use the system. It should display all the steps which need to be taken or involved by the individual staff and clearly shows the information in detailed. This is important especially for the beginners who are just started to use the system.

C. Appraiser Module

i. Approve/Reject Target Change Request

When individual staffs feel that they could not reach the target set by the faculty, they are allowed to make request to change the current target. In this case, appraisers should reply by
either approves the request if valid reasons are provided, or else, rejects the request if they feel the request is not acceptable.

ii. Search Staff

Before appraisers are allowed to perform the actions such as track staff achievements, evaluate staff and review staff performance, they must need to search for a staff. This is because they are only allowed to perform these actions to one staff at a time.

iii. Track Staff Achievements

To allow appraisers to keep track their individual staffs’ performance, system should allow appraisers to view their staffs achievements from time to time. However, system should allow the appraiser to search for the staff to be tracked before reviewing the achievement records of the searched staff. By having this functional requirement, the appraisers can know and keep an eye on their staffs’ achievement on how well they are doing. Therefore, staffs will be more cautious as their performance status is always being monitored by their superior.

iv. Evaluate Staff

At the appraiser module of this system, after the final performance report is submitted by the staffs, the system should provide a form to let the appraisers to give their marks accordingly. The system should ensure that the appraisers are only allowed to perform the evaluation only if the staff has submitted his/her final performance report. Besides, appraisers are expected to perform the searching action to look for the staff to be evaluated before performance the evaluation process.
v. Review Staff Performance

While individual staff can view their own performance results, appraisers should be permitted to view their staffs’ performance results as well. This is to notify the appraisers how each of their staffs are doing and further actions can be taken upon the performance results.

vi. Review Department Performance

To allow appraisers to analyze the performance results of a particular department, system is expected to provide a summarization of the individual department performance done by the department’s individual staffs. However, if the appraiser carries the title of Head of Department, he/she is only allowed to view the performance of his/her own department whereas if it is the dean of the faculty, it is extended that he/she is allowed to view the performance of all the departments, that indicates the overall faculty’s performance.

vii. View Appraiser Help File

Help file should be available to guide appraisers in using the e-BSC system. It should be clearly explains the information and steps for all the processes involved so that they can understand the actual processes and the required information.

D. Faculty Dean Module

i. Update Faculty Scorecard

Faculty scorecard consists of KPIs which are automatically assigned to all the staffs in the faculty. Therefore, system should allow the faculty dean to perform updates to the KPIs list and the changes made will be automatically applied to all the staffs.
ii. Update First Appraiser Selection

Every individual staff is assigned with two appraisers. The second appraiser for all the staffs will be the dean of the faculty. Meanwhile, the first appraiser will be the head of department of the individual staff. However, head of departments are selected by the dean of the faculty. Therefore, this function is provided for dean to perform the selection from the list of staffs.

iii. Review Faculty Performance

In faculty module, system should allow users to view the overall performance of the faculty. It should also include the review of each individual department’s performance as well to allow a more specified understanding while categorizing into the four perspectives of BSC.

iv. Review Staff Performance

Individual staff performance should be able to be reviewed in this module. This is to let the user to have a detailed report on the individual staff performance to allow a better understanding.

v. Flush Records

Before starting a new performance evaluation period, history records should be erased for the new records input. This function is needed to let faculty’s dean to perform the deletion on all the previous performance records while decrease the load of the database.
E. System Administrator Module

i. Updates

For the maintenance part, it is important for the system administrator to bring all the information up to date. Therefore, system should provide the availability to update all the types of information which include:

a. KPI list – This is the list of Key Performance Indicators which have been discussed, negotiated and agreed by higher management of the Faculty and University.

b. Notices – From time to time, important notice or message need to be passed to the target readers for information. Therefore, system administrator is requested to perform the updates to allow the specific group of users able to receive the notice from the sender.

c. Staff List – There may be incoming or outgoing of staffs. Therefore, this function allows system administrator to add or delete staffs list when request is received. Besides, it should allow system administrator to update staffs’ information.

d. Evaluation Score Range – Score range is the range between the minimum and maximum score set for the appraisers to evaluate their staffs during the evaluation phase for a certain part. The range may need to be altered from time to time as it may change, depending on the management’s decision.

e. System User List – This is the essential function for system administrator module to create, delete or update the list of system users such as staffs, appraisers, faculties, and system administrators. Users are allocated with a username together with a password which are important for authentication purpose.
f. **System Administrator List** – System should allow updates on the system administrator list where there is a possibility to have more than one system administrator to perform the maintenance work for the system.

g. **Faculty List** – This function is to allow the creation, deletion and updates of faculty list in the University.

h. **Update Faculty Appraiser List** – The system should allow the system administrator to perform updates on the appraisers list for each faculty. Appraisers list may change from time to time and therefore, system administrator needs to bring the information up to date to avoid any improper appraiser assignment to happen.

4.9.2 Non-Functional Requirements of e-BSC system

i. **User-friendly and Learnability**

This system may require a lot of user inputs especially when academician staffs frequently need to update their performance achievements. Besides, a few tasks may be complicated which may confuse the users. Therefore, it is important that the system is user-friendly which provides the ease for users to perform every task. System should be presented in a consistent and straightforward way for the better understanding of the users. In addition, especially for irregular or beginners, this system should also be developed to provide high learnability so that they can easily adapt to the system and understand how it works in the shortest time.
ii. **Accuracy**

In performance measurement system, accuracy is an important non-functional requirement in order to show the correct performance results of the academician staffs. Therefore, it is crucial to ensure the system obtains, calculates and stores the right performance measurement information.

iii. **Reliability**

In this performance measurement system, it is important to ensure the system is reliable to perform its tasks. The system should be able to function well and accurately compute the performance result. System is also to be ensured that is effectively performs its objective to measure the academicians’ performance.

iv. **Security**

As this is one of the private and confidential system, which stores individual performance results, it is important to ensure the system perform authentication before users are allowed to enter into a certain page. Users of the system should only be permitted to certain access rights according to their level of authority. For example, staffs should not be allowed to enter the evaluation page which it is only meant for appraisers.

v. **Modularity**

To reduce the efforts in developing the system, it is encouraged to have modularity in practice. Modularity, that is to decompose the system into a few modules so that the coding process can be done by concentrating each module at each time. This also helps to provide the ease of testing, maintenance and enhancement works in future.
vi. **Error detection**

There is the probability that the users may insert the wrong input into system. Due to this matter, the system should display error message that clearly tells the users what the errors are. It is better if the solution to the error is informed to the staff as well.

vii. **Maintainability**

The system should be developed to be easy for maintenance work. This is because data in the system may need to be updated always and high maintainability reduces system administrator’s efforts and time in performing their tasks such as add, edit and delete of data.

**4.10 Conclusion**

This chapter analyzed all the results and findings obtained from the research methods discussed in Chapter 3 earlier. The analysis was done based on different aspects of investigation and the implications of the findings. The results of the analysis process produce strong support for the development of the proposed e-BSC performance measurement system. Besides, the identified strengths of the current system are to expand while finding the solutions for the occurring weaknesses through the proposed e-BSC. The outlined framework will be used as the guide of the performance measurement processes in the University. The captured requirements which have been categorized as functional and non-functional requirements will be used in developing the prototype of e-BSC.