



SCHOOL OF ECONOMICS
AND MANAGEMENT
Lund University

Business Process Management and the Need for Measurements

- Including an empirical study about operating figures -

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Abstract

Title	Business Process Management and the Need for Measurements – including an empirical study about the measurability of business processes
Course	Master Thesis in Business Administration, FEK 591, Credits: 15 ECTS
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Problem	Since business process management (BPM) is a very spacious concept, it is influenced from many other concepts, standards and methods that determine its constancy. Companies are asked to restructure their organisation in order to meet internal and external customer demands. The term quality comes to the fore. Organisations such as ISO and the EFQM try to certify or assess companies in terms of the course of their qualitative business processes but do not provide them with helpful implementation tools. One task will be to look at these approaches in a critical perspective in order to assess them with regard to BPM. Further, a company's performance has to be assessed not only from a one-dimensional perspective. Hence operating figures have to be derived that cover a multi-dimensional assessment perspective in order to show if they meet internal as well as external customer demands. Thus, another task is to assess existing measurement systems with regard to BPM and to show how companies can control and monitor their business process in a better, more effective way.
Purpose	The purpose is seen in a processing and comparison of different management concepts and methods in order to present an embracing picture within the area of BPM. The need for measurements will be emphasized, existing performance measurement systems towards BPM analysed and the concept of process controlling presented. In the end a rather practical guideline for the derivation of operating figures will be conceived to overcome acceptance problems SME might have. Several strategic and organisational related hypotheses in the field of operating figures will be investigated that support this approach. The evaluation takes place on the basis of empirical findings within a study of SME but also with help of existing theories.
Methodology	This research is based on a combination of the systems and actors approach supplied with quantitative as well as qualitative data, which is collected in form of a questionnaire and via participation on a workshop within the so-called be.st (benchmarking for sustainability) project. This master thesis is conducted as an abductive study. As a consequence, reliability and validity are provided.
Conclusions	References and adaptabilities of existing management approaches and measurement systems are pointed out. The further focus lies in an efficient and effective monitoring of business processes in the sense of BPM. On the hypotheses it is dwelled on, most notably on the re-use of operating figures and the most effective derivation method for operating figures- the top-down approach. The role of the management comes hereby to the fore. Findings of the empirical study are presented as well, in relation to the theory. A practical guideline for the derivation and re-use of operating figures and an embracing picture of BPM, its related areas and investigated companies is conceived in the end.
Keywords	Benchmarking, BSC, Improvement, Business Process, Business Process Management, EFQM, ISO, KAIZEN, Measurement, Operating Figures, Performance Measurement Systems, Process, Quality, Six Sigma,

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List of Abbreviations:

σ	Greek letter for Sigma
ABC	Activity Based Costing
ATTD	Adherence To Delivery Date
be.st	Benchmarking for Sustainability
BPM	Business Process Management
BPO	Business Process Officer
BPR	Business Process Reengineering
CQC	Critical to Quality Characteristics
DFSS	Design for Six Sigma
DMAIC	Define-Measure-Analyse-Improve-Control-Cycle
dpmo	Defects per Million Opportunities
e.g.	for example
et sqq.	from Latin: “and the following”
EFQM	European Foundation for Quality Management
EQA	European Quality Award
e.V.	German expression for incorporated society
FMEA	Failure Mode and Effect Analysis
FPY	First Pass Yield
ISO	International Organisation for Standardisation
KAIZEN	translated from Japanese: “to improve the good”, “turn for the better”
LEP	Ludwig Erhard Preis
MBNQA	Malcom Baldige National Quality Award
MBO	Management by Objectives
MTBSC	Mean Time Between Service Call
PDCA	Plan-Do-Check-Act-Cycle
PH	Process Hours
QFD	Quality Function Deployment
QM	Quality Management
QMA	Quality Management Agent
RADAR	Results-Approach-Deployment-Assessment-Review-Logic
ROI	Return on Investment
SME	Small and Medium Sized Enterprises
TE	Time Efficiency
TQC	Total Quality Control
TQM	Total Quality Management
WP-PT	Work Package-Process Time

1. Introduction

1.1 General Introduction

Customer orientation and productivity must nowadays be seen as the key to success.¹ But unfortunately, many companies still suffer in finding their right success factors. An insufficient customer orientation can be reflected in old, unattractive, or too expensive products, in many customer complaints and thus in their migration, but as well as in a declining turnover or market share. Indicators of low productivity are for example long cycle times, late market entry, bad quality of products and services, bad cost-performance-ratios of products and services, no adherence to delivery dates, and a too slow reaction time towards market and technology changes. The reasons for these problems can be seen in an insufficient management of business processes.

Business Process Management (BPM) on the other side makes it possible to align companies towards customer requirements and to organise the course of events more efficiently. BPM is not a temporary fashion as its fundamental ideas go back to the 30ies, where pathfinders in business administration, for example F. Nordsieck, already recognised expressions like processes and performance chains.² During the 70ies and 80ies TQM academics like W.E. Deming, P.B. Crosby and J.M. Juran dealt with the subject of processes as well and emphasized its importance for the quality and success of organisations. Then, M.E. Porter showed the flow of organisational events in form of an added value chain. But Porter, among others, namely mentioned process-related approaches but did not develop this very concept further. In the end of the 80ies and the beginning of the 90ies a wave of business process reengineering projects swashed over. The reason for this was a common economic weakness that resulted in a new structuring and alignment of business processes in order to achieve rationalization potentials. One could talk about a “fundamental rethinking of how a company does business”³. But these radical reorganisation projects led to high risks of failure and to heavy uncertainties that resulted in a dismissive attitude towards changes. Nevertheless, this reorganisation wave led to a wide-ranging debate concerning business process management. Within this concept, business processes are aligned towards internal and external customer requirements that have to be fulfilled in the most efficient and effective way. On a regular basis, continuous improvement programs will then be implemented as well. Since the 90ies,

¹ Cp. Schmelzer, H.J. and Sesselmann, W. (2003)

² Nordsieck, F. (1932), p.8

³ Kaplan, R.B. and Murdock, L. (1991), p.27-34

the concept of BPM won more common consent, whereas a big lack on its implementation has still to be noted down.

