

Establishment proper of the balanced scorecard indicators to support decision making in a university: a case study in Institut Teknologi Indonesia

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Abstract. Balanced Scorecard (BSC) is a powerful tool in decision making process. Nevertheless, it is not rare that the BSC does not give satisfactory results because the indicators chosen do not reflect the needs of the organization. Therefore, indicator establishment is very crucial in the utilization of BSC. This research aims to determine the indicators BSC for a university and the research is a case study in Institut Teknologi Indonesia (ITI). In this study, BSC structure and indicators, comparison made by 4 previous researchers was used as the initial guide to determine the structure and indicators of ITI. And then, questionnaires were distributed to selected respondents and a focus group discussion (FGD) was conducted in order to produce indicators of BSC based on the mental model of the ITI. It is found 15 indicators based on the mental model of ITI. Furthermore, the relationships between the indicators are seen as dynamic relationships, and by using system dynamics, some feedback loops that are considered critical to organizational success can be identified and isolated.

Keywords: Balanced Scorecard, indicators, system dynamics, decision making

1. Introduction

University is non-profit organization that operates in dynamic environment. Due to this dynamic environment, a university faces many challenges and obstacles in operating its organization. Institut Teknologi Indonesia (ITI) also faces the same problems. ITI does not have the metrics to measure the performance and relate it to the organization's strategy. To improve the quality of its management, a university needs to measure its performance. Measuring the performance has become a central issue in both academia and business [9].

To measure the performance can be used BSC. The determination of the indicator becomes important in the BSC because the proper indicators will ensure good performance of university operations. As a result, a university continuously tries to improve its weaknesses in order to ensure its competitiveness [1]. Several studies have been conducted to determine the indicator of university performance [2] and neglected the established university performance indicators [1]. Therefore, this study was conducted.

The cause and effect relationship among BSC indicators are one-way relationship [9]. So that there can be a tendency to be indifference to its implementation. While, in fact, there are different interactions between the decision and the key performance indicators. BSC does not firmly separate cause and effect in the context of time [15]. The causal relationship in the real world does not happen



simultaneously, because there was a time delay. Therefore, BSC needs to be approached with system perspective because organization operates in dynamic environment. Indicators and relationships are developed based on the mental model of the organization, which illustrates the dynamic of the system in universities. There are quite rare the researches which study the dynamic of BSC, especially in a university. In this research, the dynamic of BSC in a university will be studied

A university has 3 primary functions, which are: education, research and service. A university should establish performance measurement indicators (PMI) to evaluate its performance related to resource allocated [1]. The perspectives of BSC can be determined by generating whole understanding of the organization's vision and mission, which is determined by the dominant logic of the organization. With respect to PMI, Kaplan and Norton pointed out that each BSC perspective must have at least one target item and no more than 15 items of measurement [1].

The reasons that the implementation of BSC is failed are: (i) too few measures in each perspective; (ii) too many indicators without identifying the critical view; and (iii) the failure of measures selected to depict the organization strategy [16]. In addition, the failure is also because not enough individuals involved in the determination of indicators [9]. The key performance indicators (KPIs) are distinguished into lead indicators and lag indicators. Lead indicators can identify anteriorly symptoms of organization management, and lag indicators require time to reflect the organization management performance [1]. Therefore, it is important to understand the determination of KPIs as the indicators of the performance measurement in order to be successful using them as performance measurement tool.

BSC differentiates between four perspectives regarding strategic development [15], namely: (i) financial perspective, (ii) customer perspective, (iii) internal process and learning perspective and (iv) development perspective [9]. Experiments show that managers can use information from the strategy map to assess the effectiveness of organizational strategy [11]. It has become common practice worldwide for a university to prepare strategic development plans that are accompanied by monitoring system, such as scorecard [12], which is regarded as a tool for better educational planning [6].

BSC is not only a performance measurement tool, but also the management system to promote breakthrough for competitive performance and it is most successful when used to drive the process of change. BSC as a communication tool [13], [14] helps staff members to understand their role in achieving university strategic goals and objectives. The application of the BSC in the process of strategic management is aimed: to clarify and translate vision and strategy; to communicate and link strategic objectives and measures; to plan, set targets, and align strategic initiatives; and to enhance strategic feedback and learning [7]. Therefore, BSC needs to be approached with a system perspective, which overcomes the above problems. This is because the system perspective is very suitable to support managers to learn and understand complex systems [17]. The system approach can be performed by using causal loop diagrams (CLD).

2. Theoretical Background

This research study consists of five stages which are as follows:

- a. Development of ITI scorecard. Find perspective and indicators based on literature. At this stage, the perspective and indicator using BSC from previous research.
- b. Find perspective and indicators based on FGD
- c. Find perspective and indicators based on questionnaires.
- d. Replication of the model. The next stage is the modeling of BSC dynamic model.
- e. Proposed strategy. The last step was to know that the policy has a high leverage on the performance of the organization in the future.

