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A SIMULATION OF UNIVERSITY STRATEGY MAP

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Introduction

To ensure academic excellence in a time of increasing competition in Thai higher education sector after liberisation, Thai public universities are now searching for an appropriate performance measurement system that reflects and gives the opportunity to improve on quality of teaching, research, and service to community. The Balanced Scorecard with strategy map is considered one of candidates for new performance measurement system (Rompho, 2004). Developed by Robert Kaplan and David Norton in 1992 (Kaplan and Norton, 1992), the Balanced Scorecard is a method, which is used to diagnose and improve on an organisation's performance. It is a management tool that translates an organisation's mission and strategy into a comprehensive set of performance measures that provide a framework for a strategic

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management and measurement system. The concept is very popular in the business sector (Kaplan and Norton, 1996; 2001; 2004; Olve et al 1999). Recent study finds that 44 percent of organisations in North America (Rigby, 2001) and 35 percent of large US firms (Marr et al 2004) use the Balanced Scorecard. Despite its popularity in business section and increasingly interests on its use for university among researchers (Ruben, 1999; Haddad, 1999; Bailey et al., 1999; Chang and Chow, 1999; Stewart and Carpenter-Hubin, 2000; Pursglove and Simpson, 2000; Lawrence and Sharma, 2002; Southern, 2002; Purslove, 2002), it is applied less frequently in the educational sector in Thailand (Rompho, 2004).

From his study, Rompho (2004) find that currently there are twenty-two universities in English-speaking countries that use the Balanced Scorecard. However most universities that apply the Balanced Scorecard only categorise the performance measures into the four prescribed perspectives, but fail to provide a causal linkage to strategic objectives of those measures. Although there is an attempt to establish a time series of performance measurement and test validity and utility of measures in university's Balanced Scorecard (The University of Edinburgh, 2005), there are limited studies that quantify the relationship among objectives in strategy map of university. This is probably due to the fact that in some measures, historical data is not available especially the new measures recently established when strategy map is created.

The objectives of this study are therefore to first explore correlations among objectives in university strategy map, then to find how a simulation can help management make decision in university. These activities will support the main contribution of this study, which is a simulation of university strategy map, a practice rarely reported in the literature.

Research questions and methodology

This study is based on the study of Rompho (2004) that proposes the strategy map for Thai public universities designed from inputs of university's stakeholders. The strategy map of Thai public university is shown in Figure 1. In this study, there are two research questions, which are *"What are correlations among objectives in university's strategy map?"* and *"How can a simulation help management make decision in university?"* The main purpose of the study is to help senior management in university see the benefits of university's strategy map before investing much effort and time on its implementation. It also helps management know the effect of each objective in strategy map on mission of university.

Due to the lack of historical data, the correlation among objectives in strategy map is obtained by using the survey method. In this study, 802 questionnaires were distributed by mail to all management staff in seventeen public universities in Thailand during August to September 2004. 308 questionnaires were finally returned (38% response rate). The strategy map, which illustrates the linkage among objectives, was included in the questionnaire and respondents were asked to quantify the correlation between each pair of objectives in strategy map in term of percentage. After the data of correlation among objectives in strategy map obtained from results of the survey was gathered,

