Designing a Process-Oriented Framework for IT Performance Management Systems

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Abstract: This paper shows, which concepts and frameworks currently exist to measure the performance of the IT department and its delivered IS services. We discuss how a performance management system might be designed and implemented with the purpose to monitor and improve the IT function. A performance metrics catalogue has been elaborated to document and to enable a common understanding of the individual metrics. Finally, this paper provides lessons learned and some recommendations for further research in the area of IT performance management.

Keywords: Performance metrics, balanced scorecard, causality, performance manager, accounting

1. Introduction

In recent years, control and governance of internal services such as Information Technology (IT) have become quite critical in organisations due to the enormous size of their expenditure. As a result, managers have faced growing pressure to measure the performance of IT departments. Several concepts have been developed during the last few years such as IT governance, IT scorecards, and benchmarking that have been considered by IT and business executives. But surprisingly, a recent study by the IT Governance Institute (ITGI) that covered 335 CEOs and CIOs in 21 countries, reported "*while more than 91 percent of executives recognize that information technology (IT) is vital to the success of their businesses, more than two-thirds of CEOs are not comfortable answering questions about governance and control over their IT processes*." The study validates that the major problem continues to be *"the inadequate view of how well IT is performing*" (ITGI, 2004).

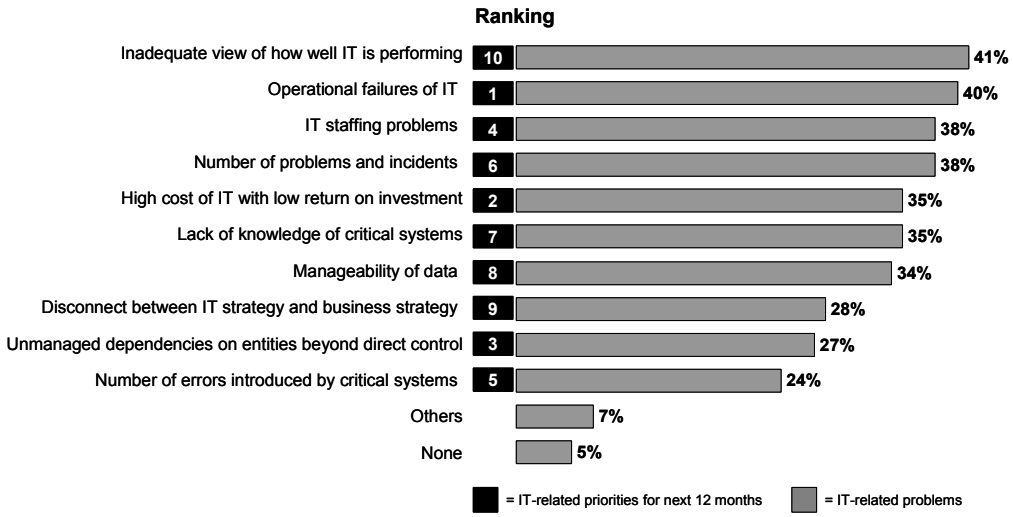

Figure 1: Problems and Priorities of CEOs and CIOs (ITGI, 2004)

Another study by the Boston Consulting Group (BCG) provides valuable insights into the IT cost-performance tradeoff in eleven top-tier European banks across four countries (Minz et al., 2004). BCG's benchmarking experts found out that between 2002 and 2003 the share of IT costs (expressed as a percentage of operating costs) reached an all-time high: from 15% to 16%. In addition, surveyed banks showed a significant increase in 2003 to 20%. Moreover, about 10% of a typical bank's total revenues – that is approximately €17,000 per employee – are consumed by IT. The study also outlines that higher IT spending does not directly result in better operational effi-

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ciency or increased user satisfaction. Authors of the study recommend three levers of improvement: business and IT strategy alignment that consists of well-defined alignment processes, project portfolio management and various joint committees between business and IT. In addition IT performance management and standardization are recommended by the authors of the study as furher IT management disciplines.