3. Research Method

3.1 Structure of BSC Based on Literature

To develop the framework of ITI BSC, this research refers to the previous BSC research conducted by four people, namely: Mang Chuang [4], Chen, Wang and Yang [1]; Venkatesh et al., [18], Cullen, et al. [5]. This is because the research that has been done by the four researchers produced indicators that can provide benefits for the college under study to improve its performance. In addition, the study is in conformity with the needs of the research undertaken. Previous research by four researchers was the measurement of universities performance with BSC. The results of the comparison of the four researchers can be seen in Table 1.

Table 1. Comparison of the Four Researchers

Scorecard Dimension	Framework	Sun Shing Chen		Cullen		Venkatesh and Kirti		Mang Chuang	
		Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead
Costumer	Product Image Relationship	X	X	X		X	X		X
		X	X	X				X	X
		X	X	X	X	X	X	X	X
Internal Process	Innovation		X	X	X	X	X	X	X
	Services Operational	X	X	X	X	X		X	X
Learning and Growth	Competency of the staff members	X	X	X		X	X	X	X
	Technology					X		X	X
	Climate to act					X		X	X
Financial	Early Sustainable	X	X			X	X		
	Mature			X				X	X

Comparative analyses of the four researchers are as follows:

1. Chuang; Chen; Cullen, et al.; Venkatesh et al. conduct performance measurement studies in universities referring to the BSC framework;
2. The results of the four researchers do not all thoroughly address the four frameworks of the BSC perspective, except Chuang;
3. The four researchers measure the performance of universities by using indicators that pay attention to the vision, mission and strategy in each university, so as to assess the extent to which the achievements made by the institution.

Considering the comparative analysis of the four researchers in Table 1, the structure of ITI's BSC is built with four perspectives thoroughly so that it will provide performance measurement indicators that can measure the full perspective, both internal and external, both customer satisfaction and stakeholders. Based on literature produced 4 perspectives and 57 indicators.

3.2 Find Perspective and Indicators Based on Focused Group Discussion (FGD)

The next stage was FGD consisting of 7 lecturers in ITI who understand the BSC. The result of the first stage (based on literature) is delivered in FGD to be discussed. FGD produced 4 perspectives and 65 indicators as presented in the Table 2.

Table 2. Perspective Based on the Literature

No	Research	Theme	Indicator
1	FGD	Reputation	The Number of Student
2	Chen		University reputation
3	Chen		Accreditation
4	Chuang, Venkatesh		Quality of Graduates
5	FGD		Customer satisfaction
6	Chuang		Service quality
7	Chuang		Job satisfaction
8	Chen		Short-term and long-term plans
9	Chuang	Organizational development	Organizational Capacity
10	Chen, Venkatesh		Competence of lecturers
11	Chen	Lecturer	PhD Ratio
12	FGD		Further Education
13	Chuang		Training
14	Chuang		Competences of Lecturer
15	FGD	Teaching resources	Facilities and Infrastructure
16	FGD		Operating expenses
17	Chen, Chuang, Venk		Total Income
18	Chen		Return on investment, ROI
19	Venkatesh		Number of Partnership
20	Chen, Venkatesh		The cost of infrastructure per student
21	Chen		Economic value added, EVA
22	Chen, Cullen	Finance	Paper published journal per lecturer
23	Cullen		Books published per lecturer
24	Cullen		Number of studies per full-time lecturer
25	Cullen		Papers published at conference per lecturer
26	Chen, Chuang		License average per lecturer
27	Chen, Chuang		Patent average per full-time lecturer
28	Chen, Cullen		Integration of research and planning
29	Chuang, Cullen		Average research fund per lecturer
30	Chuang, Venkatesh	Research	Alumni reputation in the market
31	FGD		Patent
32	Chen, Venkatesh		Participation in social activities
33	Venkatesh		Community service fund
34	Chen	Community service	Full time student / lecturer ratio
35	Chen, Chuang		Average graduation rate
36	Chen, Chuang	Teaching quality	New student retention
37	Chen		Dropped out students
38	Chen		The number of students
39	Chen		Alumni donation ratio
40	Chen, Venkatesh, Cullen	Student retention rate	Donation from other sources
		Financial Donation	

