Experience in Development of Balanced Scorecards System for Higher Educational Institutions

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ABSTRACT

The article presents findings of how to develop a model of the balanced scorecards system to perform an internal audit of the operating performance of higher education institution departments for its further use when determining to what extent threshold values of the operating performance of higher education institution are achievable. The importance of developments in this area is determined by the need to evaluate individual findings of scientific and educational work of the faculty and staff of Russian high education institutions.

Keywords

Computer science, informatics, information technology, information management, balanced scorecard

1. INTRODUCTION

The annual monitoring of performance criteria of Russian high education institutions makes them face problems related to the operational evaluation of key and additional performance criteria. Solution to the above problems will allow Russian high education institutions monitoring key indicators of those activities, in order to conclude obviously, at any time, of to what extent threshold values of particular performance criteria of higher education institution are achievable, and to take appropriate measures to carry out activities for the achievement of target values.

In this regard, at the State University of Management (hereinafter – the University), a monitoring model for the balanced scorecards (BSC) system of the operating performance of higher education institution departments was developed; its target is to increase the transparency of managerial information environment through clear performance criteria of educational processes for each department, which are linked to the strategy and medium-term plans of high education institution activities, on the one hand, and to requirements of the Ministry of Education and Science of the Russian Federation, on the other hand.

In order to achieve the desired target, the following tasks were completed:

- a balanced scorecards system was selected and approved to perform an internal audit of the operating performance of higher education institution;
- a software was developed to periodically actualize performance criteria of the higher education institution;
- a technique was developed to audit the activity of higher education institution departments;
- a software was developed to perform an internal audit of to what extent threshold values of particular performance criteria of higher education institution are achievable;
- a technique was developed to implement the software at higher education institution.

2. A MECHANISM OF BSC IMPLEMENTATION INTO THE UNIVERSITY MANAGEMENT PRACTICE

Based on the experience of leading experts in the field of strategic management [1-4] and BSC implementation [5-7], and as a consequence of modelling of different approaches, the following algorithm was used to implement and apply this system to the management practice of higher education institution (Fig. 1):

Fig. 1 – A mechanism of BSC implementation into the University management practice

At the stage of the strategic analysis, information on market situation, consumers of educational services, success factors and competitors was collected and analyzed. The analysis started from the most important general and specific trends for the higher education system, those consolidation in possible future scenarios. The own competitive position of the University was analyzed compared to the position of actual and potential competitors, success factor were determined. Possible strategy variants were analyzed. At the stage of strategy assessment selection, a basic strategical orientation was determined, which set a principal direction of the organization development – from the real strategic position to a desired one.

At the stage of organizational frameworks, directions were determined for BSC implementation, in which strategic objectives and criteria were posed, and organization departments were determined, for which BSC was developed. At the University, the development of BSC started from the top organizational level, i.e. for the University in whole. As directions, prospects «Social significance», «Finance», «Consumers», «Processes», «Resource potential» were selected.

At the stage of a strategic roadmap, strategic objectives were determined and causal relationships were made between

them. In order to maintain an acceptable observation level, max. 4-5 objectives for each prospect should be determined. Since the higher education institution is an organization, which serves the public interests, the prospect «Social significance» is reasonable to set at the top of its strategic roadmap, which determines the ability of higher education institution to meet society's expectations, i.e. to respond timely to varying needs, and reflects the mission of the University.

At the University, causal relationships were started from strategic objectives of the prospect «Resource potential», which is the basis of the whole strategy. Causal chains were distributed «bottom-up», in order to allow connecting strategic objectives of different prospects and make the general map of objectives with all most important relationships.

For the purpose of strategy description and communication, the basic strategic orientation is transformed into strategic objectives and causal relationships. The system of objectives and relationships shows, which aspects of prospects «Social significance», «Finance», «Consumers», «Processes» and «Resource potential» will be addressed by management, where key resources will be directed, and how individual objectives are interrelated.