Hence, decision-makers and stakeholders within private and public companies are insisting that IT executives provide hard facts on mission and IT performance. Key performance indicators, various monitoring systems and new reference models, such as CobiT (Control Objectives for Information and related Technology) or ITIL (Information Technology Infrastructure Library) are new approaches to estimate how well the IT department and relating processes perform vis-à-vis expectations and improve over time. As such, a promising performance management system is required: setting performance targets, designing efficiency and effectiveness measure, systematically and accurately measuring outcomes, and then using the results for fact-based decision-making.

The subject of this paper is IT performance management. In order to establish a common understanding of relevant terms and concepts, it is first necessary to review the related literature. We also propose a cohesive performance management system that has been implemented in a major financial institution in Europe. Finally we present some lessons learned and further research recommendations.

2. Literature Review

The formal basis for an IT performance management system is described in this section.

2.1 Clarification of terms and definitions surrounding IT performance management

The past 20 years have seen significant research and development in the field of management accounting and performance management with various models, frameworks and empirical studies by practitioners and academics. Nevertheless, researchers argue that performance itself is an ambiguous term, and capable of no single definition (Otley, 1999). Neely states that "*performance measurement is a topic which is often discussed but rarely defined*" (Neely et al., 1995). In order to define the terms IT performance and IT performance management it is useful to start with definitions that are already used in the literature. The Merriam-Webster-Dictionary defines performance as "*the execution of an action*" and the "*ability to perform*". As synonymous with performance, accomplishment, efficiency, capability and satisfaction are listed. Therefore, it is not surprising that the literature is not consistent concerning the definition of performance. The same applies to the field of performance management. Meyer and Gupta indicate this with the statement "there is a massive disagreement as to what performance is and the profileration of performance measures has led to the paradox of performance, i.e. that organizational control is maintained by not knowing exactly what performance is" (Meyer and Gupta, 1994). Although there is a large array of definitions of performance management, we have summarized below the most appropriate definitions that fit the IT performance context.

- Rolstadas (1998) claims that the performance of an organizational system is a complex interrelationship between seven performance criteria: effectiveness, efficiency, quality, productivity, quality of work, innovation, profitability (Rolstadas, 1998).
- Lebas (1995) argues that performance is about deploying and managing well the components of the causal model(s) that lead to timely attainment of stated objectives within constraints specific to the firm and the situation. He also points out that performance is case specific and decision-maker specific (Lebas, 1995).
- Neely et al. define performance as a metric used to quantify the efficiency and/or effectiveness of an action (Neely et al., 1995).

Any discussion of performance management frameworks needs to feature the role played by performance indicators (PIs). For instance, accepted reference models such as CobiT or ITIL are offering together more than 300 PIs to monitor the entire IT organization and its delivery processes. However, what exactly are performance indicators? To provide a classification of PIs, three features need to be described; how PIs are measured, what they measure and how they are used. Macintosh makes a distinction between *instrumental* and *social* measurements. Instrumental measurements are authoritative objective assessments of the organization's performance. Performance indicators collected by monitoring systems (e.g. system availability or response time of applications) or provided by accounting systems (e.g. costs per service or budget compliance) are results of an instrumental measurement. Social measurements, on the other hand, judge the performance of an organisation by the subjective opinions and beliefs of one or more stakeholders (e.g. customer or employee satisfaction surveys). In related literature, it is proposed to

make a second distinction concerning the entities that are measured. *Lagging indicators* are performance measures that represent the consequences of actions previously taken. They focus on results at the end of a reporting period and represent historical performance. IT expenses or customer satisfaction indices may be considered as lag indicators. *Leading indicators* signal future events and are considered to be "drivers" of lagging indicators (Kaplan and Norton, 1992). Therefore, performance management frameworks, such as the Balanced Scorecard or the Performance Pyramid assume relationships between both types of indicators. In other words, an improved performance of a leading indicator will drive better performance in the lagging indicator. A third classification of performance indicators may be described by Simons' "levers of control" concept. Simons distinguishes different modes of control according to the way they are used by the organisation (Simons, 1991). Indicators can be used as *diagnostic controls* and present automated control, which measures and evaluates ex post outcomes and compare them with targets that have been set. While diagnostic systems do not receive managerial attention, they are likely to be the first ones to be implemented. *Interactive control,* on the other hand takes place when managers become involved in monitoring the indicators, which gives rise to a regular interaction with staff through discussions and meetings. Because of time constraints and limited management attention – managers have to choose where to invest their personnel involvement (Simons, 1991). Thus, they prioritise implicitly the activities they monitor from the most critical to the least critical. Simons found out in several case studies that the most critical activities represent strategic uncertainties that managers believe they must monitor personally (Simons, 1990). They heavily rely on data gathered by accounting systems and provide these data to managers recurrently throughout the organization. Communication is realised face-to-face and discussions are marked by an ongoing challenge of assumptions and action plans. Interactive systems are used to stimulate organizational learning and information sharing vertically in the firm and to learn about changing strategic conditions. They are most useful in environments with strategic uncertainties that require disruptive changes in order to adapt strategy accordingly.