The optimisation of company-wide courses of events is also a task of the quality management (QM). The quality of processes beside the quality of products won more and more recognition during the past years. This is reflected in the newest editions of quality standards like the one of the International Organisation for Standardisation -DIN EN ISO 9001:2000-, which explicitly demands a process orientation of all organisations.

But what does it help an organisation to improve its business processes if it cannot put the success of these very actions down on paper? Therefore, a company has to measure its performance in order to know where its stands and which targets by which actions it wants to achieve. Then, it will be possible to get improvement results in numerical values.

The measurement of the right indicators also plays an important role within the concept of corporate management. In business administration, it is the task of the controlling to detect major specific values within a company-spanned reporting in order to edit those. A precondition hereby is the definition and measurement of operating figures that can be summarized in a performance measurement system to leading-edge operating figures, e.g. the return on investment (ROI). As we will see later, classic performance measurement systems incorporate the disadvantage of considering only economic results while disregarding other aspects and perspectives at the same time. This stands in conflict with the concept of BPM as its major orientation is towards the customers. In dependence on this aspect, other more quality oriented measurement systems were developed. In this context the EFQM-model (European Foundation for Quality Management) has also to be mentioned, which is in fact no measurement system but follows the goal to assess companies with regard to its quality with help of a catalogue of criteria. The major requirements of the total quality management (TQM) will find their application in the single criteria of this very model.

But both, the business oriented approaches as well as those resulting from the qualitative oriented ones consider the assessment of business processes only as a part perspective. Most of the times, only the degree of a process orientated company will be assessed and the not quality of the business processes by itself. These approaches are more like a managerial instrument for the leadership of an enterprise and thus the lack of a specific consideration of single business processes with regard to the objective and quality becomes clear.

Business processes are on one hand dependent on the division of labour and on the other one stamped by human co-operations within internal customer-supplier-relationships. Under these circumstances many companies face the problem of finding and defining indicators in order to be able to assess the quality of business processes. To do this and to initiate logic improvement actions, pragmatic approaches for the assessment of business process have to be found.

Employees can be seen as the navigators of business processes, comparable with those of a sailing ship. In order to act goal-oriented and to contribute to the company's success, they have to know on which course they have to steer at and therefore great knowledge about the standpoint of their business processes is necessary. To assess this standpoint, past values have to be edited and converted into target values that at the same time motivate employees and lower their fear of not exactly knowing what to do in the future. This comes along with the necessity of measurements as well as with an adequate flow of information in order to work efficient and under responsibility.

Furthermore, companies have to be managed in a goal-oriented way that makes it possible to steadily improve its performance, i.e. its business processes. Companies without measures of output are unable to either assess the efficiency or the effectiveness of its performance in order to initiate improvement actions. Useful operating figures must therefore be derived. This derivation of operating figures must take place via a deduction of customer requirements because they are the ultimate buyers of a product that is in turn assessed by their own quality definition and whereof a company is dependent on.

1.2 Topic and Motivation

During my previous studies I dealt with different courses in organisation and strategic management. Of course, motives like customer orientation were discussed during these courses, but the whole concept of BPM was new for me. I hit on this subject during a conversation with my ex-employer, who described it as a totally new concept where nothing much has been researched of. After reading a lot of literature I got very interested in it and found out that this area is quite a "burning theme". Furthermore, the context with TQM models and other quality standards such as the ISO norms, the EFQM model and methods like business process engineering, Six Sigma and KAIZEN became clear. Thus, the proceeding work showed me that the concept of BPM is a much broader term than I thought before, so a containment of the literature was necessary.

Literature, which is forming the different subjects into a complete picture, is very rare. Also, the problem occurs that these theoretical views and quality norms may be very difficult for companies to realise. This stands in connection with the dilemma that no useful implementation methods concerning BPM and the derivation of operating figures are given.

But as said before, these concepts and (improvement) methods are not very significant if the actual performance and improvements of the inner course of events of companies cannot be measured. This logic theoretical coherence in connection with the context of quality methods and models motivated me to carry out some investigation in this very field. Furthermore, the opportunity to enhance this master thesis with an empirical study in order to get a better picture of the relation between theory and praxis underlines my motivation regarding this topic even more.

1.3 Formulation of the Problem

“BPM is a change management and system implementation methodology to aid the continuous comprehension and management of business processes that interact with people and systems, both within and across organizations. BPM allows processes to be modelled and then dynamically maintained as business requirements are refined or modified, in the light of new information on how users work or changing business needs”⁴. It is a very spacious concept, which comes along with great demands towards organisations. Companies are asked to restructure their inner organisation into many coexisting business processes in order to meet internal as well as external customer demands.⁵ In connection with this stands the term quality. Organisations such as ISO and the EFQM try to certify or assess companies in terms of the course of their qualitative business processes but do not provide them with helpful implementation tools. Also approaches, for example the error-prevention concept Six Sigma and the improvement method KAIZEN, contribute to a certain extent to the concept of BPM and show interdependencies. Thus, one task will be to look at these approaches in a critical perspective in order to assess them particularly with regard to BPM.

To come back to quality and its connection to measurement systems, many of those show lacks in the perspectives. Services as the outputs of service companies, for example, cannot be expressed and measured in monetary terms. Hence, evaluating performance results becomes problematic since non-financial aspects of performance come into play because they are

⁴ www.staffware.com/understanding-bpm

⁵ BPM is further defined in chapter 3.

difficult to define, measure and quantify. The same counts for internal customer-supplier-relationships, as each process demands a certain output of the foregoing process, which equals the input for the considered one. Finally, external customers as the ultimate buyer decide whether to buy a product or not on aspects such as costs, satisfaction of his or her own needs and especially quality. To be concrete, operating figures should provide information about how efficient and effective the making of a product was.⁶ Efficiency compares output with inputs, thus the economy of processes, whereas effectiveness looks at the degree or ability of processes to achieve desired results. If, for example, a certain output can be achieved with less input or the same input brings out more output, the task is accomplished more efficiently. The assessment of effectiveness on the other hand is more problematic since its definition is derived from subjective defined requirements.

