

BALANCED SCORECARD FRAMEWORK IN SOFTWARE PROJECT MONITORING

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Balanced scorecard is performance measurement system in enterprises and non-profit organizations. Many scientists and practitioners adapted balanced scorecard to specific applications. This paper presents overview of implementing balanced scorecard in IT project management. We propose framework for software project monitoring based on balanced scorecard and PRINCE 2 methodology for project management.

Keywords: balanced scorecard, software project management, PRINCE 2 methodology, project monitoring

INTRODUCTION

Business performance management (BPM) can be described as a series of business processes supported by technology designed to optimize both the development and the execution of business strategy (Krolick and Ariyachandra, 2006). BPM standards group (Business performance management standards group, 2004) defined a BPM framework: an organization define strategic goals, create plan for implementing them, measure and analyze effectiveness of strategy implementation, determine the gap between actual and targeted performance and take corrective actions to improve performance.

"Performance measurement is evaluating how well organizations are managed and the value they deliver for customers and other stakeholders" (Bocci, 2004). The significance of performance measurement is described in well-known sentences: "if you can't measure it, you can neither manage it nor improve it" and "what gets measured, gets done" (Kaplan and Norton, 1992). Performance measures must be according to Performance measurement management framework (UK Department of Trade and Industry, n.d.): meaningful, unambiguous and widely understood; owned and managed by the teams within the organization; based on a high level of data integrity; such that data collection is

embedded within the normal procedures; able to drive improvement; linked to critical goals and key drivers of the organization. There are four key steps in a performance measurement framework (UK Department of Trade and Industry, n.d.): the strategic objectives of the organization are converted into desired standards of performance, metrics are developed to compare the desired performance with the actual achieved standards, gaps are identified, improvement actions initiated.

BALANCED SCORECARD

"One of the best approaches to identifying the appropriate performance metrics (i.e. key performance indicators - KPI) is through the use of a methodology known as the Balanced Scorecard (BSC). The Balanced Scorecard approach provides executives with a comprehensive framework that translates a corporation's strategic objectives into a coherent set of performance measures. It provides a framework that not only provides performance measurements, but helps planners identify what should be done and measured. It enables executives to truly execute their strategies. The Balanced Scorecard (Balanced Scorecard Institute, n.d.) approach is consistent with the concepts of cross-functional integration, customer supplier partnerships, continuous improvement and team

accountability. (Management and Accounting Web, n.d.) Since "not all long term strategies are profitable strategies." (Management and Accounting Web, n.d.), Kaplan and Norton expanded the existing view of performance metrics, which were then primarily financial, into four perspectives:

1. financial,
2. internal business,
3. customer, and
4. innovation and learning (i.e. learning and growth)." (Krolick and Ariyachandra, 2006)

The balanced scorecard suggests that we view the organization from four perspectives that effect each other in the process of implementing vision and strategy. Generally speaking, improving performance in the objectives found in the Learning & Growth perspective enables the organization to improve its Internal Process perspective Objectives, which in turn enables the organization to create desirable results in the Customer and Financial perspectives. (Balanced Scorecard Institute, n.d.) These four perspectives give a framework for developing metrics, collecting data and analyzing it relative to each of these perspectives (Balanced Scorecard Institute, n.d.):

- LEARNING AND GROWTH PERSPECTIVE includes employee continual learning, training, corporate cultural attitudes related to both individual and corporate self-improvement, ease of communication among workers as well as technological tools for knowledge management, (Balanced Scorecard Institute, n.d.). This perspective "involves goals and measurements related to continuous improvement in the company's ability to innovate, improve and learn." (Management and Accounting Web, n.d.)
- INTERNAL BUSINESS PROCESS PERSPECTIVE - metrics based on this perspective allow the managers to know how well their business is running, and whether its products and services conform to customer requirements." (About) This perspective "includes the business processes that have the greatest impact on customer satisfaction, such as those that affect cycle time, quality, employee skills and productivity. These measurements should be decomposed to the local levels to provide linkages to upper level measurements on the scorecard to insure that lower level employees have clear targets for actions and decisions that contribute to the company's overall mission." (Management and Accounting Web, n.d.)
- The CUSTOMER perspective importance of customer focus and customer satisfaction In

developing metrics for satisfaction, customers should be analyzed in terms of kinds of customers and the kinds of processes for which we are providing a product or service to those customer groups. (Balanced Scorecard Institute, n.d.) Metrics include categories such as: lead time (i.e., time from order receipt to delivery) and quality (e.g., defect levels) of products and services, (Management and Accounting Web, n.d.).