By definition, a performance management system is defined as the set of metrics used to quantify both the efficiency and effectiveness of actions (Neely et al., 1995). Thus, IT performance management is an ongoing and consistent process used to evaluate the outcomes of IT activities, practices and processes at all levels of the IS organization. Performance management makes strategic objectives clear, focuses on critical processes and signals where performance has not been fulfilled. At the same time it provides an unambiguous basis for assessing and rewarding behaviour.

2.2 Design elements of and implementation guidelines for IT performance management systems

2.2.1 Design elements

Various models can be applied to set up IT performance management, e.g. the Performance Pyramid, the Tableau de Bord and the Balanced Scorecard. The Balanced Scorecard is implemented more and more in practice for IT organizations. Several publications encompass design principles, case studies and useful recommendations for the implementation of IT Balanced Scorecards (Van Grembergen, 2002, Van Grembergen and Amelinckx, 2002, Van Grembergen and Saull, 2001, Martinsons et al., 1999, Atkinson, 2004, Hu and Huang, 2005, Van Grembergen and Van Bruggen, 1997). The rationale underlying all the articles is that IT performance should not be assessed using a single financial indicator. The following design guidelines for IT performance management systems were extracted and further evaluated within the case study:

Substantial modifications of the original four ***BSC perspectives*** are recommended to apply the concept to IT organizations. The changes are necessary because (1) the IT organization is an internal service provider and (2) most of the benefits generated through IT services or projects have to be considered from a corporate view. Martinson suggests the following four perspectives for a balanced IT scorecard: business value, user orientation, internal processes and future readiness (Martinsons et al., 1999).

- *Business value* encompasses short-term (focus on individual projects) and long-term (focus on the whole application portfolio and the IT department) evaluation of IT performance. Both traditional financial metrics such as "IT costs per employee" or "percentage over/under overall IT budget" and value-based metrics are included within this perspective. Whereas benefits of IT investments are easy to estimate by productivity gains of staff or increased availability of systems, value is a much broader concept that refers to the value creation of the company. For instance, a mobile computing architecture may increase the flexibility and satisfaction of end-users, but the real business value of such an investment needs to be reflected in efficiency

gains or increased sales. Risks are also quantified and assessed within the business value perspective.

- *User orientation* addresses both the satisfaction of internal users and external customers (e.g. customer satisfaction with an extranet). The performance metrics within this perspective are focusing on the user satisfaction with delivered IT services and the partnership between business managers and IT managers. Relevant metrics can be gathered by surveys or semi-structured interviews (so-called "involvement surveys") in order to gain deeper insights. (Van Grembergen and Van Bruggen, 1997). User satisfaction and service quality can be also measured by the SERVQUAL model (Parasuraman et al., 1985). In order to assess the adaptability of SERVQUAL to the IS research field, several researchers tested the concept of SERVQUAL successfully and investigated whether the use of the 45 items, the "gaps" and the dimensionality is applicable to the IT function (Kettinger and Lee, 1994, Pitt et al., 1995).
- *Operational excellence* requires measuring three core processes within an IT department: (1) planning and control of IT resources, (2) the development of new applications and (3) the operation and maintenance of the installed base (Martinsons et al., 1999). Other processes according to ITIL or CobiT (i.e. problem management, procurement, user training, and change management) can also be considered within this perspective. Proposed technical metrics are system availability, response time of applications, number of tickets solved immediately, percentage of personal resources allocated to different tasks, etc.
- *Future readiness* is concerned with IT skills development, the ongoing upgrade of the application portfolio and the evaluation of emerging technologies' suitability to incorporate IT architecture.

