Performance management

O. Krause, K. Mertins
Fraunhofer Institute for
Production Systems and Design Technology
Pascalstr 8-9
10587 Berlin
Tel: +49/(0)30 39006 -345
Fax: +49/(0)393 25 03
e-mail:oliver.krause@ipk.fhg.de, kai.mertins@ipk.fhg.de

Abstract

Performance indicators are required to enable an effective and efficient management process. This paper describes the application of the Management Information Engineering concept used to develop a balanced set of performance indicators in the context of a benchmarking project. It shows how benchmarking can initiate the development of a Performance Management System.

Keywords:

Management Information Logistics, Knowledge Management, Decision Support, Performance measurement, Performance Management System, Balanced Scorecard, EFQM, Benchmarking, Management Information Systems, Executive Information Systems, Data Warehouse.

1 MANAGEMENT AND PERFORMANCE MEASUREMENT

Competitive success of a company does largely depend on its ability to adapt products and processes to a rapidly changing environment. For the long-term generation of value it is required to anticipate change and to proactively create markets and the products and services to feed them. To do so, entrepreneurial decisions have to be taken. Reasonable entrepreneurial decisions are based on the availability of relevant and correct information. This information forms a model of a rather complex decision domain comprising (Mertins and Krause, 1997):

1. The market with competitors and stakeholders. The stakeholders are:
 - the customer, being a source for money generated by sales of products,
 - the investor, funding new business opportunities to generate profit,

- the employee, contributing know-how and effort for adequate remuneration, and
 - the society, providing an infrastructure in return for tax payments.
2. The company with its core processes, for instance strategy development, product development, production planning & control, production, distribution, and knowledge management.

The management process has the task to direct resources such that long-term survival of the organisation is ensured. To do so, a manager has to take into account a large number of variables. Given that there is a limit to the amount of information anyone can process, management information systems have been developed. Their purpose is to:

- reduce complexity and focus attention on key issues,
- provide a rational basis for management decisions by quantifiable representation of key issues.
- inspire managers by providing useful information enabling to detect patterns of change

Management and performance measurement are closely linked. Performance measurement systems either as calculation schemes or as modular frameworks grouping particular performance indicators are used to control organisations. Calculation schemes in particular are based on financial measures. ROCE, ROI, EVA, MVA are examples. These diagnostic metrics are useful to judge results of former action based on former management decisions. Therefore they are useful indicators for shareholders in the first place. For management they are of limited relevance, as they do hardly indicate what has to be done in the future. These systems are referred to as diagnostic control systems (Simons).

Two organisational paradigms which have gained significant relevance are the process-concept and the decentralisation concept (Warnecke, 1993). Both do require a new control approach, which differs significantly from diagnostic control systems. Diagnostic performance measurement system are usually hierarchically and inflexible. Closed-loop control processes have to be established to ensure effectiveness and efficiency of organisations based on these paradigms. To establish closed-loop control systems performance measurement systems have to be developed into performance management systems.

A review of the existing performance measurement systems and frameworks (Krause et al, 1997).shows that recently considerable progress has been made concerning the development of performance management systems. Two key representatives of such approaches are the EFQM-model and the Balanced Scorecard. The EFQM-frameworks (EFQM, 1996) suggests to develop performance indicators for the areas enablers in the dimensions leadership, people management, policy and strategy, resources, processes and results in the dimensions people satisfaction, customer satisfaction, impact on society and business results. The Balanced Scorecard (Kaplan and Norton, 1996) is a framework for performance indicators in the dimensions Finance, Customer, Internal Business Processes and Learning and Growth. Frameworks of this type are

the basis for the development from the shareholder-value perspective, which is of limited scope, towards a stakeholder-value perspective.

The large gap between frameworks like EFQM and the Balanced Scorecard and their implementation within a company has to be bridged by a methodology integrating appropriate tools to deploy performance measures.

2 MANAGEMENT INFORMATION ENGINEERING

Management Information Engineering is a methodology supporting the development of a balanced Performance Management System. It follows the six steps:

1. Develop value chain process model,
2. Identify critical success factors,
3. Define performance indicators,
4. Gather and verify data,
5. Evaluate performance indicators,
6. Implement continuous process.

A key element of this methodology is the Integrated Enterprise Modelling Method (IEM) (Spur et al). The basic idea of this object-oriented method is to look at an enterprise in terms of orders, products and resources. All elements within a business environment can be mapped on one of these object-classes. The attribute-values defining a particular state are transformed by business processes which are of type action. With the process-mapping tool based on this method a common understanding of the value chain can be generated. The process maps are the basis for the identification of critical success factors. These are used to define performance indicators covering the perspectives Financial Results, the Market Structure in terms of customers, products, competitors, the Business Processes in terms of volume, value, quality, time and cost and the Innovation and Learning.