At the stage of BSC development for the University, criteria are selected, target values are determined, strategic measures are developed. At the end of this stage, target values are documented, which are required to connect BSC to systems of scheduling, internal reports and coordination of targets with subordinates. Such information can be integrated into the internal reports system.

Integration of BSC into management system consists of an integration into scheduling, reporting, human resource management, coordination with quality management system etc. A no less important implementation task of the balanced scorecards system is an appropriate support based on information technologies. Such support is required for the constant use of BSC. The balanced scorecards system is an effective management tool only if it is used in combination with other management tools.

At the stage of assessment of achievement of objectives and adjustment, the balanced scorecards system is critically studied. It should be determined if its components really describe the strategy. Based on the assessment, changes are made in both objectives and criteria. When analyzing criteria, deviations are to consider not just as drawbacks, which should be corrected, but also as opportunities to extend knowledge.

3. DEVELOPMENT OF THE BASIC CONCEPT OF BSC MONITORING INFORMATION SYSTEM

The following principles provided the basis for the solution architecture of interest:

1. Systematicity: interrelated subsystems are to form on the basis of a single methodology and satisfy unified principles of cooperation, reliability and management.

2. Openness and compatibility: in order to provide prospects for IS further development, it should be considered if it is possible to integrate heterogeneous computation components and different applications, as well as system add-ons with new functional systems of other developers.

3. Modularity: a possibility to finely adjust and extend any system part should be provided without radical structural changes.

4. Personalization: an easy personal access to IS should be provided for all groups to complete appropriate tasks.

5. Controllability: flexible full functional IS control mechanisms should be provided at all architecture levels (the use of web-services in the system generation and integration; support of SOA paradigm etc.).

6. Safety and reliability: security and reliable data protection against errors, intentional information destruction or loss, as well as user authorization, workload management, protection management and online restore of portal functions after failures etc. should be provided.

The integration of planning, analysis and control processes for all activity areas of higher education institution allows realizing information support of the educational process at all management levels and managing the institution using convenient and reliable tools to plan, control and analyze results of all activity types, distribution of material, personnel, and finance resources.
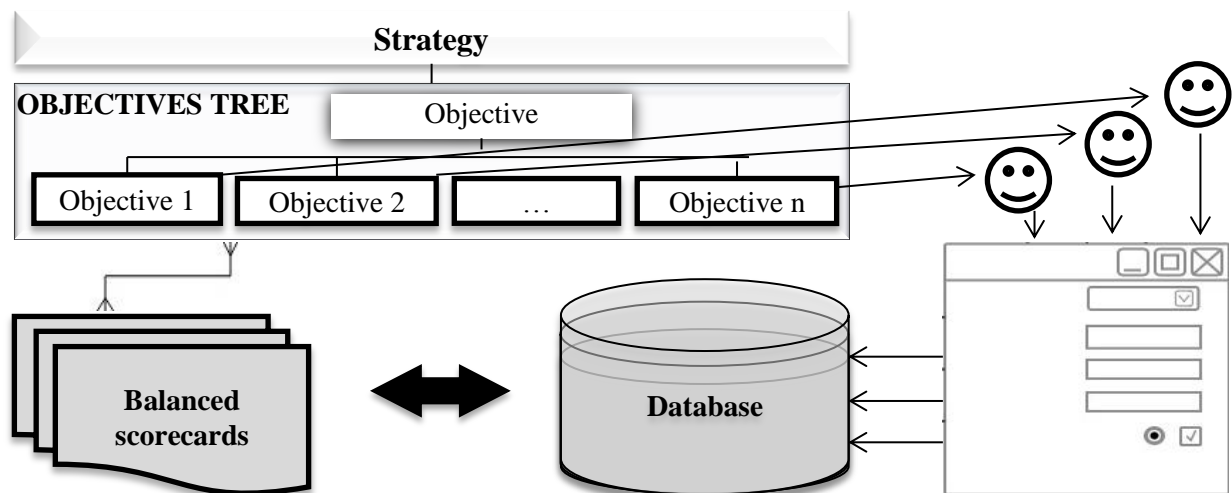