- The FINANCIAL PERSPECTIVE - Metrics could include timely and accurate funding data, risk assessment and cost-benefit data, (Balanced Scorecard Institute, n.d.) cash flow, sales growth, market share, operating income and return on equity, operating expenses, asset turnover, (Management and Accounting Web, n.d.).

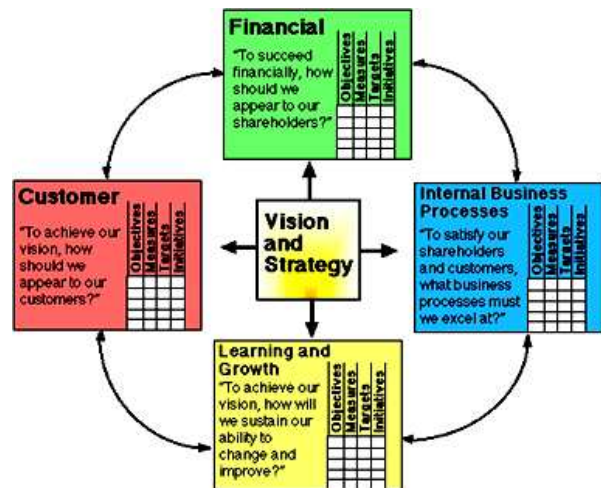


Figure 1: Balanced scorecard perspectives (Balanced Scorecard Institute, n.d.)

OPERATIVE IMPLEMENTATION OF BSC

Operative usage of BSC is illustrated in e-government application (Dobrović et al., 2008). Activities are grouped in four levels, associated with appropriate working roles:

1. Government: Development policy determining, approving vision, approving strategic goals.
2. Management: defining vision, defining strategic goals, identifying SWOT elements, SWOT elements ranking, defining strategies, identifying activities for strategy implementation, defining activity goals, defining relationships among goals, identifying metrics, determining relationships among measures, reviewing strategies, managing by BSC model
3. BSC model administrator: BSC model updating, metrics feeding, data source creating, preparing BSC model validation, model validating

4. Database administrator: database administration, extending functionality (adding new data resources)

Dobrović et al. (2008) describe the process of BSC operative implementation starts with government who determine development policy. Management of a public sector organization then define vision and strategic goals (previously created by using SWOT analysis) and government approve them. To achieve these goals, management define relationships among goals, strategies and activities for strategy implementation, identify metrics for activity success measurement. This way, management create BSC model, while BSC model administrator's role is to continuously update BSC model according to changes of goals, strategies, activities and metrics and to link metrics with data that feed them. Database administrator's role is to do administration of a relational database or other data sources and to extend their functionality as needed by BSC model changes.



Figure 2: BSC implementation phases (Virtanen, 2009)

To accomplish complex tasks of data feeding and processing for analysis and visualization, many commercial software solutions are provided. Generally they can be categorized as stand-alone applications and integrated solutions. One of solutions is QPR software system (Virtanen, 2009) that enables integration of BSC software with data warehouses, databases and spreadsheets, such as MS Excel, for feeding BSC metrics. Additionally, in (Virtanen, 2009) is described that "common tools used to help structure the strategy work are: Strategy Mapping, PEST (Political, Economical, Societal, Technological) analysis, SWOT (Strengths-Weaknesses-Opportunities-Threats) analysis, Porter value chain analysis, Porter Five forces of competition analysis, BCG Matrix analysis". Finally,

it is suggested that introducing BSC to an organization need to be guided as a "management system development project, rather than an IT project", and that this process of including of BSC to everyday management practice need to follow these phases: model synthesis, technical implementation, organizational implementation, technical integration, operation (Update, Analyze, Report, Refine) (Figure 2).