Figure 1: Approach for definition of performance indicators

A clear definition of the performance indicators, the basic data elements and the method of data-acquisition is indispensable to obtain accepted and reliable data (Neely et al). Therefore a detailed approach for the definition of performance indicators has been developed, figure 1.

A further key aspect of the methodology is the active involvement of process owners in the definition of relevant performance indicators as well as the basic data definition including the data acquisition approach. The process owner involvement ensures that the results are trusted and the performance indicators are applied as a management tool rather than being a one-off tool in a particular project.

The application of the Management Information Engineering concept in the context of a benchmarking project demonstrates its practical relevance. The approach for definition of the performance indicators is illustrated in figure 1.

3 BENCHMARKING AND PERFORMANCE MANAGEMENT

3.1 Benchmarking-basics

Benchmarking (Camp 1995) is a management concept which has gained widespread attention at a large number of companies. Rather than a simple comparison of performance indicators the method aims to (Mertins, Krause 1997):

- take into account non-financial measures and qualitative data,
- look beyond ones own organisation and branch,
- explain differences rather than to purely document them,
- focus on those criteria which are most relevant to the customer,
- team-up line-managers and specialists with the core project-team,
- consequently look for implementation of innovative processes,
- be implemented as a continuous process.

The Benchmarking-concept is closely linked to performance measurement. However, by looking beyond ones own organisation it inspires management and serves as a catalyst for product and process innovation. In essence Benchmarking is a performance management tool aiming at a cultural change towards a learning organisation.

3.2 The case: Situation and goals

Market entry of a competitor with sales-prices to wholesalers well 20-30% below current price level were the reason for three established international companies of the construction supply industry to initiate a Benchmarking project for their four business units manufacturing the core product range in focus. This business segment is very profitable and does for one company even account for 100% of the total group profit. Previous attempts to benchmark operations failed due to the fact that management did not accept the results as the performance indicators and data-sources were not adequately defined. The development of process oriented

performance measures with clear and generally accepted definition of the performance indicators, their constituent elements, and the method of data acquisition was therefore a key element of the specified goals of the project. Initially top-management intended to benchmark production cost only. By a rough calculation it became evident that production cost did only account for 0.5 - 10% of the end-user price depending on the specific product. Therefore top-management of the three client companies accepted to follow the Management Information Engineering approach which starts with the mapping of the complete value chain.

3.3 Approach and results

The value chain process model developed in a first step show, how a potential end-user requirement is transformed by the acquisition-process into orders, how order-processing controls engineering, production and dipatch and how the product is finally reaching the end-user via wholesalers, dealers and finishing-industry. On a top level the core processes and their interdependencies were mapped. This top-level was detailed with up to 3 levels. On the basis of these process-maps approximately 200 performance indicators were developed. These indicators covered the perspectives of the balanced performance management sheet.

The exact definition of performance indicators and basic data is a prerequisite to obtain comparable data to calculate the performance indicator values. The basic data definition acts as a filter to unify the data-structure between and within the business units. An example is the situation with the depreciation of production equipment which was completely incomparably handled for the business units according to their national depreciation policy. For a correct calculation of the cost—performance the data content and acquisition had to be exactly defined with the CFO's. Figure 2 overleaf illustrates the approach schematically.

On an aggregate level a cost performance indicator has been defined as *1-potential cost reduction per sold qty / process cost of BIC per sold qty* for each process. The processes defined are: administration, acquisition, customer order management before dispatch (1), production planning and control, production comprising the sub-processes raw-material provision, maintenance, manufacturing (salary & machine-cost), packing, internal transport and customer order management after dispatch (2), distribution and storage. In addition freight discounts and stock-holding cost were defined. A revenue performance indicator has been defined respectively. The distribution of margins over the value chain was compared for selected products with a high turnover share.

On the basis of a scenario anticipating that each business unit could realise a cost-reduction per category to the level achieved by the most cost-effective business-unit in this benchmarking-study, each business unit could achieve a cost-reduction of 40-45% of its total cost. For the trade margin a potential of up to 300% net profit increase was identified.

Figure 2: Schematic approach of process benchmarking

Four realisation-projects have been initiated, the most promising one being an optimisation of value chain management and new-product initiative looking for opportunities to adapt products with significantly lower end-user cost.

3.4 Lessons learned

This project has clearly demonstrated the benefit of an analysis of the complete value-chain compared to a limited view on the production cost-aspect. The overall cost-reduction potential easily doubled the one identified in production. In addition, the margin-optimisation-potential, which is twice the cost reduction potential in manufacturing, could be realised through better channel management and management of the product-range.

The IEM-process maps proved to be essential as a tool for communication on processes, the value chain and the performance indicators associated with the processes. Without these process maps a common understanding would not have been reached.

The non-financial benchmarks have been indispensable to interpret the financial results indicators. An example is the cost-performance in acquisition which does not allow to judge the quality of this process if other benchmarks like market-share and market-potential are not taken into account.