Fig. 2 – Basic conceptual model of BSC information system to perform an internal audit of University operating performance

4. A MODEL CONCEPT FOR BSC MONITORING OF UNIVERSITY OPERATING PERFORMANCE

The following information systems are implemented and used now at the University:

➢ ACS «Entrant» is a system, which provides an enrollment campaign at the University. The system is a workstation of the admission committee assistant secretary to fill necessary documents. Moreover, the storage holds data of students enrolled to the University. The format of data storage is DBF. The storage is in the server connected to the University local network;

➢ 1S-Accounting Suite is a multifunctional system dedicated to automate tax registration and bookkeeping and to prepare regulatory reports. Similar to ACS «Entrant», the format of data storage is DBF; moreover, the export of information to different popular formats is supported, there is also a possibility to upload files to a remote server;

➢ 1C–Payroll & HR, similar to 1C-Accounting Suite, is a system, which provides tools to automate the operation of University human resources;

➢ The portal of the State University of Management is a solution developed by professionals from IT-departments, powered by Internet portal, and which provides a dashboard functionality for teachers and students of the State University of Management. The system is deployed on the server of the State University of Management to upload data. The format of data storage is MariaDB.

The analysis of functional capabilities of the above systems allowed making the following conclusions:

➢ Information stored in databases may be used to calculate some monitoring criteria, in particular those, which specify the human capacity of higher education institution and its financial and educational activities;

➢ All systems are capable to upload data to external network resources;

➢ The interface of the University portal may be used as the basis for the source data input system to monitor indicators, which cannot be obtained from automated systems used at the University;

➢ Since the University portal stores data in the format different from data formats of other systems, an ESB should be created.

Since monitoring indicators can change in both composition and calculation methods, the system under development should provide the appropriate extendibility through the development of external and internal modules. The extendibility is also required to adapt the automated system for its further use in other higher education institutions. In this regard, there is a need for development of the application-programming interface (API), a set of predefined classes, procedures, functions, structures and constants provided by IS for the use in external software programs.

Within the system, a data backup mechanism should be present, which provides both the forced backup, and the backup on schedule.

The system should be designed to obtain information from third-party systems implemented in higher education institution. In this regard, an ESB is required to provide the following functional capabilities:

• generation of data requests from the systems of 1C-Accounting Suite, 1C-Payroll & HR, ACS «Entrant», the University portal;

• conversion of obtained data into a single format;

• data from external systems should be obtained both manually (by user command), and automatically, on schedule.

Calculation algorithms of key and additional monitoring indicators should be implemented in software by the procedure of the Ministry of Education and Science of the Russian Federation.

The system implementation should cover all university departments, which participate in the monitoring of operating performance of higher education institution.

A conceptual IS monitoring model as an abstract model, which determines the simulated system structure, properties of its elements and causal relationships, inherent in the system and important to achieve the objective, is given on Fig. 3.

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Interface and ACS database "Entrant"
User: "Admission Committee"

Interface and database "1C-Accounting Suite"
User: "Financial departments"

Interface and database "1C-Payroll & HR"
User: "HR department"

LOCAL AREA NETWORK OF UNIVERSITY

ENTERPRISE SERVICE BUS

Generation of requests for receiving and transferring data

Conversion of data into a single format

Module "Download schedule

Dashboard in Web-portal
User: "Chair / Department"

Informational monitoring system of balanced indicators of efficiency of activity
Users:
1. Teaching department
2. Doctoral and graduate courses department
3. Student body department
4. Library
5. Publishing house
6. Department of international cooperation
7. International student department
8. Administrative and economic department
9. Logistics support department

Main database   **Storage**

| Educational activities | Scientific activities | International cooperation | Financial and economic activities | Personal resources |