BSC IN IT PROJECT MANAGEMENT

Information Technology Aspects if BSC implementation include:

1. IT projects management:
 - Alleman (2003) discuss that balanced scorecard and project management should be unified (especially for IT project focused organizations) in aim to link strategy and implementation.
 - Brock et al. (2003) proposes model of balanced approach to IT project management.
 - Asosheh et al. (2010) propose integration of balanced scorecard and data envelopment analysis (DEA) for information technology project evaluation in the process of selecting among project proposals.
 - Control Objectives for Information and related Technology (CobiT) framework (IT governance institute, 2007) include linking business goals to IT goals, providing metrics (based on BSC) and maturity models to measure their achievement and ensure that the enterprise's IT supports the business objectives.
2. Software projects management:
 - Specific methodologies, such as agile approach resulted in agile balanced scorecard (Hamilton-Whitaker, n.d.), which emphasizes teamwork, velocity, reliability and performance as key metrics categories.
 - Software Engineering Institute describes the synergistic application of the balanced scorecard and goal-driven measurement methodologies (goal - question - (indicator) - measurement) to develop measures and associated indicators (Goethert and Fisher, 2003).

BALANCED SCORECARD FRAMEWORK IN SOFTWARE PROJECT MONITORING

In this section we present business process model (Figure 3) of project management activities and data stores according to PRINCE 2 project management methodology and document templates (UK

Department for Business innovation and skills, n.d.). Based on this business process model, we present balanced scorecard framework that describe

elements of software project monitoring and evaluation from both process and product perspective (Table 1).