As this problem shows, companies that have implemented BPM might have problems in deriving the right parameters and operating figures for their business processes in the sense of working efficient and effective. Thus, another task is to assess existing measurement systems with regard to BPM and to show how companies can define, assess, control and improve their business processes in a better way. This will be executed with help of existing theories and empirical findings.

The empirical part of this paper encompasses a study of four SME⁷ that have implemented the concept of BPM within the so-called be.st (benchmarking for sustainability) project. Delegates of these companies participated at a workshop with the topic “operating figures for business processes”, which overall purpose it was to exchange experiences about operating figures and to eliminate certain problems the companies have with those. Therefore, a questionnaire was developed that encompasses areas of application, questions concerning the use of operating figures and organisational aspects. These questions were chosen for the following reasons: to get an ex ante impression of the use of measurements within those SME, to contribute to the purpose of the be.st project (therefore, questions are related to benchmarking processes) and to investigate certain hypotheses stated beneath. This questionnaire will be evaluated here as well and a documentation of the workshop will be attached in order to get a complete picture of the situation and to understand problems and dependencies.

⁶ Anthony, R.N. and Govindarajan, V. (1998), p.130et sqq.

⁷ These companies are listed in chapter 6.2, table 4. For simplification reasons the author wants to apply the phrase SME to all 4 participated companies at the workshop whereas one has to be seen as a large one.

The hypotheses, which emerged during the reading of the literature regarding BPM and the necessity of measurements, are primarily concerned with the derivation and use of operating figures. Ex ante discussions with one of the best project consultants let those hypothetical cogitations arise as well. When considering the derivation of operating figures, I hence claim that a top-down approach, i.e. a clear goal deployment set by the management that can be broken down to the process level, is more effective than the bottom-up approach which proceeds reversely, i.e. starting basis are actual activities at the lowest process level that will be bundled into process steps. In order to investigate this, a practical investigation of the companies participating at the workshop will be made. In addition, I argue that even if business processes are well documented, it does not help a company if only a naming of operating figures is taking place, rather a certain learning effect and the using of those to draw consequences is necessary in order to improve business process and to bring the company a step forward. This hypothesis will be analysed as well in connection that less operating figures have a better effect on a company's performance and on the motivation as well as responsibility of employees than many. This is associated with opinions that claim that the use of operating figures is rather followed by chaotic conditions and a lack of coordination than by a great monitoring and learning effect.⁸

Since the experience of the workshop showed that companies sometimes have problems in defining which measures shall be undertaken, particularly how to do so and what the object of any measurement shall be, a rather practical guideline for the derivation and re-usage of operating figures will be construed.

1.4 Purpose

The purpose of this paper lies in highlighting the relatedness of different concepts, standards, methods and models in the area of quality management to the concept of BPM. Intersections between these fields will be pointed out but as well as compared to each other in order to show interdependencies and references to BPM. The aim is therefore to make a contribution to the complexity and coherency within this field in order to achieve a better interconnected picture and to underline the concern of BPM. Adaptation possibilities of these very approaches with regard to BPM will be described as well.

Furthermore, the need for measurements will be emphasized during this thesis and therefore existing performance measurement systems will be critically analysed towards their

⁸ Cp. Paul, J. (2004), p.108-111

compatibility to BPM. In addition, essential controlling approaches with regard to BPM will be delineated in order to be able to establish connections to the empirical findings and vice versa. These possess high relevance for monitoring purposes useful for any kind of company.

Within the evaluation of the empirical study the before stated hypotheses will be investigated followed by a subsequent execution of the other intentions. The complex theory regarding measurement systems shall thereby be simplified in a way that minimizes acceptance problems of operating figures by simultaneously focusing on the most essential elements that are crucial for a high explanatory power of operating figures in terms of BPM. The application or more precisely the re-use of those figures will be accentuated as well. In addition the role of the management shall be accentuated when it comes to the determination of business processes and to the derivation of operation figures.

1.5 Audience

On one hand, this thesis is intended to be read by an academic and scientific audience. It helps to understand the complexity of BPM and the need for measurements in a more constructive and comprehensive way. Moreover, it contributes to create a higher awareness of the many influences resulting from quality- and measurement related sides. But on the other hand, this paper should also interest students and practitioners like employees on whose understanding it is dependent on, whether BPM will reach common sympathy or not. They could learn from the empirical findings in this document and profit from a (hopefully) simply and understandable guideline for the derivation of operating figures. As said, the thesis has a very broad view, so there is enough space for further researches in different aspects of the mentioned approaches.

1.6 Outline

In chapter 2 the applied methodology will be described. Therefore, the chosen perspective, the methods and data collection including some comments regarding the questionnaire, the workflow and the literature research including a critical attitude towards the sources, will be presented.

Chapter 3 describes the concept of BPM and the term quality with regard to business processes. Definitions, organisational aspects and coherences with TQM will be shortly described.

In chapter 4, the author will present quality standards and other approaches that do not only concern quality but also the avoidance of mistakes, reorganisational and improvement aspects. The adaptability of those approaches will be afterwards investigated and the hints for measurements will be pointed out as well.

Chapter 5 is dedicated to the controlling and monitoring aspect of business processes. Performance measurement systems will be considered and analysed in a critical perspective and the essential concept of how to control processes will be presented in combination with some theoretical and mathematical measuring examples.

In chapter 6, the empirical study will be presented including the be.st (benchmarking for sustainability) project, the participated companies, the questionnaire and the workshop. An evaluation will follow subsequently.

Afterwards, the questionnaire and the findings of the workshop will be analysed in chapter 7 in relation to the theory. The guideline for the derivation and re-use of operating figures will be conceived here as well.

