Conceptual Modeling of Performance Indicators of Higher Education Institutions

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Abstract: Measuring and analyzing any type of organization are carried out by different actors in the organization. The performance indicators of performance management system increase according to products or services of the organization. Also these indicators should be defined for all levels of the organization. Finally, all of these characteristics make the performance evaluation process more complex for organizations. In order to manage this complexity, the process should be modeled at the beginning. The aim of this study is providing the conceptual performance model for higher education institutions to manage this complexity easily and evaluate the higher education institutions from all aspects. The proposed model is also exemplified by using Sakarya University case study.

Key words: Performance, modeling, higher education.

Introduction

All enterprises exist for the achievement of one or more goals and these goals vary depending on the type of organization. The main goal of a manufacturing company can be the realization of maximal profit while the goal of a non-profit organization can be to effectively provide its services. The measuring of performance and results of the enterprise shows the success of the management. Therefore, measuring and evaluating organizational performance plays an important role in turning organizational goals to reality, and the notions of a goal and a performance indicator are essential.

Today organizations need to define and make explicit company-specific performance indicators by using a systematic approach. That's why, it is necessary to formalize the concept of a performance indicator together with its characteristics, relationships to other performance indicators and relations to other formalized concepts such as goals, processes and roles. This study presents a framework of performance evaluation model of higher education institutions by modeling performance indicators and the relationships between them. The contribution of the study can be summarized in the following points:

i. clarification the required knowledge for performance measuring of higher education institutions by formalizing the concept of a performance indicators,
ii. formalization of the relationships between performance indicators,
iii. integration of the concepts of a performance indicator of higher education institutions,
iv. providing a basis model for application of information technology in a performance measuring system.

Performance Measurement Systems and Performance Indicators

Performance Measurement (PM) is defined as getting timely information about the operations have to be monitored and measured constantly for heading of company's success (Kanji, 2007). Although the immediate role of any performance measurement system is to check progress towards the established goals, such system fulfills several other purposes in the organization such as decision support, diagnosis, performance evaluation and

monitoring effect of strategic plans (Tehhumen et.al, 2002). By implementing PM, an enterprise can have following capabilities (Kanji, 2007);

- ability to identify major improvement opportunities,
- ability to achieve goal congruence and organizational alignment,
- ability to enhance accountability,
- ability to drive future resource allocation decisions
- ability to communicate to each individual how he/she can contribute to the overall strategy and thus to encourage and reinforce certain behaviors and attitude.

A performance measurement system is a set of performance indicators (PIs) to quantify actions. These PIs are the building blocks in a measurement system. In the literature, the PIs can be classified in different ways. For example, the PIs is classified according to its characteristics into hard versus soft PIs. Hard PIs are pure facts that are possible to measure directly whereas soft PIs are intangible metrics that have to be measured indirectly like for instance attitudes (Rolstadas, 1995).

Also, the PIs can be grouped into three groups according to its purposes and time horizons such as achievement, diagnostics and competence PIs. Achievement PIs are direct metrics for actual business achievement such as net profit, return on investment, market share, export share etc. as well as diagnostics PIs are indirect metrics for business achievement. These PIs are critical success factors such as delivery precision, delivery flexibility, product quality, product reliability, lead time on customer request, customer satisfaction, outstanding claims etc. Competence PIs is used to describe how well the company is prepared for the future or to meet new requirements (Rolstadas, 1995).

In the other framework, there are two types of performance measures such as process performance measures and output performance measures. While process performance measures monitor the activities of a process, output performance measures report the results of a process. Process performance measures are used to motivate people within the process as well as output performance measures are used to control resources (Hronec, 1993).

Optimal performance measurement systems would be developed to serve different purposes and provide different time horizons by balancing of various PIs. The best performance measures give balance to the company's operations and are deployed throughout the organization in a way that links strategy to processes and processes to one another. Therefore, developing an objective measurement system and determining accurate performance indicators are a comprehensive and difficult task for any kind of enterprise. There are a number of different performance measurement and analysis systems available for companies. The Balanced Scorecard, the Performance Pyramid System and the Performance Prism are globally known. There are also numerous different implementation processes and practice examples for companies presented in the literature and scientific articles (Tehhumen et.al, 2002).