Another core design element for a Balanced Scorecard is ***causality***. Performance management systems such as Balanced Scorecards aim to exceed the benefits of disconnected lists of performance indicators by providing reliable prediction of process outcomes, which are based on cause-and-effect relations among performance measures. Therefore, a reliable, predictive IT performance management system requires measurement of leading and lagging indicators at key points in the IT value chain. Luft and Shields stated that comprehensive and valid cause-and-effect relations also might reduce the cognitive complexity of understanding multiple measures of performance (Luft and Shields, 2001). A strategy is a set of assumptions about cause and effect. If these assumptions are not adequately embedded into the Balanced Scorecard, it will be difficult to communicate and convert strategy into actions. For example, better trained staff (future readiness perspective) will solve help desk problems faster and more sustainably (operational excellence perspective). Applications that cause fewer problems and are supported by a professional help desk will meet end-user expectation better (user orientation perspective). This will result in productivity gains within business processes (business value perspective). ***Rewards and incentives*** are further important elements for an effective design of IT performance management systems. Otley emphasizes this issue from a behavioural control perspective (Otley, 1999). Managers and employees must be clear about the rewards they will get by achieving the performance targets (or, conversely, what penalties they will suffer by failing to achieve them). The ***documentation*** within a metrics catalogue is also a pre-requisite to determine and communicate the content, frequency, and layout of IT performance reports. In addition, a metrics catalogue enables a detailed understanding of the individual metrics and supports the awareness campaign with an IT department.

2.2.2 *Implementation guidelines and steps*

Neely divides the development of a performance management system into three phases: design, implementation, and use (Neely, 1995).

- The design phase covers the identification of key objectives and the design of measures. Data need to be collected and analyzed regarding the following issues: business strategy, IT strategy, specific objectives and goals related to business and IT strategy, metrics that are already used for IT performance measurement, potential metrics that are appropriate to the four Balanced Scorecard perspectives.
- The implementation phase is about the installation of monitoring systems and procedures to collect and process the data that enable ongoing measurement. A preliminary Balanced Scorecard based on the defined objectives and goals of the enterprise needs to be developed.
- The use phase encompasses management's involvement in performance analysis, the evaluation of IT performance, and the review of strategic assumptions. The persons in charge receive comments and feedback on the IT Balanced Scorecard from management, and revise it immediately. Within the use phase consensus will be achieved by the

usage and communication of the scorecard to all stakeholders.

The design, implementation and use phase are not one-time efforts: an IT department must challenge the selected performance measures and strategic assumptions continuously. A review process ensures that a useless measure may be deleted or replaced, the target may be changed, and the definitions of performance measures may be modified. A standard development approach is described in Table 1. The entire process is iterative, whereby performance measures are adjusted as relevant information about strategy, processes, etc. becomes available. Kaplan and Norton emphasized the use of documents, interviews, and executive workshops to gather information and to create awareness for the concept of the Balanced Scorecard among senior management and IT management (Kaplan and Norton, 1993).

Table 1: Nine steps to develop a PMS (Neely, 1995)

Step	Action
1	Clearly define the firm's mission statement
2	Identify the firm's strategic objectives using the mission statement as a guide (profitability, market share, quality, cost, flexibility, dependability, and innovation)
3	Develop an understanding of each functional area's role in achieving the various strategic objectives
4	For each functional area, develop global performance measures capable of defining the firm's overall competitive position to top management
5	Communicate strategic objectives and performance goals to lower levels in the organization. Establish more specific performance criteria at each level
6	Assure consistency with strategic objectives among the performance criteria used at each level
7	Assure the compatibility of performance measures used in all functional areas
8	Use the PMS
9	Periodically re-evaluate the appropriateness of the established PMS in view of the current competitive environment

3. Implementing IT performance management systems: a case study

The authors were involved in a consultancy project carried out as part of a set of initiatives based on the IS delivery study. One author, François Laurent, led the project as the Head of Division; the second author, Sertaç Son, supported the project as a consultant and is has been given temporary leave of absence from work for an external PhD program at Frankfurt University. The project carried out full time at the ECB over a period of six months. The empirical findings are compared to related literature regarding the design and implementation of performance management systems in order to assess how such theories or concepts fit into real situations.