Consolidated findings and an outlook will be drawn up in chapter 8.

1.7 Acknowledgements

Before the actual paper commences, I would like to take the opportunity here to thank my supervisor Professor Claes Svensson for offering me the chance to write my master thesis. I am very thankful for this as well as for the supportive attendance he gave me during this study.

Another acknowledgement goes to graduate physician Michael Lörcher who made my participation within the be.st project possible. I owe him big thanks for this. Furthermore I am very grateful for the inspiring ideas I could benefit from and for his ongoing support during the whole progress of work.

I would also like to thank my friends for their constructive assistance when it came to difficulties during the elaboration of some issues.

2. Methodology

2.1 Introduction and Perspective

The choice of method is an important element when conducting an academic paper. It is important to explain how the data this study is based on were collected. Furthermore, the used sources, the whole procedure in executing this study and the approach of handling the gathered data during the working process have to be elaborated. This choice influences the modus operandi but will also be affected by my own perspectives, values and personal frame of references. The perspective of any person influences his or her way of thinking. Considered or unconsidered assumptions co-determine an author's work. This framework is for instance influenced by my breeding, experience, knowledge and education. By using different sources from different countries and gaining experiences during the empirical study that are influenced by different views of the participants, I will hopefully get a broad and therefore less subjective perspective on this topic. Aware of that, I have tried to be as objective as possible and to work proactive throughout this study. As mentioned during the introduction, many spheres influence BPM. As a basis, it is important to understand why companies should align their organisational structure towards this concept and from which fields it is influenced. The need for measurements will become apparent from this investigation that in turn is influenced by existing performance measurement systems. Their adaptability towards BPM must therefore be critically analysed as well.

In the following I will explain how the cohesion between the theory and the workshop has to be understood: after a discussion about BPM and operating figures with my ex-employer, I got a connection to a consultant company in Munich, Germany, and found out that a two year project of "future e.V."⁹ with five SME has started in March 2002, called the "be.st project", which stands for benchmarking for sustainability. The purpose of this project was to initiate the concept of BPM within those firms and to attend them on their way towards process excellence. In connection with the necessity of measurements and operating figures, a workshop concerning this topic was planned, at which project managers of all those companies were invited in order to present their measurements methods and to exchange themselves in a discussion. After some discussions about the purpose, I took the opportunity to contribute to this workshop in form of sending a questionnaire concerning operating figures to four of these companies since one called the invitation in consequence of intra-

⁹ Future e.V. is an environmental initiative of companies that arranges eco-accountings, environmental reporting and develops environmental management instruments further within innovative projects.

organisational rearrangements off. This questionnaire was evaluated in advance in order to use it for questions and discussions within the debate. I was assisted by one of the best project consultants, Michael Lörcher. Furthermore, the opportunity was given to listen to a lecture held by a graduate engineer who dealt with measurement methods for years.

By conducting a literature survey within the field of BPM and related areas I arrived at the very purpose of this paper including the hypotheses stated in chapter 1.3. But also lively discussions with Mr. Lörcher, one consultant of the project I worked with, let me come to the hypotheses. The gathered information and experiences during the workshop, which purpose it was to get an insight into corporate reality vs. theory in terms of reported circumstances concerning operating figures, underlined and contributed to the aim of presenting an embracing picture of this field and to derive a guideline for the use of operating figures. More information concerning the workshop and the participated companies is given in chapter 6.

When carrying out a research it has to be clear from which point of view the problem is approached. As this paper can be distinguished between a theoretical and empirical part, the former describes a theoretical and academic perspective that is presented critically. Because business process officers (BPO) and quality management agents (QMA) participated at the workshop, who were also addressed for answering the questionnaire, the latter issue has to be seen from an employee and managerial perspective.

2.2 The Components of a Research and Methodological Approaches

According to Bjerke¹⁰ any research can be divided into the “research problem”, the “basic assumptions” and the “solving technique” that show a certain interaction between each other.

As stated previously, the research theme is to condition the existing literature of BPM and to highlight in which relatedness certain approaches stand with this concept. Further, the need for process controlling shall be underlined and the use, handling and derivation with and of operating figures shall be investigated on the basis of an empirical study. Thus, this is an explanatory as well as exploratory approach as I will explain different theories concerning the concept of BPM and inter alia controlling methods and explore on the other hand coherences between them as well as derive conclusions with regard to the purpose of this document in

¹⁰ Bjerke, I. (1981), p.3et sqq.

form of investigating hypotheses and conceiving a rather practical guideline for obtaining operating figures.¹¹ The understanding comes hereby to the fore.

My basic assumptions are mostly influenced by the field of business, especially controlling, organisation and strategic management. The reader will note while reading this thesis that these fields are very hooked on each other when considering the field of BPM. BPM actually falls under the phrase of paradigm as it is a “theory providing a unifying explanation for a set of phenomena in some field, which serves to suggest methods to test the theory and develop a fuller understanding of the topic, and which is considered useful until it is replaced by a newer theory providing more accurate explanations or explanations for a wider range of phenomena”¹². Because BPM can be seen as the newest concept in the field of organisation and control, it hence explains reality. There exist three different approaches when describing reality: the ”analytical approach”, the “systems approach”, and the “actors approach”.¹³

The general assumption of the analytical approach is that reality is objective, measurable and independent of human beings, so one can say it is the sum of its parts while the parts are explained by verified judgements. I consider this approach as not suitable here as BPM encompasses many parts that when understood and implemented right, equal in total more than the sum of its parts and is furthermore very much dependent on human beings and the actions of the observer. The systems approach is hence more suitable here as it verifies the statement above and focuses more on relations between a number of components that have a certain impact on the overall outcome. Each individual part must be examined in order to understand the whole and synergies between the parts. The actors approach describes reality as a social construct in which knowledge is dependent on individuals. Not the organisation by itself is the actor, rather the doing of individuals. This thesis will illustrate this aspect since the outcomes of business processes are very much dependent on individual actions. Moreover, employees have to understand operating figures in order to use them.