Using recognized objective indicators and evaluation systems is necessary for a rational justification of higher education institutions. European University Association (EUA) supports and executes the special studies to develop a shared reference system for indicators and evaluation procedures for higher education institutions in Europe. It reported a number of principles that are fundamental to define and use PIs of higher education (Tavenas, 2003):

- HE performance indicators will differ depending on the level of analysis envisaged.
- The statistical indicators of any university activity have to be regarded as elements that support a particular judgment rather than objective facts.
- Indicators have to be used in complementary clusters so as to give a very precise and thorough picture of the activity concerned;
- Indicators should preferably be concerned with the distinctive features of a particular institution or a university sector and enable it to monitor its strategic orientations.
- Analysis of performance indicators at any level (institutional, regional or national) must therefore take information on the variety of academic disciplines in terms of their nature and relative representation fully into account.
- Performance indicators too firmly rooted in the diversity of disciplines may no necessarily do this. By using indicators applicable to the major branches of learning such as natural sciences applied sciences, life sciences, the social sciences and arts, this potential pitfall is largely averted.

- The use of uniform performance indicators in a university system is only justified if all the institutions in this system have similar fundamental goals and responsibilities. If not, the adoption of such indicators carries with it the considerable risk that the system will eventually become uniform and sacrifice its diversity. They should therefore only be used discriminatingly and with the agreement of all concerned.

An establishing a measurement system and determining performance indicators for the higher education institutions is getting difficult because of their inherent complexity. EUA also declined these difficulties in the following points (Tavenas, 2003):

1. An availability, representativeness, and reliability of raw statistical data,
2. A relation between the level at which data are aggregated and their meaning,
3. A diversity of academic disciplines,
4. Possible dangers inherent in using performance indictors to evaluate and finance institutions.

Conceptual Model of Institutional Performance Evaluation of HEIs

There are various studies about measuring the performance of higher education institutions as well as determining the performance criteria. Most of the studies try to answer what performance criteria should be and how performance criteria can be measured. For example, Centra (1997) determined the university evaluation criteria as classroom teaching, number of publications, quality of publications, research and/or creative activity. Martin (2003) evaluates the performance of 52 departments of Saragossa universities by using the collective model of envelopment analysis with three input variables: human resources, financial resources and equipment (material resources) and two outcome variables: educational and research in a coordinate way. In the other study, Azma (2010) described key performance indicators and presented a conceptual framework for the evaluation of the performance of the universities according to the key performance indicators. According to this study there are ten factors such as area and facilities (cultural area, research area, lab area, office area, education area, sport area), research and scientific journals, processes, education and technology, cultural and social services, faculty members, employees, students and graduates (Azma, 2010). In the other study, Wu et al. (2011) developed a set of appropriate performance evaluation indices mainly based on balanced scorecard for extension education centers in universities by utilizing multiple criteria decision making.

On the other hand, some studies focus on special dimension of the higher education institutions and use the different techniques for selection of the performance indicators. Lee (2010) focused on especially an intellectual capital (IC) and developed IC evaluation model to facilitate the understanding of their contribution to the university performance. He also applied Analytic Hierarchy Process (AHP) to formulate and prioritize the IC measurement indicators for constructing the IC evaluation model. In this study; university evaluation criteria were defined as administration, curriculum, technology transfer, research, teaching and service (Lee, 2010). Ahmadi (2012) aimed that cognition of performance appraisal system of this university and also introduced AHP technique in performance appraisal (Ahmadi, 2012). Kiakojoori et al. (2011) evaluated the performance of each branch of the Azad Islamic University (IAU) in Mazandaran province, determining the role model and reference branches to define the inefficient branches by applying envelopment analysis and ranking the efficient branches of AIU in Mazandaran province by applying Anderson Peterson Method.

After all, the beginning of any study about performance measuring of higher education institutions should be started by designing a reference model. Therefore, this study aims to provide the performance evaluation model for higher education institutions by considering the findings of above mentioned studies and EUS's principles. The proposed model consists of ***indicators sub-model*** and ***measurement process*** which are described in detail in the following sections.