3.1 Background information

As from 1994, the ECB made significant efforts to establish the core infrastructures and applications required for the successful launch of Stage Three of the Economic and Monetary Union (EMU) and the introduction of the euro. During this time, the IT departments of both the European Monetary Institute and thus European Central Bank (ECB) have met the very strict deadlines set, and the IT systems of the ECB and the European System of Central Banks (ESCB) proved to be reliable and productive.

Following this successful phase, the Directorate General Information Systems (DG-IS) of the ECB decided in 2002 to review its delivery functions, with the objective to assess the current structure and processes according to their effectiveness, in order to be in a position to smoothly negotiate the change from a "start-up" phase to a more mature and established institution.

As an outcome of this review, a new organization was set up. Beside the rather traditional split between the IT development area on the one hand, and the IT operation and support on the other hand, a third area was created in DG-IS: the IT Management Functions area.

This area is responsible for delivering policies and methodologies to ensure excellence in IT governance within the ECB and for common ESCB components and to support functions of a transversal nature across the IT organisation (i.e. DG-IS). The IT Management Functions drive the development of and provide framework, advice and guidance on architecture, security, performance and quality issues. It also deals with transversal IT issues such as skills development and procurement.

To support its mission, vision and strategy, the ECB Directorate General Information System (DG-IS) decided on the design and implementation of an IT Performance Management Framework and Methodology based on the IT Balanced Scorecard (BSC).

The goal is to establish a framework for IT management reporting and controlling based on a balanced set of key performance indicators (metrics) and specific performance targets to determine IT effectiveness and efficiency in relevant key performance categories, thereby communicating and motivating IT performance, increasing transparency on the performance of delivering IS services at the ECB, enabling the definition of precise actions to improve IT performance and eventually assigning accountability and responsibility for IT performance. In this context, a first design of an ECB IT Management Scorecard has been elaborated and a first piloting cycle has been conducted by manually collecting data for selected metrics in order to verify the feasibility of the proposed design. As a result, a first ECB IT Management Scorecard Report has been generated comprising actual values for selected key performance indicators. Based on the findings of the "Gather Actuals" phase (see figure 2) and the first IT performance report, an action plan comprising specific measures and respective responsibilities, resources and deadlines for implementation is currently being developed to ensure the necessary availability and quality of performance data.