The attention of this thesis, as mentioned, lies rather in an understanding and exploration of interactions between the different parts and data of a system than just explaining them (cp. purpose). Thus, the systems approach is very much applicable in this case. One can also talk

¹¹ Yin, R.K. (1994), p.5-8 and Saunders, M. et al. (1997), p.212et sqq.

¹² www.webster-dictionary.org/definition/paradigm; BPM should rather be seen as a concept than as a theory but the expressiveness of the statements in this context is still valid.

¹³ Arbnor, I. and Bjerke, B. (1997), p.49-79

about a rather hermeneutic than positivistic research.¹⁴ Here, delimitations because of time restrictions, too many influences from different areas, and in order to provide necessary relations concerning the empirical study, were necessary in order not to overshoot the mark. But also because of the fact that attitudes and actions of employees, but as well their understanding of concepts and influences are necessary to work in an effective and efficient way, this paper takes into account the actors approach as well.

The following graphic reflects these classifications and points out the overlap between the systems and actors approach:

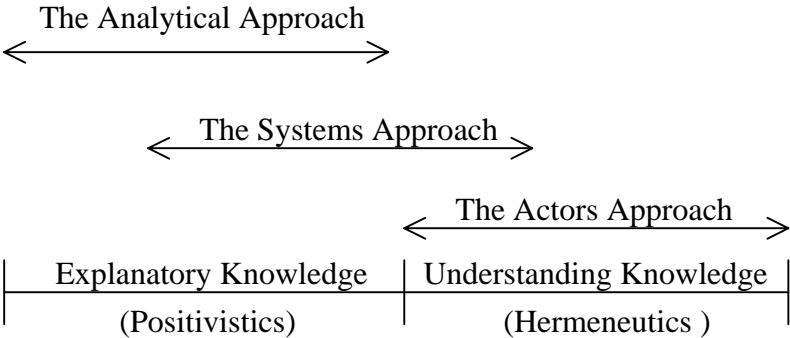


Figure 1 Classification of different approaches¹⁵

Further, the authors Arbnor and Bjerke differentiate between goal-mean- and trial-error-studies.¹⁶ While the former states a goal setting in the beginning of a research by eliminating gaps between the actual reality and the goals during the study, and is taking into account relations between different parts, the latter focuses on changes of goals by a stepwise provision of material for the continuation of the study. As the goals, objectives and purpose of this study were provided in the beginning and resulted from a real system, the latter view can be disregarded here.

Let me now turn to the last component – the solving technique. I will divide this part into the literature study and to the solving technique of the empirical one.

2.2.1 Solving technique of the literature study including data research

The search for literature in this study was an ongoing process. In order to get an overview and to understand coherences between the different areas, an extensive search was necessary. It

¹⁴ *ibid*, p.45-48
¹⁵ *ibid*, p.46
¹⁶ *ibid*, p.300-306

was further important to collect current studies that support the process thinking, new emerged concepts and the empirical findings in this field. Via the Lund University's search engines "LOVISA" and "LIBRIS" I was able to find relevant books but also "ELIN" supported me with many additional articles. This literature search encompassed topics of BPM, QM, performance measurement systems inter alia activity-based costing- and BSC related methods, error prevention systems, and continuous improvements. In addition, other Internet search engines such as "Amazon" and "Google" were a valuable help for this purpose. I further narrowed this search down to include main literature that was not older than approximately 10 years. With help of articles, it was possible to disclose relevant areas in more detail. Foremost European and American authors have written about these fields, supported by South American and Asia-pacific ones. I therefore included findings from all over the globe written in English and German. This literature study has widened my perception about these subjects very much and was very helpful when it came to the so called abductive approach, which is described in chapter 2.3, whereas some sorting-outs were necessary in the beginning. I was also provided with some internal material of best project that was of great assistance when it came to finding the bridge between theory and praxis.

After having described the secondary data collection, primary data should not be neglected here. As this thesis is a combination of the systems and actors approach, interactions and relations between different part of the system can only be affiliated by collecting actual primary data. This took place via semi-structured discussions within the workshop that should disclose not only "what" and "how" but also "why" questions that in turn were determined by the purpose of the workshop, the agenda and questions from the questionnaire. Observations and personal talks with the participants will top the primary data collection off.

In order to provide the reader with a critical and spanning review of the literature, it is important to develop an understanding of previous researches within the field of BPM and to detect approaches such as the ISO standards, the EFQM model, Six Sigma and KAIZEN that directly or indirectly require the alignment of an organisation towards BPM.¹⁷ Relationships have therefore to be analysed. These approaches were chosen since they are very up to date, widespread and applied not only in theory but also in praxis that as a consequence fit the purpose of this paper to a large extent. The possibility of not having included *all* related areas is of course given but as a comprehensive literature research was conducted in which those

¹⁷ Cp. Saunders, M. et al. (1997), p.38et sqq.

chosen ones were commonly applied, this aspect can be seen as not very significant. By developing a thorough understanding of BPM, it will come to the fore why and that BPM is an indispensable concept to implement and from which other areas it is fed. The comparison of these approaches will enable a researcher to disclose and assess the perspectives in a critical way in order to finally achieve an interrelated picture of BPM.

When it comes to a performance assessment or improvement of business processes the author will underline the necessary usage of operating figures within the BPM concept. For this purpose it is again essential to critically assess existing performance measurement systems, as most traditional ones tend to disregard a multi-dimensional perspective when it comes to an overall evaluation of business processes. Thus, the same procedure as before can be used here as well by judging and comparing the actual purpose of performance measurement systems with the demands of the BPM concept. Problems will be disclosed and indications for editing purposes given.

The stated hypotheses will result from this literature study by considering the use of operating figures in connection with the continuous improvement method supported by the findings of the empirical study but also from the way in which operating figures shall be derived and what they should express. The guideline for the derivation of operating figures for business processes will underline the findings the hypotheses investigation even more.