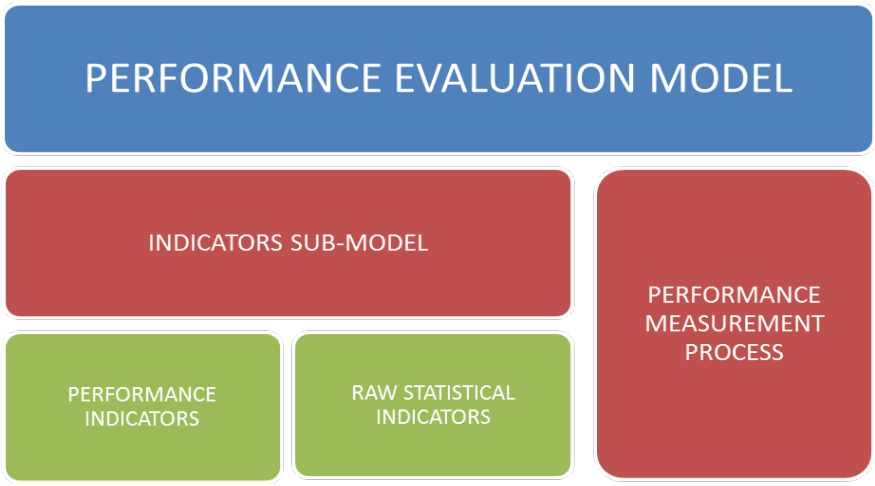

Figure 1: Performance evaluation model for higher education institutions

1. Indicators Sub-Model:

The indicators are classified into Performance Indicators and Raw Statistical Indicators in the indicators sub-model. ***Raw Statistical Indicators*** are the statistical numbers which are not processed and do not give any judgment about the situation. For example, "the numbers of the students of any departments" don't give any meaning for the situation and performance of this department. Therefore, we need to calculate some data to assess a performance of process or department. Raw Statistical Indicators could be Student Data, Academic Staff Data, Administrative Staff Data, Degree Programs Data, Course Data, Facility Data and Financial Data.

On the other hand, ***Performance Indicators*** are the calculated numbers about the process or the units in the higher education and can be used directly to evaluate this process or departments. The performance indicators consist of Strategic Performance Indicators and Process Performance Indicators:

- The Strategic Performance Indicators (SPI) are used for measuring the achievement of the institutional targets and they are output PI. Strategic Performance Indicators are grouped into following clusters for higher education institutions:
  - ✓ Education and Training PI
  - ✓ Research and Development PI
  - ✓ Community Services PI
  - ✓ Administrative and Management PI
- The Process Performance Indicators (PPI) can be used to monitor the processes which are executed in the institution, and these processes support the strategies of the HEI by determining the process targets in line with the strategic targets. Process Performance Indicators (PPI) are grouped into following clusters for higher education institutions:
  - ✓ Education and Training Processes PI
  - ✓ Research and Development Processes PI
  - ✓ Services Processes PI
  - ✓ Administrative Processes PI
  - ✓ Management Processes PI

As a consequent, the indicator has two dimensions in the proposed performance indicators sub-model such as:

1. Statistical versus Performance dimensions
2. Strategic versus Process dimensions

This classification also provides that the performance indicators can be differed depending on the level of strategic (institutional) or process analysis. The SPI can be used for strategic analysis, and derived from raw statistical indicators and the PPI which is used for process analysis. For example, "number of published paper" is the

indicator of knowledge creation process of higher education institution, and "number of published paper per academicians" is the institutional performance indicators of the higher education from the same dimension.

Figure 2: Relationship between indicators

Following table was constituted by using the Sakarya University's performance indicators based on the proposed model.

Table 1: Examples of Sakarya University's based on the model.