The data-collection-phase with plausibility and consistency-checks did take approximately 5 months after the process models and the benchmark and basic-data definition were completed. During this phase the basic data has been exchanged completely or partly several times for each business unit. This time-

consumption confirmed our perception that management information logistics in most companies does not meet today's requirements.

Benchmarking projects can initiate a systematic Management Information Engineering if top-management realises the potential of a consistent representation of management information.

4 IMPLEMENTATION OF MANAGEMENT INFORMATION LOGISTICS

With state-of-the-art technology it is possible to implement an integrated Management Information System to supply departments, process-owners and top-management with decision-relevant and consistent information. Some keywords in this context are data-warehousing and online-analytical-processing (OLAP) (Inmon, 1993).

The terms Executive Information Systems and Management Information Systems both suggest a technology-centred view on the process of information-supply. Therefore, we suggest the term Management Information Logistics to describe the process of supply of relevant goal-oriented information and knowledge to process owners at all levels of the organisation.

Rather than technical issues and implementation tools, the challenge is to establish the logical structure of the Performance Management System. The Management Information Engineering concept proved to be useful in this context. Business Process Benchmarking is a method which does contribute significantly to the awareness of top-managers that they need to develop a Performance Management System.

5 FURTHER RESEARCH

Control concepts meeting the requirements of decentral and process-oriented organisations have to be developed. These concepts will be based on closed-loop control. Therefore a better understanding of the cause and effect chains within a business environment is required. Management Information Logistics is based on a network structure rather than on a hierarchical and inflexible structure known from traditional performance measurement systems. Consequently it is useful to map the network consisting of:

- processes,
- basic data characterizing the processes,
- control parameters linking the basic data objects, and
- business-goals which are linked to the control parameters.

Figure 3 overleaf illustrates this aspect.

Figure 3: Network of Business processes, basic data, performance indicators and business goals

It is required to develop a better understanding of how closed-loop control processes can be implemented within an organisation. Closed-loop control processes can be considered as building blocks of a decentral organisation. A pototype software module integrated in IEM has been implemented. This software tool does support the definition and management of an organisations performance indicators.

6 REFERENCES

- Camp, R.C., (1995), *Business Process Benchmarking*, APQC Quality Press, Milwaukee, Wisconsin
- European Foundation for Quality Management (1996), *Self-assessment- guidelines for enterprises*, E.F.Q.M. Brussels
- Inmon, W.H., (1993), *"Building the Data Warehouse"*, John Wiley&Sons, New York
- Kaplan, R.S., Norton, D.P., (1996), *"The Balanced Scorecard: Translating Strategy into Action"*, Harvard Business School Press, Boston, Massachusetts
- Krause, O., Palm, R., Klusmann, M., (1997), *"Kennzahlensysteme"*, working paper, IPK, Berlin
- Neely, A., Richards, H., Mills, J., Platts, K., Bourne, M., (1997) *Designing performance measures: a structured approach*, *International Journal of Operations & Production Management*, Vol 17 No 11, 1997, pp 1131-1152
- Simons, R., (1995) *Levers of Control: how managers use innovative control systems to drive strategic renewal*, Harvard Business School Press, Boston, Massachusetts
- Spur, G., Mertins, K., Jochem, R., *Integrated Enterprise Modelling*, Berlin, Wien, Zürich: Beuth, 1996
- Mertins, K., Krause O., (1997), *Perspectives for Executive Information, decision support and information management in the extended enterprise*, *Proceedings*

of the IFIP Working Conference Organizing the Extended Enterprise, 15-18. September 1997, IFIP WG 5.7, Ascona Switzerland

Warnecke H.J., (1993), *The Fractal Company: A Revolution in Corporate Culture*, Springer, Berlin,

7 BIOGRAPHY

Oliver Krause, Dipl.-Ing. M.Sc., born in 1965, is head of department Management Systems at Fraunhofer IPK's Division Systems Planning. Besides his Engineering degree from Stuttgart University and Ecole Centrale Paris, he holds an M.Sc. in Advanced Manufacturing Systems from Brunel University London. Before joining IPK's Division Systems Planning, he worked on project assignments in London and Paris. He has been project manager for national and international projects. His research interest is focusing on Business Process Engineering, Benchmarking, Management Information Logistics, Performance and Knowledge Management.

Kai Mertins, Prof. Dr.-Ing., born in 1947, studied Control Theory in Hamburg and Economy together with Production Technology at the Technical University of Berlin. In 1978, he became member of the scientific staff of the University Institute for Machine Tool and Manufacturing Technology (IWF), Berlin. Since 1983 he had been head of the department "Production Control and Manufacturing Systems" at the Fraunhofer-Institute for Production Systems and Design Technology IPK (Chairman: Prof. Dr.-Ing. E. Uhlmann, honorary chairman Prof. Dr. h.c. mult. Dr.-Ing. G. Spur), Berlin, where he is Director of the Division Systems Planning since 1988.