2.2.2 Solving technique of the empirical study

There exist several but similar research strategies provided by different authors that follow almost the same pattern when conducting a social science research. I will try to combine the ones proposed by Yin¹⁸ and Bryman¹⁹. Yin distinguishes between different strategies, i.e. experiment, survey, archival analysis, history and case study, that are dependent on the form of the research question, the level of control the investigator has over the event, and if there exists a focus on contemporary events or not. Bryman, on the other hand, allocates different designs to several methods that almost equal the strategies of Yin. Each strategy is useful for explanatory as well as exploratory approaches because both deal with causal inquiries and want to disclose causal connexions.

¹⁸ Yin, R.K. (1994), p.3et sqq.

¹⁹ Bryman, A. (1995), p.28et sqq.

Since this study deals with different purposes I will apply the method of self-administered questionnaire and structured interviewing as components of the survey design within the data inquiry, and a qualitative research with the components participant observation and unstructured interviewing when considering the workshop. Case studies usually entail the latter methods. It would go too far here to deliberate about each category but the following table makes these subdivisions of the authors clear. Coherences between the different divisions of the authors are pointed out with the help of arrows. The chosen ones will be described afterwards.

YIN

Strategy	Form of research question	Requires control over behavioural events?	Focuses on contemporary events
<i>Experiment</i>	how, why	Yes	Yes
<i>Survey</i>	who, what, where, how many, how much	No	Yes
<i>Archival Analysis</i>	who, what, where, how many, how much	No	Yes/No
<i>History</i>	how, why	No	No
<i>Case Study</i>	how, why	No	Yes

BRYMAN

Designs	Methods
Experiment	Self-administered questionnaire
Survey	Structured interview
Qualitative research	Participant observation
Case study	Unstructured interviewing
Action research	Structured observation
	Simulation
	Archival sources of data

Table 1 Research strategies and designs²⁰

²⁰ Yin, R.K. (1994), p.6 and Bryman, A. (1995), p.29 (there is to note that experiments, case studies and action researches can be associated with different methods and most methods can be related to different designs)

The *self-administered questionnaire* has to be regarded as a quantitative research since questions are standardized and structured.²¹ It is at this juncture not a must to carry out a statistical inquiry. The questions asked in this case were also standardised as all respondents received the same questionnaire and followed a certain structure as well. This is a great advantage of questionnaires because they can be finely evaluated and answers can be clearly opposed to each other. As already noted, the purpose of the questionnaire was to get ex-ante information of the companies concerning the use of operating figures from where problems crystallized that could be used to get discussed during the workshop. Therefore, it was sent via e-mail one week before the workshop took place but unfortunately only two out of four questionnaires reached me in time, so the aim of comparing and deriving questions was constrained. One could state that the respondents should have had more time for answering, but this was on the other hand not possible since the consultant I worked with and on whom I was dependent on had no time in advance. Nevertheless, a third one reached me during the workshop. Respondents of this secondary data survey were project leaders, BPO or QMA of the participating companies. Some disadvantages that come along with questionnaires could thus be abrogated since the purpose of the workshop and questionnaire was explained via a covering letter and further we could be sure that it reached the right hands. However, it is still arguable that questionnaires do not provide a form of getting spontaneous answers and unclear points cannot be discussed, but since the respondents had the possibility of call backs and because these issues were addressed again during the workshop, this statement can be neglected.

The content of the questionnaire that can be seen in the appendix, chapter 9.1 and 9.2, was determined by several aspects: the question I have asked within it originated from the studied literature and were related to the stage of affairs of the be.st project and the very purpose of this paper. Furthermore, operating figures incorporate a certain value for companies that in turn presumes a certain stage of maturity of business processes. The knowledge about this and the use of operating figures co-determined this questioning. For instance, questions concerning the embedment of those into a target system and organisational aspects resulted out of this. Further, discussions with and experiences of the consultant I worked with, relating to the use and problems SME may have when it comes to a determination of operating figures, shaped the questioning as well. Also, in order to contribute to the be.st project, questions were aligned towards pre-determined benchmarking processes. For making a best

²¹ Bryman, A. (1995), p.41et sqq.

practice sharing during the workshop possible, the asked questions should enrich this purpose as well.

To come back to the classification of Yin, these questions incorporated explanatory and exploratory characteristics of “who”, “what”, “where”, “how many”, “how often” and “how much”, but also simple “yes” and “no” answers. The asked questions were of a clear language and of unambiguous character. This was underlined by presenting possible answers and by a division into sub-questions. Of course, giving examples of what is meant by a particular question may bias the way of answering but on the other hand it was necessary to do so since the concept of process controlling was rather new for all delegates and the probability to make a promising comparison should be enhanced. Moreover, we did not deal with controlling “experts” and the course of events during the workshop referred to these questions as well. From there, statements could be consulted in order to adjust the answers of the questionnaire. By having a participant observation during the workshop, the problem of reactivity concerning the incorrectness of answers because of the fact that people are being studied and may occur in a too positive light will be of less relevance.²² I think that I have succeeded in this part, as the answers did not show any signs of being too extensive or misunderstanding. The questionnaire can be considered as a co-foundation for the workshop.

Since the aim of this master thesis is to put light into theory vs. corporate reality, the *workshop* suited very much for this purpose. The use of operating figures was discussed as well as experiences and problem were exchanged there. Hence, this study is foremost based on a qualitative method that can be seen as a primary data collection.²³ Further, it is affected by statements of the members since qualitative studies focus on interpretations. They also focus on a certain context that was clearly given within the project and workshop. Participants of the workshop were the interviewees of the questionnaire, and dependent on the company sometimes assisted by other colleagues (BPO or QMA), the consultants of the project, and myself.