INDICATOR EXAMPLES OF SAKARYA UNIVERSITY			
Evaluation Focus	**Process Performance Indicators**	**Raw Statistical Indicators**	**Strategic Performance Indicators**
Education and Training	Number of revised courses according to the student surveys	Total number of courses	Ratio of revised courses (Number of revised courses/Total number of courses)
	Number of courses whose materials shared on web		Ratio of courses material sharing
	Number of enrolled students	Number of expected students	Ratio of fulfillment of programs
Research and Development	Number of published papers in SCI, SCI-expanded, SSCI and AHCI indexed journal	Total number of faculties	Number of published paper per faculty
	Number of national projects		Number of national project per faculty
	Number of international projects		Number of international project per faculty
Community Services	Number of supported projects for community	Number of appealed projects for community	Supporting percentage for community services
	Number of activity carried with the non-governmental organizations (NGOs)	Number of total NGOs	Effectiveness of collaboration with NGOs (Number of activity carried with the NGOs/ Number of total NGOs)
	Number of activities carried for social benefit	Number of departments	Number of activities carried for social benefit per departments

2. Performance Measurement Process:

The other component of the proposed PI model is the performance measurement process shown in the following figure. This component is to formalize the relationships of PIs and to describe the performance measuring procedure through the higher education institutions. The performance measurement process also links strategies to processes and processes to another.

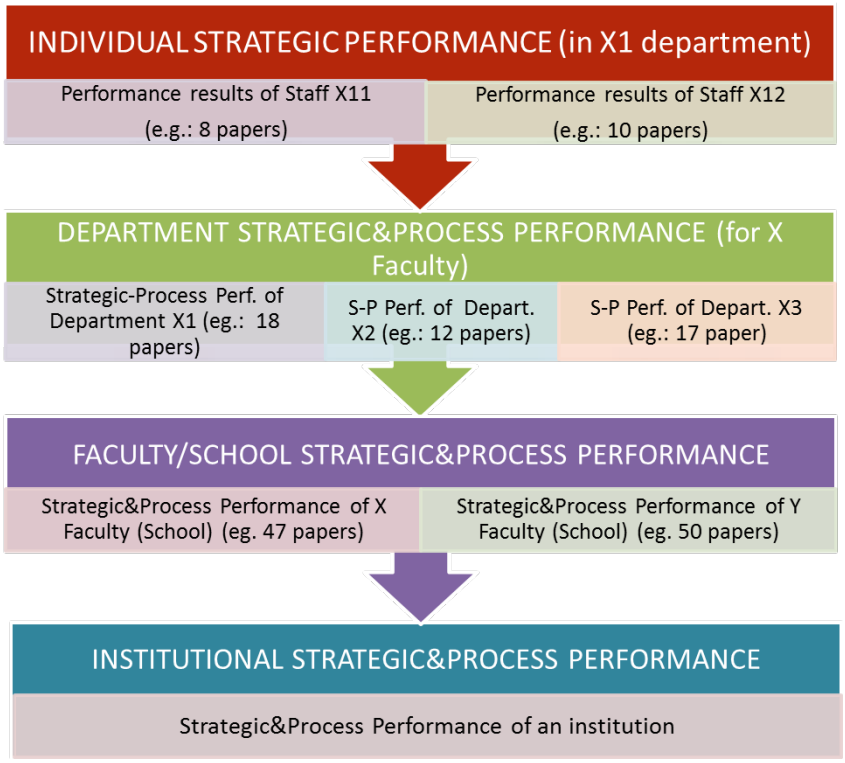

Figure 3: Performance evaluation process of higher education institutions

The performance evaluation process starts with determination the results at the individual level. After that, the department's performance values are calculated from individual results. The faculty's performance results are determined by aggregating performance results of all departments in the faculty and so on, the institution performance is calculated by similar ways from faculty to institution.

Conclusions

Todays, the performance evaluation is essential for any kind of institutions as well as higher education institutions. There are numerous different implementation practices for companies and for higher education institutions in the literature and scientific articles. Especially, EUA's studies about performance indicators and performance evaluation of higher educations are considerable. The aim of this study is to provide the performance evaluation model for higher education institutions by clarifying the required knowledge for performance measuring, formalizing and integrating the concept of performance indicators. This model also provides the knowledge basis for the implementation of information technology in a performance measuring system. The performance evaluation model consists of indicators sub-model which is classified into performance indicators and raw statistical indicators, and performance measurement process.

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