Quality Characteristics of Processes: Analysis of Existing Approaches to the Selection

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***Abstract*— This paper gives issues met when deciding how right to measure processes. The paper develops a framework for analysing some existing measurement approaches, including their overview and definition of criteria, and uses this framework to compare the examined approaches. The paper concludes that none of the examined measurement approaches is in conformity with the criteria.**

Index Terms— performance measurement, process measurement, quality characteristics

I. Introduction

There is currently considerable interest in performance measurement. One of the requirements of the international standard ISO 9001:2008 [7] is about establishing monitoring and measurement processes. Story goes: "Measurements are key. If you cannot measure, you cannot control it. If you cannot control it, you cannot manage it. If you cannot manage, you cannot improve it" [4]. Process measurement indicates the current status of process. The view on what to measure and how to express these measures differs from one person to another. It should be pointed out that measurement is the source for monitoring processes, making strategic and operational decisions. Process measurement is a prerequisite to process measurement. That is why it is extremely important to choose the right quality characteristics of processes that are future looking (not traditional backward looking) and this can allow managers to manage processes and interfere with processes in time if it is needed.

So the success of quality management depends on the ability to measure and evaluate the quality characteristics, because their adequate use and analysis ensure the correct management decisions. When it comes to measuring the process, it is said about indicators of processes or measures, thereby losing the focus on the consumer and his requirements which is present in the concept of "quality characteristic" at [6]. Though some authors give different definitions for "indicator" and "measure", in this paper it is assumed that "quality characteristic of process", "indicator" and "measure" are the same terms.

The paper is structured as follows: the brief description of eleven measurement approaches is presented in section II; in section III the criteria - requirements for measurement system - and according to these criteria the comparison of eleven approaches are given; finally, section IV concludes with some lessons learned.

II. Overview

For a long time, DuPont scheme, which had "return of investment" as its main measure, was the most popular measurement systems. In spite of criticizing this scheme is still being used in a slightly modified form, because many managers evaluate performance mainly through financial indicators.

Since the late 1980s the general dissatisfaction with traditional measurement systems, based on financial measures, led to development of different "multi-dimensional" measurement approaches. References [1]-[5] show that there are:

A. Activity-based Costing, developed in the mid 1980s by Computer Aided Manufacturing-International, Inc. The main idea consists in assigning the costs of activities to products and product lines.

B. Balanced Scorecard, developed by Norton and Kaplan. The purpose is to describe an organization's performance using indicators according the four perspectives: the customers, the financial, the internal business and the learning and growth perspective.

C. Self-assessment (Deming Application Prize, Malcolm Baldridge National Quality Award, European Quality Award and etc). These models let the organizations evaluate the quality management system by means of the number of categories of criteria (this number differs from one model to another one).

D. Process performance measurement system (PPMS), developed within the project PROMOSYS (Fribourg University, Switzerland). The model consists of 9 steps and its essence is to define process indicators for each process goal by answering the question: which indicators can be used for measuring the extent to which a certain goal is fulfilled?

E. Process performance system TOPP, developed by SINTEF in partnership with the Norwegian Institute of Technology, the Norwegian Federation of Engineering Industries and 56 companies. This system represents performance assessment along three dimensions: ability to change, efficiency, effectiveness – by means of questionnaire, which contains three parts: concerning the enterprise's overview, its operation and twenty specific areas.

F. The AMBITE (Advanced Manufacturing Business Implementation Tool for Europe) performance measurement framework. The system ensures translating the critical success factors into a set of performance measures. Mapping the five macro business processes to the five performance measures (time, cost, flexibility, quality and environment) leads to a set of 25 performance indicators.

G. The ENAPS (European Network for Advanced Performance Studies) performance measurement system, developed within the project of 10 research and industrial partners in Norway, Ireland, Germany, France and The Netherlands. This system provides the unified set of performance measures (117) which lets the organization compare its level of indicators with the levels of indicators of another organization within the same industry.

H. The University of California Approach, where selection of process indicators is based on the SMART criteria: they should be specific, measurable, attainable, relevant and trackable.

I. Performance monitoring and evaluation tips of USAID Centre for Development Information and Evaluation. Selecting indicators starts with clarifying the results statements and developing a list of possible indicators using brainstorming. Then each indicator is assessed through seven criteria: direct, objective, adequate, quantitative, disaggregated, practical and reliable. So the best indicator is selected.

J. The Approach of US Department of Energy, which essence is to design indicators in accordance with strategic goals.

III. Analysis

For making a comparison of measurement approaches above it is necessary to define the criteria. According to P.Kueng [4] a measurement system should be focused upon processes (not upon departments) and have a broad spectrum of performance-relevant data (it means using as well as quantitative and qualitative data). Dixon [2] has pointed out five characteristics: the connection with business operating objectives, critical success factors; use as simple and few set of measures as possible; focus upon indicators that customers can see; transparent understanding how the decisions and activities of all employees affect the entire business; supporting organization learning and continuous improvement. Regarding a measurement system Bradley [2] requires a business process focus, the performance measures that are quantitative in nature and related to the strategy of the organization and its customer requirements. Besides, the common requirements for indicators are to be local in scope, not to be in conflict with each other and to represent and assess the impact of the changes made in an organization.

TABLE I
Comparison of Examined Measurement Approaches

Criteria / Approach	Objects measured	Type of measures	Focus on customers	Connection with strategic goals	Ability of assessment the impact of changes
DuPont scheme	organization	financial, quantitative	no	only with financial goals	no directly
Activity-based Costing	processes	financial, quantitative	no	no	no directly
Balanced Scorecard	organization or departments	financial, quantitative, non-financial, qualitative	no	yes	no
Self-assessment	organization or departments	mostly non-financial, qualitative	yes	no directly	no
Process performance measurement system (PPMS)	processes	financial, quantitative, non-financial, qualitative	no	yes	yes, it calculates the trend and “cause-effect” relationships between the applied indicators, so it lets indicators be used as a lead indicator or an early-warning one
Process performance system TOPP	organization	financial, qualitative, non-financial	no directly	no directly	yes, due to one dimension: ability to change, which means strategic awareness to handle changes
AMBITE performance measurement framework	processes	financial, quantitative, non-financial, qualitative	no	yes	no
ENAPS performance measurement system	processes	financial, quantitative, non-financial	no	no	no directly, the indicators should be reviewed every six months
The University of California Approach	processes	financial, quantitative, non-financial	yes	no	no directly, but thanks to SMART criteria it implies that indicators verify changes
Performance monitoring and evaluation tips of USAID Centre	processes	financial, quantitative, non-financial	no	no	yes, indicators verify the status of changes
The Approach of US Department of Energy	processes	financial, quantitative, non-financial	no	yes	no

According the aforesaid criteria the comparison of measurement approaches has been made. Table I shows that none of examined measurement approaches fulfils the requirements.

IV. Conclusions

In this paper different measurement approaches have been examined and their comparison has been made according to the criteria for measurement system. As a result, the measurement approaches do not meet the requirements: focus upon process and customers, alignment with strategy, use as well as quantitative and qualitative indicators, ability of assessment the impact of changes. Therefore there is a need for new process measurement system that can provide managers with the information they require to make business decisions in today's changing environment. Such system should change over time as needs change and should be intended to foster improvement rather than simply monitor process.

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