The workshop was both, an unstructured interview as discussions tended to be loosely structured, and a participant observation as feelings, behaviour, beliefs, body language and backgrounds towards certain aspects were expressed.²⁴ But a part of the workshop can also be

²² Bryman, A. (1995), p.65-69

²³ *ibid*, p.135-169

²⁴ *ibid*, p.142et sqq.

considered as a structured interview since precisely formulated questions were asked in a coordinated application flow with regard to the questionnaire.²⁵ One can also talk about a semi-structured workshop. Discussions during the workshop were held in an open manner since delegates and consultants got to know each other from past workshops. Since the project consultants were rather considered as assistance for the companies on their way towards process excellence, any interviewer's effect in the sense that the physical presence of the interviewer may affect the answering of the interviewee almost vanishes. The same counts for me, as my work was not aiming at *auditing* the companies rather in disclosing certain procedures. Body language in combination with the tendency towards interpretations can on one hand be considered as a negative fact, but as I said before, I will try to work as much as objective as possible. But on the other hand it has also a positive effect since the interviewer has the ability to observe the reactions of the interviewee directly after a question was asked. Thus, obscurities could be quickly solved within the workshop, also with regard to the questionnaire. Because the will to exchange, to solve problems and to learn from each other with regard to operating figures can be classified as very high within those companies, so that any doubts about given statements can be seen as not reasonable.

I consider the talks with the participants in accordance to the comparison of the questionnaires as the most relevant source that could be used for the evaluation and conclusion but also for confirming or disproving the stated hypotheses. This has its origin in a directly response and reflection to the asked questions. I tried not to go in too much detail rather to find a common pattern that is applicable for those SME and maybe for SME in general. This, of course has to be analysed.

I have not tape-recorded the workshop but wrote meanwhile single statements down, that were used for an elaboration of a protocol that in turn was reviewed with Mr. Lörcher in order to affirm the findings and not to get biased when interpreting the data. This protocol is partially included in the evaluation of the empirical part. Moreover, no names were given due to confidentiality reasons.

If we go back again to the classifications given by Yin, the form of questions during the workshop had mostly a "how" and "why" character.²⁶ Further on, the fact that the investigator did not exert any influence on behavioural events during the workshop or questionnaire,

²⁵ *ibid*, p.41et sqq.

²⁶ Yin,R.K. (1994), p. 3et sqq.

confirms the chosen solving technique. This is also approved by having a focus on contemporary events such as BPM and the use of operating figures in business processes.

2.3 Strategies for the Analysis²⁷

To be able to conduct this rather qualitative than quantitative research paper, it is essential to determine the strategy. The development can take place from existing theories, from empirical findings or a combination of those. The deductive approach describes the development of a theoretical framework consisting of many theories that in turn will be tested using data. From there, it is possible to formulate the research problem and objectives. This descriptive framework should help to get better overview about the subject. But in order not to introduce a “premature closure on the issues to be investigated”²⁸, it is necessary to reanalyse data inductively. This induction incorporates an exploration of the data gathered from any empirical study to a subsequent use for drawing conclusions and creating new theories respectively to prove the existing ones. I agree with the authors that to start with an inductive approach, very much pre-knowledge about the subject area is necessary in order to succeed in it. In both approaches, a verification process has to be carried out.

This paper commences from a deductive position in which I will try to describe and explain, but also critically analyse, different concepts, models and methods that concern the field of BPM. These approaches had to be narrowed down because of time constraints but also in order to provide a relevant basis for conducting an inductive study. Thus, the area of QM including novel improvement concepts and the broad field of performance measurement systems were chosen and critically reviewed concerning their relevance and adaptability towards BPM. To some extent the purpose of this paper resulted from reading the literature within these fields, i.e. to describe and explain coherences between the BPM concept and related areas that incorporate the process thinking. My attention to the need of measurements was aroused during the readings, but was also pretty much influenced when I got to know about the workshop. Further, the empirical study via the inductive approach was not carried out to find or establish new theories, rather to see the context between theory and praxis.

Therefore it is accurate to describe this study with an abductive character, a combination of the deductive and inductive approach. By implementing this abductive approach via connecting empirical finding with selected theories, one can also talk about “pattern

²⁷ Saunders, M. et al. (1997), p.38+39, 348-350

²⁸ *ibid*, p.348

matching” in which derived empirical data contradict, verify or make an extension of the selected theories possible.²⁹ The hypotheses that were compiled during the literature research and from thoughts and discussion during the creation of the questionnaire can be finely analysed within this approach. Pattern matching was also applied when discussing empirical findings and relating them to the theory. Via the abductive approach the need for compiling a rather practical guideline for the derivation of operating figures for business processes became clear since the investigated companies had difficulties in doing so. Also, the thought to establish a more interconnected picture between the different theories influencing each other resulted from this approach. This procedure increased my understanding of how to cope with these tasks.

2.5 Critical Attitudes towards the Sources

Being aware of the aim it is essential to read and understand the literature from a neutral point of view. This is actually hard to assess since all researchers may be influenced from several backgrounds. My critical approach towards this and the inclusion of books and articles from different countries should have mitigated this aspect.

Furthermore, I think that any doubts about the compatibility between the quantitative and qualitative data are not given in this case since this is hedged via the abductive approach. Any criticism about the possibility of collecting data from the wrong persons within the qualitative study including the risk of losing relevant information thereby is not reasonable here because talks took only place with either the consultants of the project or BPO and QMA that are responsible for a correct implementation of business processes and operating figures within their companies.

Saunders et al. note that primary data collections always incorporate a certain interviewer and interviewee bias.³⁰ I also think that comments, tones and body languages may affect to some extent conversations and ultimately the conclusions as well, but this has to be considered in a certain context. The workshop, which was accrued via the own interests of the companies and their employees and was held in a very open language, softens this particular problem whereas it cannot disappear completely.

²⁹ Yin, R.K. (1994), p.106-110; with “theory”, the different approaches stated in chapters 3-5 are meant.

³⁰ Saunders, M. et al. (1997), p.217et sqq.