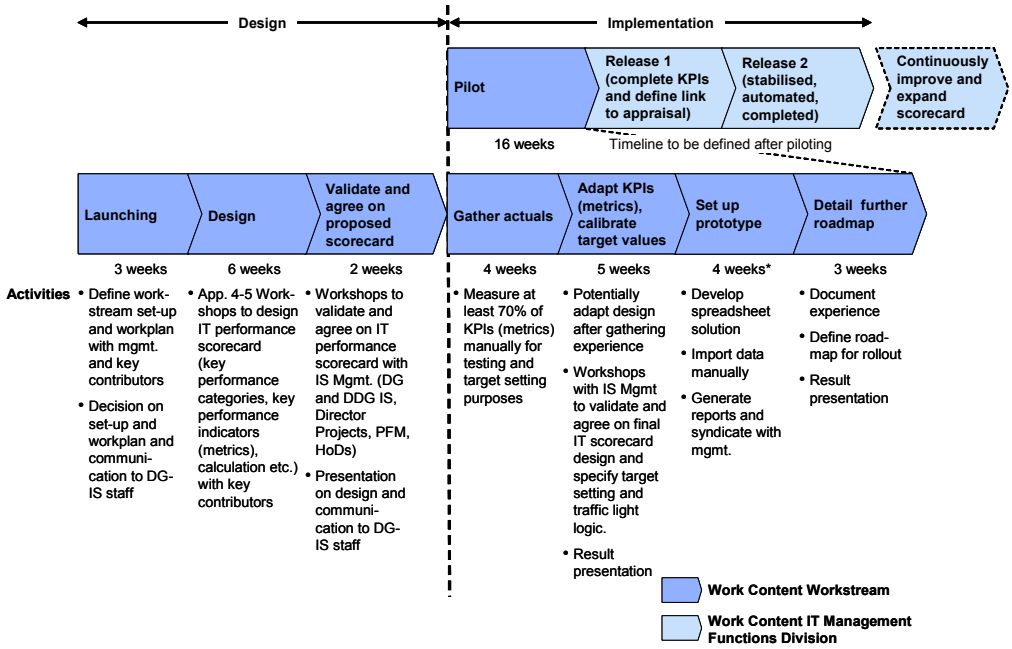

Figure 2: Phases of development for an IT management scorecard

3.2 The design and implementation of the IT performance management system

Mission and strategy are the starting points and source for selecting appropriate performance measures. The scorecard includes four clusters or perspectives of performance metrics: customer orientation, corporate contribution, project, operation and support excellence, and future orientation. Each question within the different perspectives is answered by specific leading or lagging metrics. For instance, a customer satisfaction survey is established to quantify the IT performance from a customer perspective. The project management and delivery performance is measured by traditional project metrics such as “percentage of projects in time” or “percentage of projects in budget”. The management of the ECB selected initially 24 performance metrics (see figure 3).

CUSTOMER ORIENTATION	CORPORATE CONTRIBUTION
Mission To be the supplier of choice for all information services, either directly or indirectly through supplier management. **Performance Metrics:** ▪ Index: Customer/user satisfaction	**Mission** To enable and contribute to ECB's mission and strategy through the effective and efficient deployment of IT. **Performance Metrics:** ▪ Average percent of delivered functionality ▪ Average no. of (critical) incidents in first 6 months of production ▪ Percentage of projects in time ▪ Percentage of projects in financial budget ▪ Percent of projects in resource budget
PROJECT, OPERATION and SUPPORT EXCELLENCE **Mission** To efficiently deliver effective IT services at targeted project delivery, operation and support levels. **Performance Metrics :** • Average unscheduled downtime of critical services ▪ Average response time of critical services ▪ Percent of application servers underutilized ▪ TCO/desktop (server, data, voice line) ▪ Percent of (critical) tickets solved on same day ▪ First call resolution rate ▪ Average tickets per agent per day ▪ TCO/ticket	**FUTURE ORIENTATION** **Mission** To learn and innovate to continuously "change the bank" by exploiting future opportunities. **Performance Metrics :** ▪ Percent of completed strategic IT projects ▪ Percent of applications managed by IS ▪ Percent of IS Budget/Headcount of ECB ▪ IS costs per internal ECB FTE ▪ External vs. internal FTE ▪ Average costs per external FTE (per hour or per day) ▪ Index: Employee satisfaction ▪ Costs spent on changing vs. running the bank ▪ Costs spent on infrastructure projects vs. business functionality projects

Figure 3: The ECB IT Balanced Scorecard - 4 perspectives and 24 performance metrics

3.3 Lessons Learned within the implementation phase

3.3.1 Documentation

Building and sharing a common understanding of the definitions of performance metrics became crucial to the development of performance metrics. While the literature focuses extensively on the structure and presentation of scorecards (such as perspectives, hierarchy of metrics), we found out that the performance metrics catalogue became the main discussion basis and guideline to implement the scorecard and related procedures. A performance metrics catalogue provides a detailed understanding of the individual metrics. At the start of the project, metrics were often documented in an ambiguous way causing potential communication problems and differences in interpretation between the performance management team, the metric owners and the management. A template was developed to increase the quality and efficiency of the performance management system design. We followed Neely et al. and added some complementary attributes (Neely et al., 1997):

Table 2: Attributes for performance metrics

Scorecard Perspective / Category	Type
Critical Success Factors	Description
Source of Information (Tools)	Formula
Measurement Objective	Target / Target Ranges
Escalation procedures	Frequency of measurement
Graphical presentation	Frequency of review
Further drill down	Performance metric owner
Performance metric recipient	Specifics and comments
Status: Active/Future/Retired	Metric last revised

Furthermore, the metrics catalogue dictionary made the stakeholders involved more aware of the performance management system.