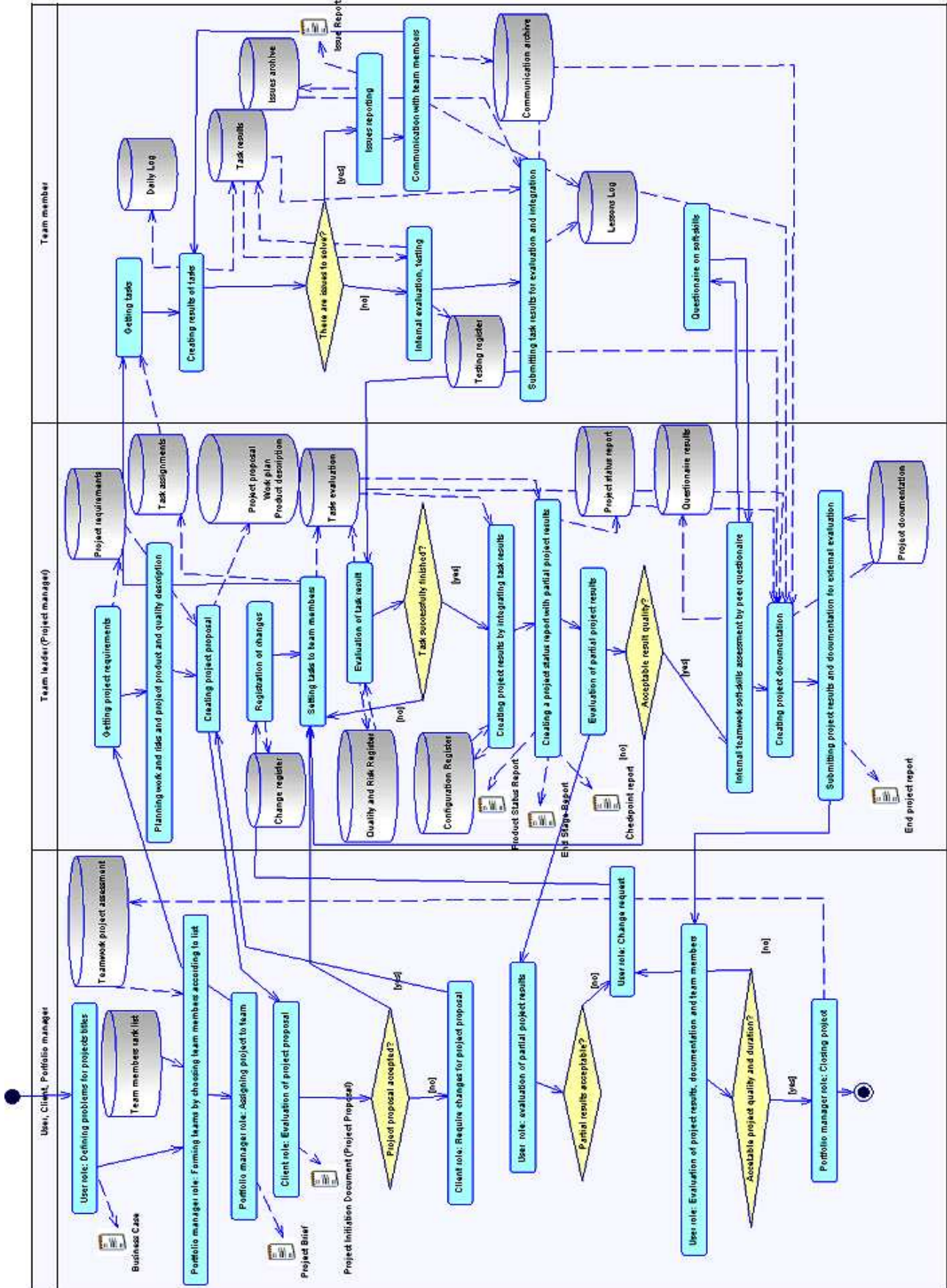


Figure 3: Business process model for software project management according to PRINCE2 (Kazi, 2011)

Table 1: BSC model for software project monitoring (Kazi, 2011)

Scope	Perspecti ve	Goal	Measurement	Data resource for measures	
Process	Quality of team members	Choose quality team members	Team member rank (position at list)	Team members rank list	
		Team member behaviour positively assessed	Assessment points at peer questionnaire	Questionnaire results	
	Project proposal	Project proposal according to requirements	Number of change requests according to project proposal	Project proposal Change register	
	Tasks	Achievable results in project proposal	Setting achievable tasks	Percent of software functions implemented	Task results
				Number of issues per task	Task results, Issue register
		Tasks finished within time and quality		Number of tasks implemented per day/week/month	Task results
				Number of tasks finished at specified time	Task results
				Number of tasks finished at specified quality	Task results
				Number of functionalities implemented per day	Daily log
				Number of implemented use cases	Task results
				Number of software functions	Task results
	Issues	Minimum issues		Number of tasks per team member	Task assignments
				Number of issues	Issues archive
				Number of issues per task	
				Number of issues per team member	
	Communi cation	Minimum communication Maximum clarification of tasks Maximum team cohesion - mutual help		Number of unsolved issues	
			Number of messages		
			Number of clarifying messages regarding tasks		
Product	Partial results	Minimum communication	Number of issues solved by messages from team members	Tasks evaluation	
		Maximum clarification of tasks	Number of change requests for partial results		
	Integrated product	Maximum team cohesion - mutual help	Number of change requests for partial results	Change register	
		Has all modules integrated	Number of change requests for partial results	Configuration register	
		Has all functionality specified	Percent of modules integrated	Project proposal Task results	
		Has minimum bugs	Percent of software functions realized comparing to required number of software functions		
	Number of test cases executed	Testing register			
	Number of bugs resolved				

CONCLUSION

Balanced scorecard is widely accepted as performance measurement system as well as strategic management system. Many scientists and practitioners applied BSC concept as performance measurement system in the field of IT. This paper present a comprehensive survey on state-of-art in the field of applying balanced scorecard in IT sector, specially in IT project management. This way it is possible to use BSC framework at other fields of IT, such as data modelling evaluation or specific software project management performance

measurements. By developing new BSC frameworks, it is possible to enable creating new software that could be based on those frameworks. These software would be useful in systems such as large software producing companies.

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