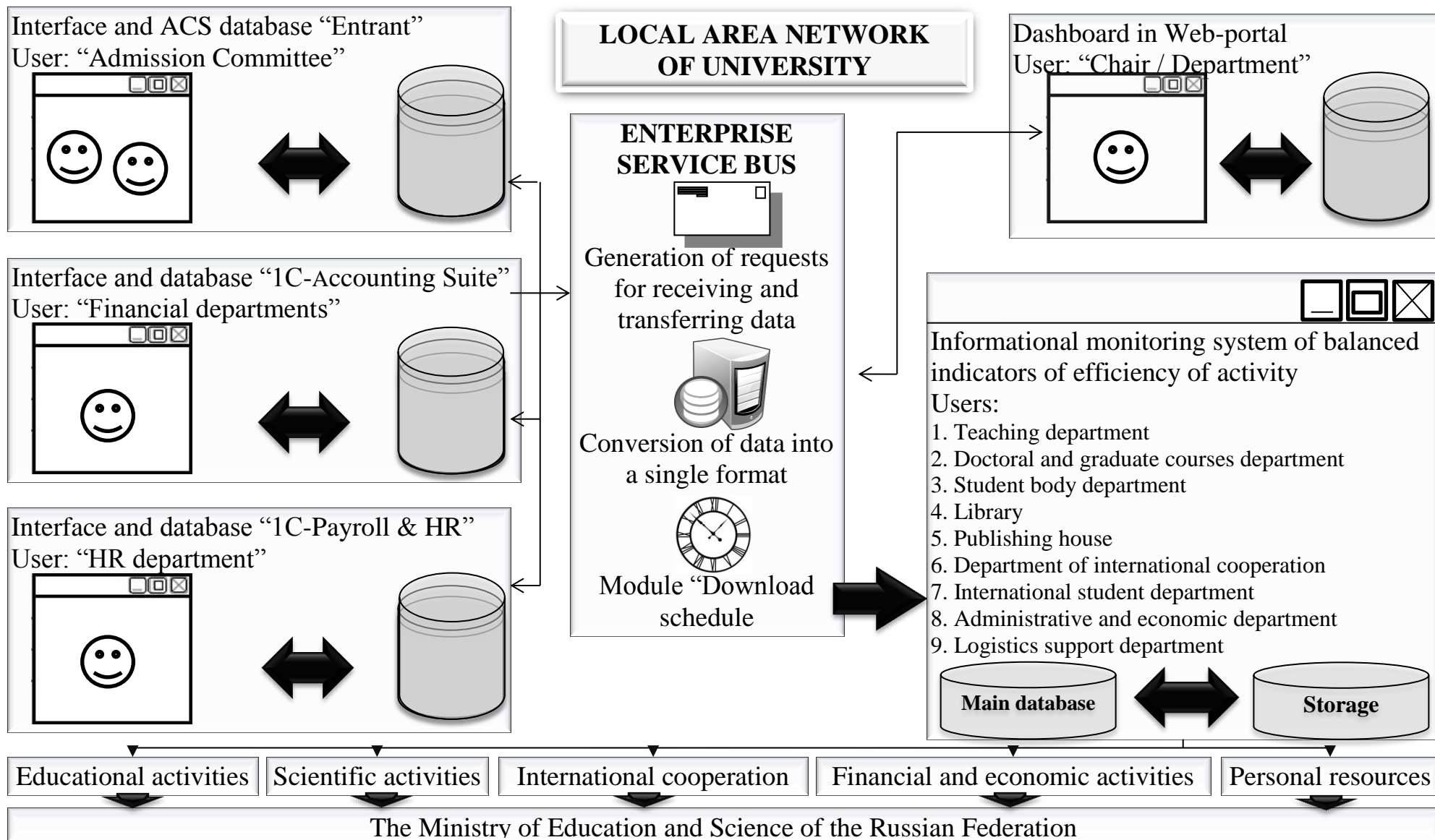The Ministry of Education and Science of the Russian Federation

Fig. 3 – A conceptual IS monitoring model of balanced scorecards of operating performance of higher education institution