3.3.2 Causality

Malina maintains that performance management systems are business models that describe related performance at the key points of the value

chain (Malina, 2004). Scorecards without causality, however, are mere lists of performance measures. Eccles argues that quantifying the cause-and-effect relations between actions and outcomes at key points in the value chain helps to predict future effects of current actions (Eccles, 1991). Although most IT experts downplay the long-term predictability of complex performance models, an IT executive must provide a comprehensive set of assumptions about cause and effect to develop a strategic, forward-looking scorecard. Only an initial causal mapping enables the structural development of relations among different performance measures and thus the translation of an IT strategy into an action plan.

3.3.3 Metric Ownership

For most of the performance metrics, the staff were able to deliver the most reliable data (including interpretation). The data specialists and IT monitoring experts were necessary to develop metrics that can be reported at reasonable cost. In addition, the fact that they were indirectly asked to deliver information about their own or their team's performance is another barrier. Within DG-IS, a dyadic concept concerning the metric responsibility was established: an operational and a managerial metric owner. The operational metric owner is the person in charge of the technical data collection and data quality. The managerial metric owner investigates the performance results together with the performance management expert and provides regular performance reports for the management of the ECB. Cooperation with these metric owners is of paramount importance to get the process running in smoothly. It is also important to allow metric owners the required room for collecting and delivering the data.

3.3.4 Rewards

Performance measurement and management is one of the critical factors that determine how individuals in an organization behave. In general, a performance management system consists of (1) the performance measurement and evaluation system, (2) the reward and punishment system, and (3) the system for allocating decision rights amongst individuals in an organisation. The reward and punishment system relates the rewards granted to individuals to results measured by the performance measurement system. Rewards and punishments may include non-monetary factors such as honor, attention, and rank, as well as monetary factors such as salary changes and bonuses. For management attention and employees' motivation to participate in the process it is important to link individual metrics with these rewards. We have experienced extensive discussion about one major prerequisite for these rewards: The person in charge must be able to influence the metrics.

3.3.5 Measurability and integration

Already existing accounting and monitoring procedures have a fundamental impact on the development of performance management systems. Instead of creating a "Greenfield" tool, we recommend ensuring that existing performance metrics and parallel initiatives outside the IT department are aligned with the IT performance management system. There is still a need to consolidate various monitoring activities and to introduce new measurement processes (e.g. customer satisfaction surveys). But first, the design and implementation efforts have to be aligned with other performance reporting initiatives.

3.3.6 The role of the performance management expert

A process owner is required to manage the cross-functional activities along the performance reporting process. He gathers data from several sources, coordinates the reporting frequency, elaborates the monthly reports, discusses the results with managers and determines adequate actions. He is also in charge of reviewing the structure and strategic assumptions of the scorecard in order to improve the process. The performance metrics are reported on a regular basis. In one-to-one review meetings with the IT managers, the performance management expert will go through results, deviations and possible actions to be taken. These experiences prove the importance of a process-oriented IT expert, a manager who is responsible for the whole process. He is not just an accountant or reporter, but a facilitator of concrete follow-ups and the monitoring of the effects of the actions that ensure the continuous improvement of the IT delivery.

4. Conclusion and further research recommendations

This paper has provided theoretical knowledge of performance management systems and practical guidelines for similar developments. The insights gained within a major financial institution show how a scorecard can be structured and implemented in practice with respect to some crucial aspects: documentation, metric ownership, rewards, measurability and integration, and the role of the performance management expert. With the empirical findings in this case study, we suggest the following questions for further research: How can the principal/agent theory be applied to investigate the inventive schemes in IT departments? Which methodologies or best practices from theory and practice are applicable to design and im-

plement causality in performance management systems? Which skills are essentials for the role of a performance management expert? What distinguishes a “better” performance management system?

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