No	Research	Theme	Indicator
41	Chuang, Cullen	Quality of students	Fund raising increase
42	Chen		Requirements for new students
43	Chen, Cullen		The ratio of registering students to accepted students
44	Chen	Tutorship result	Participate student in community service activities
45	Cullen		Community service activities
46	Cullen		Career alumni monitoring
47	Chen	Continuous service	Ratio of part-time lecturers involved in promotions
48	Venkatesh, Cullen		Continuous education planning
49	Chen		Students and lecturers ratio
50	Chen	Human resources	Full-time and part-time student ratio
51	Venkatesh		Ratio between lecturer and total cost
52	Chen, Venkatesh		Financing ratio per student
53	Chen	Library	<i>E-process</i> ratio
54	Venkatesh		Average libraries cost per student
55	Chen		Curriculum planning
56	Cullen	Curriculum	Curriculum development
57	Chen		<i>E-curriculum</i> ratio
58	Cullen		Curriculum improvement
58	Chen, Venkatesh	Alumni	Alumni career
59	Chuang		
59	FGD		Tuition fee
60	FGD		Grant and donation
61	FGD		Customer complaint
62	FGD		Obsolete
63	FGD		Recruitment/retirement of lecturers
64	FGD		Quality of services
65	FGD		Culture

3.3 Find Perspective and Indicators Based on Questionnaires

The next stage of the BSC is developed by collecting and processing data from questionnaires that contain draft indicators based on literature and FGD. The questionnaires were given to 30 selected lecturers in ITI. Respondents were asked to complete questionnaires with Likert Scale 1-7 (1 = strongly disagree, 7 = strongly agree). The selection of the respondents is done by purposive sampling. Six of them are lecturers who served as the leader of university and 4 others are lecturers who had served as the leader in the university. Others are lecturers who know BSC and are involved in promoting ITI performance. The next stage is to process the questionnaire data with SPSS to determine the indicators of ITI performance.

Each BSC perspective must have at least one target item and no more than 15 items of measurement [6]. From data processing, it is obtained that the structure ITI BSC consists of 4 perspectives with 15 indicators. The selection of indicators is based on ME = 0.4438 and SD = 9.89.

The indicators are as follows:

- Costumer perspective: customer satisfaction, organizational capacity, quality of graduates
- Financial perspective: total income, grant and donation, operating expenses
- Learning and growth perspective: competence of lecturers, further education, research, training, job satisfaction.
- Internal process perspective: facilities and infrastructures, the number of student, quality of services, recruitment/retirement of lecturers.

3.4 Weaknesses of BSC Framework

The above BSC framework has a disadvantage because it assumes that all indicators are independent, due to all of the indicators produced are in the same direction and every indicator is equally important. In fact, the whole indicators are not independent each other and have a circular causal relationship. The system thinking principle will cope with the problems and increase the success of BSC as a strategic management tool. The interaction among variables of the BSC in 'cause and effect relationship' is a one-way relationship [9]. So that there can be a indifference tendency to its implementation. While in fact, there are different interactions, particularly the delay between the decision and the change of key performance indicators. BSC does not firmly separate cause and effect in the context of time [15], while the causal relationship in the real world does not happen simultaneously, because there was a time delay.

Therefore, it is necessary to build a dynamic ITI BSC. The most important managerial insight of this stage is when the management realizes that the achievement of goals cannot run independently, but influencing each other. Management cannot prioritize only customer satisfaction, or internal processes or the growth of learning or cost effectiveness, but rather: how these four goals will be achieved simultaneously.

BSC dynamics aims to identify the issues in each scorecard, so it can be understood system behaviour caused by the interaction among variables. After identifying the issue, the next stage is to create feedback diagrams (Causal Loop Diagram/CLD) as well as analyse Behaviour Over Time (BOT).

3.5 Dynamic Model of ITI

The performance of the universities has a very complex inter-linkage among the variables that affect each other. The most important managerial insight from this stage is when management realizes that the achievement of goals cannot run independently, but is interrelated. At this stage dynamic BSC is build, which aims to construct CLD, prepare and analyse BOT graphs.

Through dynamic BSC, it enables leaders to identify and isolate some feedback loops that are considered critical to organizational success. This loop is called by Daniel Kim (1997) as the key success loop that needs to be monitored and managed together with key performance indicators (KPIs). Model of key success indicators representing ITI performance can be seen in Figure1.