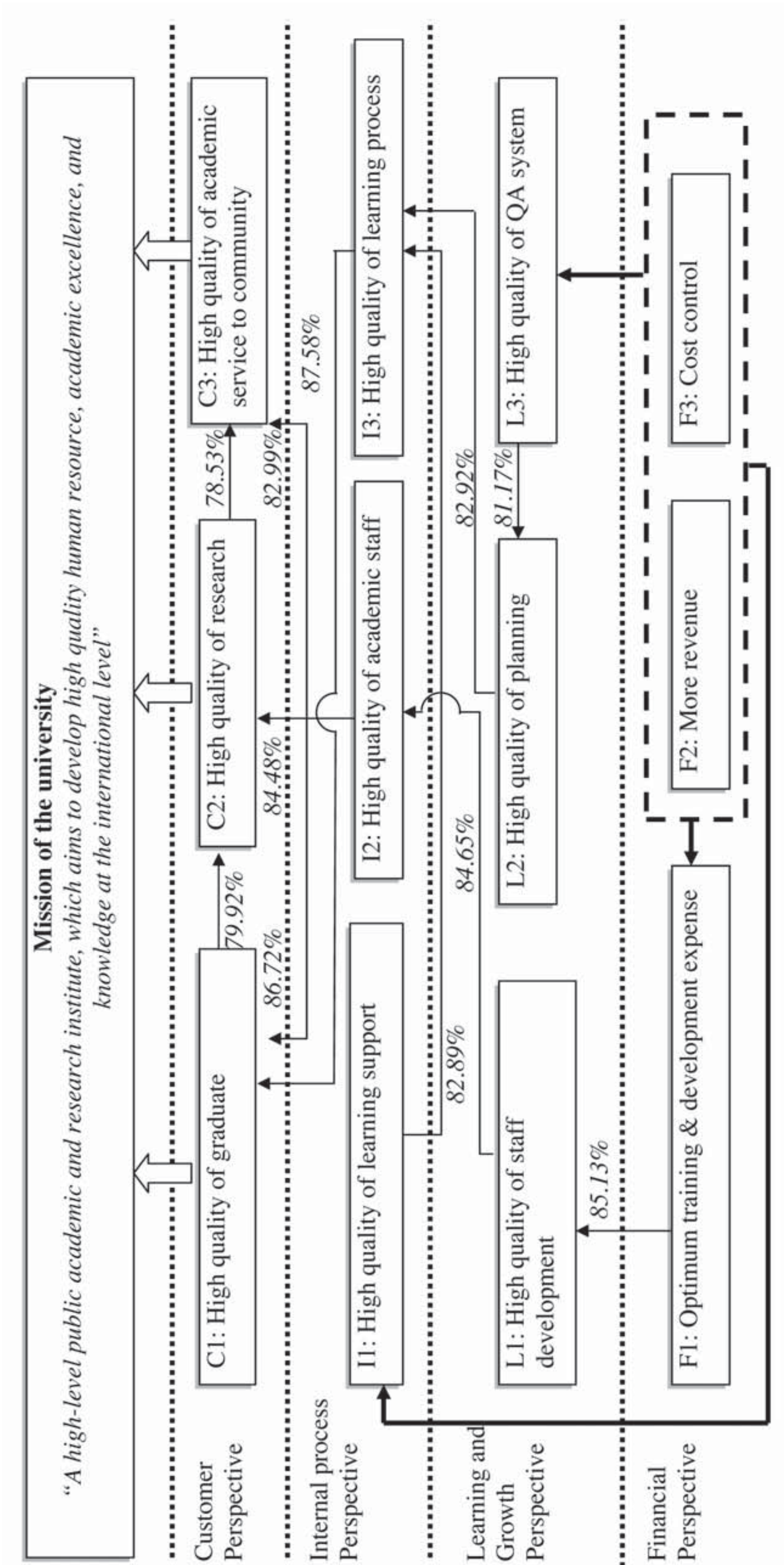

Figure 1 Strategy map of Thai public university (adapted from Rompho (2004))

the average of each correlation between each pair of objectives in the strategy map were then calculated. A simulation was then performed to see how specific objective has an effect on other objectives and on mission of university.

Simulation of the strategy map

Based on results from the survey, the correlation between each pair of objectives in strategy map based on opinion of management staff is presented in Figure 1. Each line connecting from each block represents the cause and effect linkage. The bold line however represents the area under control of the management. For example, when a university receives more revenues or save some costs (block F2 and F3 in the Figure 1), the management can make decision where they would like to invest these additional incomes into. It can be used for training and development (block F1), improving the learning support (block I1), or investing in the quality assurance system (block L3). For the normal line, the linkage is beyond the control of the management. It is a cause and effect relationship. For example, training and development expense is believed to be a driver of staff development, which will drive quality of academic staff and finally will lead to the success in term of quality of graduate, quality of research, and quality of academic service to community. However there is no guarantee that this will always happen. Therefore this linkage is considered a hypothesis that is needed a statistical test. If there is enough historical data, these hypotheses can be test statistically. However at the time this research is conducted, the data is insufficient. A simulation is therefore needed to be performed.

The linkage between objectives in the customer perspective to mission of university also depends on management decision, whether a university is going to focus on teaching, research, or academic service to community. For example if the senior management sees their university to be a teaching university, the weight of high quality of graduate will be higher than quality of research and academic service to community.

Before performing simulation, the following assumptions are made.

- Management has the total available investment of £150,000.
- Every £10,000-investment in training and development (block F1) or in learning support facilities (block I1) or in quality assurance system (block L3) causes 1% improvement in that area.
- Regarding to mission of university, the weight of quality of graduate (teaching university) is 70%, quality of research (research university) is 20%, and quality of academic service to community (university for community) is 10%.

Based on these assumptions, a simulation can be performed. For example if management invest £50,000 in training and development (5% improvement), with the correlation between training and development expense and quality of staff development of 85.13%, it will increase the quality of staff development by 4.26% (5% x 85.13%). This will also lead to the increase in quality of academic staff by 3.61% (4.26% x 84.65% - correlation between

quality of staff development and quality of academic staff). It finally partly drives quality of graduate by 3.13% (3.61% x 86.72% - correlation between quality of academic staff and quality of graduate). If the management decides that university should be a teaching university by putting the weight of 70% in quality of graduate in relation to the mission of university, the quality of graduate will finally improve the achievement of its mission by 2.19% (3.13% x 70%).

However the question in this case is that how management can allocate its limited amount of fund of £150,000 in order to achieve the highest possible improvement of the university's mission with the constraint that every objective must be improved by 5%. By performing a simulation with an advanced linear programming, the spreadsheet add-ins, Solver, the optimum solution can be found. In this case, if we set the maximum target of highest mission achievement by seeking the proportion of investment of total funding, by using linear programming, the solution is that the management should invest 52% of their money into training and development, 41% to quality assurance system, and 7% to learning support facilities. This will yield the highest improvement of mission achievement of 10.33%. The results of the simulation are shown in Table 1. This information is useful to management as they can estimate the optimum solution of their decision. In this case, the results reveal that £78,100 should be invested in training and development, £61,600 in QA system, and £10,300 in learning support in order to achieve the maximum improvement of mission of 10.33%

Table 1 Results of a simulation

Perspective	Objective	% Increasing
Financial	F1: Training and development expense (Management decision)	£78,100*
	F2 and F3: More revenue and cost control	N/A
Learning and growth	L1: High quality of staff development	6.65%
	L2: High quality of planning	5.00%
	L3: High quality of QA system (Management decision)	£61,600*
Internal business process	I1: High quality of learning support (Management decision)	£10,300*
	I2: High quality of academic staff	5.63%
	I3: High quality of learning process	5.00%
Customer	C1: High quality of graduate	9.26%
	C2: High quality of research	12.15%
	C3: High quality of academic service to community	14.22%
Mission of the University		**10.33%**

Conclusion

This paper has attempted to present a simulation of strategy map of Thai public university. By using the correlation between each pair of objectives found from the results of the survey of management staff in Thai public universities, results from simulation helps management focus on the areas that are strategically important to university and can allocate the appropriate funding to improve that area in order to achieve the highest possible improvement of mission of university. More constraints can also be added and new solutions can be found by re-simulating the model. As a result, the model is very beneficial to the university's management.

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