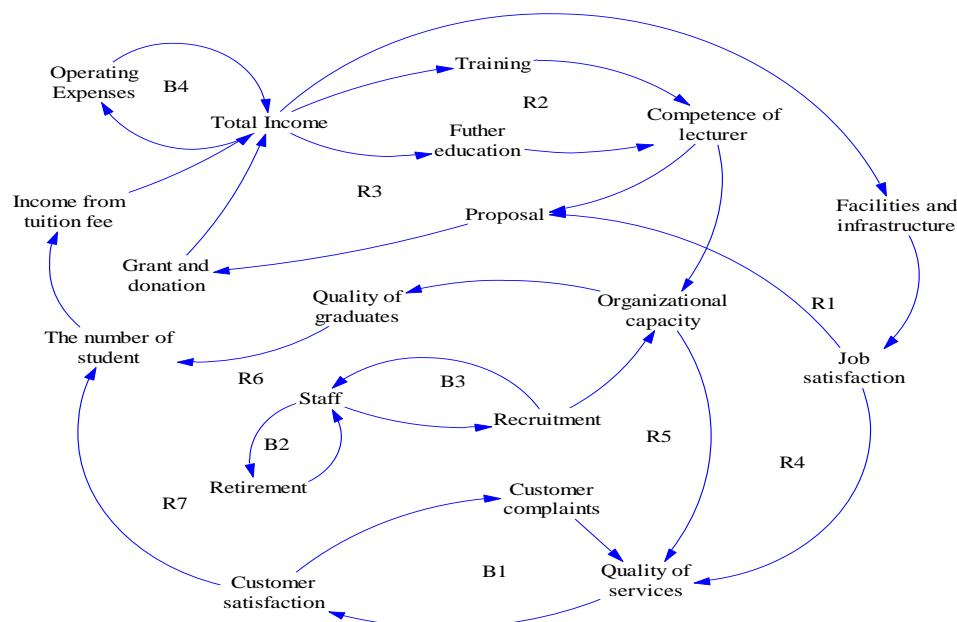


Figure 1. CLD of ITI

Figure 1 above shows that there are eleven interconnected key feedback loops that together determine the dynamic behaviour of the model, where seven reinforcing loops (R1, R2, R3, R4, R5, R6, and R7) and four balancing loops (B1, B2, B3, B4). Loop reinforcing (or positive) is a loop aimed at growth (having exponential growth as a dynamic behaviour), while loop balancing (or negative) aims for balance and static.

The reinforcing process can have a pattern with positive and negative loops. This describes that reinforcing loop not only improves growth, but also accelerates destruction. The implication is that if the target of the system works in accordance with the desired result, then the process is profitable. But sometimes in the process found the opposite conditions.

The goal of a successful strategy is to reinforce a positive feedback loop, a performance-enhancing loop, which at the same time eliminates or correctly manages other negative loops, which decrease the performance. From the results of ITI CLD performance measurements, important KPIs are obtained as leverage points that reinforce the performance, which are: total income (financial perspective), number of students (internal process perspective), job satisfaction (growth and learning perspective) and customer satisfaction (customer perspective). The determination of these variables as leverages because the variables are the principal variables in each perspective which have a positive feedback loop that improves performance. Interrelated variables and considered to be a leverage of ITI performance.

ITI is a non-profit organization, so customer perceptions with customer satisfaction variables are an important perspective for the institution. If customer satisfaction increases, then complaints on service will decrease. This will provide a good internal image, and the customers will spread their satisfaction from mouth to mouth. It acts as an advertisement that can increase the students registering to ITI.

The increasing number of admitted students will contribute to increase the income from students' tuition fee. Increase in tuition income will increase total revenue. Increased funds available will increase funding for the activities increasing income, such as training, further education so that will increase job satisfaction of lecturers/employees. Job satisfaction and lecturer competence will improve lecturers' ability, either in making proposals to earn income from grants and other sources, as well as in conducting research and community service and service to students. All of these loops are closed loops and are positive loops (active) in the system. This positive loop is the key to sustained growth and success of the institution. Therefore, management needs to identify and manage it properly.

CLD of key performance drivers form the Limit to Growth pattern. This pattern shows limited growth. The behaviour of this pattern indicates that a growth cannot be done continuously because it encounters resource constraints. This pattern is often repeated within an organization. Ultimately this pattern forms a standard structure and behaviour. The problems that form the structure of the pattern of limit to growth or limit to success has the characteristic of reinforcing in the initial process and then encounters balancing due to resource constraints to promote continuous growth.

4. Conclusion

The result shows that the BSC provides a systemic view on the strategy of higher education institution. Each university develops BSC in accordance with its vision and mission and focuses on human resources, teaching resources, research, teaching quality improvement based on the requirements of external and internal stakeholders of higher education institutions.

Although difficult and time-consuming in its development, the dynamic BSC is an efficient strategic management tool in creating the harmony among all elements of a higher education institution strategy. From the results of dynamics BSC research in ITI, it is found that the indicators becoming leverages of ITI future performance are customer satisfaction, the number of student, job satisfaction and tuition income. Therefore, management needs to identify and manage the key performance drivers correctly.

In addition, BSC can be used as a communication tool which helps staff members to understand their role in achieving the strategic goals and objectives of the organization and can provide effective organizational performance measurement. In addition, it helps not only staff members but also external stakeholders to clearly understand the strategic goals that the university wants to achieve.

5. References

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