2.6 Reliability and Validity

In this chapter I would like to underline the importance of reliable and valid data. Reliability indicates how trustworthy the collected information is.³¹ One can achieve a high degree of reliability if another independent observer comes to the same results by implying the same data collection procedure. When considering the qualitative data of this research, I think that a high reliability is assured via direct and indirect observations³², via my own presence in the workshop where I had the possibility to ensure that the given answers within the questionnaire are right, and via a check-up of the workshop protocol with Mr. Lörcher. I also tried to ask myself how reliable my observations are by keeping the theoretical knowledge and critical attitude at the back of my mind. I also think to have achieved a high degree of reliability within the workshop, as the same results would occur if I or someone else would ask the questions again. Further, I did not have any bearings on the interviewees, I did not ask for personal opinions, and the purpose of the questionnaire and workshop was clear from the beginning. Other aspects concerning the reliability of the quantitative and qualitative study were already mentioned during this chapter.

Even if this thesis can be regarded as reliable, this does not implicit that it is valid automatically. Validity describes “whether the findings are really about what they appear to be about”³³ or “if the test does indeed measure what it is intended to measure”³⁴. By using the abductive approach and pattern matching, the validity of this study should be high.³⁵ Via the combination of quantitative and qualitative data a certain access to different levels of reality should be feasible. The former describes an understanding of the theory from a practical point of view, whereas the latter indicates relationships between theory and praxis. This combination makes a certain reciprocal “hedging” possible. Thus, measurements can be regarded as adequate ones. Implementing an abductive approach can disprove the statements of Bryman³⁶ that a qualitative approach brings difficulties with it because the theory by itself is questioned. This counts also for the problem of reactivity and social desirability bias that was discussed before. Any social related bias would harm the participants themselves. Nevertheless, I think it is never 100% solvable to know whether what people say or feel is actually true. There always exists a gap, which of course can be narrowed down, as it was the case here.

³¹ Bryman, A. (1995), p.54-56, 211et sqq. and Yin, R.K. (1994), p.32-36

³² Arbnor, I. And Bjerke, B. (1997), p.225et sqq.

³³ Saunders, M. et al. (1997), p.82

³⁴ www.alleydog.com/glossary/definition.cfm?term=Validity

³⁵ Yin, R.K. (1994), p.106-110

³⁶ Bryman, A. (1995), p.54-69

From a hermeneutic standpoint a total understanding of the whole context is only achievable after all data are collected, i.e. after the workshop took place. These data as well as the theoretical findings were compressed in order to make an evaluation containing the most relevant one possible. I also take it as a presupposition that the talks within the benchmarking project were highly valid as everybody's intention was to learn from each other and to solve problems within discussions. Communication difficulties could also be directly solved within the workshop. The findings of this paper should be seen as indications, but since a couple of companies were investigated, which all showed cause and effect coherences, let me conclude that the degree of generalization should be high.

Before I lead over to the actual document, I would like to note that the evaluation of the empirical part was limited to the findings of the timely constrained workshop. But additionally, I had the possibility for callbacks if some question were open. The complexity of this study would be more extensive if both, the timely possibility would be given to follow up the derivation and use of operating figures in those companies, and to conduct observations for a longer period. These are aspects for further investigations.

3. Why Business Process Management?

Exigencies towards companies are steadily increasing. The globalisation process, the internationalisation of markets, deregulations of competition, rapid technological developments, saturated buyers' market and shorter product life cycles are all indicators for the fast changing macroeconomic environment in which all companies have to find ways to stay competitive. The homogenisation of products, cost pressure and the increasing customer demands are contributing even more in terms of challenging the companies. Nowadays, competitive advantages are only achievable if organisations have the ability to respond very quickly to market-, customer-, and technology changes. High flexibility combined with a short reaction time is greatly demanded. Companies are only able to sustain their market positions if key words such as time, quality, celerity, efficiency and proximity to customers are well understood, and if they consider those challenges resulting from market changes as permanent and as a continuous process. This vicissitude enfolds the whole organisation – from the attitude and behaviour of employees to the leadership system, controlling, technologies, processes and products.

BPM is an adequate and approved concept in order to be able to react flexible towards new exigencies as well as to make any necessary adjustments. It is crucial to pay attention to the aim of the organisation (this includes the vision and strategy), i.e. to achieve effectiveness by “doing the right things“, as well as towards the implementation of those goals, i.e. to work efficient. Parameters of efficiency are time, quality and cost. Many efficiency and effectiveness problems have their origin in non-controlled or undefined business processes. Examples are many complaints, many defects, many changes, high product costs, long cycle times, insufficient delivery reliabilities, high stocks and a low flexibility. BPM reduces those problems and can also be applied to service companies under the focus of customer orientation.³⁷

In the following chapters the author wants to present the most relevant principles of BPM in order to provide the reader with the fundamental ideas of this concept and to show how these stand out from the traditional functional approach. A first transition to the need of process controlling will be given as well. Afterwards the term quality with regard to BPM is delineated as highly qualitative products are depending on well working business processes.

³⁷ Murphy, P. (1999), p.56-73

3.1 What is Business Process Management?

BPM is an integrated concept of leadership, organisation and controlling that allows a goal-oriented control of business processes. It aligns the whole company towards the needs and demands of customers and all other stakeholders such as employees, investors, owners, suppliers, partners and the society.³⁸ The ultimate ambition is seen in solving customer problems, in creating customer value and in satisfying customers. The existence of companies is very dependent on the customers' satisfaction because he or she is the ultimate buyer of a company's product or service. The concept of customer relationship management deals with this aspect as well and thus contributes very much to the topic of BPM.³⁹ The further focus of BPM lies in the creation of value-added activities supported with an orientation towards employees who shall be toughened to optimise business process in a self-contained way. Self-responsibility comes hereby to the fore. This is underlayed by a learning orientation in the sense of continuous improvements.

Services are created in business processes.⁴⁰ A process consists of activities in which inputs are transformed into outputs. Business processes define "the way in which organisations combine their resources to conduct their activities"⁴¹. Already the conjunction of some activities or working steps can be seen as a process because a certain output is created. Different processes have to be combined in such a way that the outcome of a process chain fulfils the requirements, wishes and expectations of external customers. Inside the process chain, one can talk about internal and external customer-supplier-relationships. The former are buyers of partial results that are used as inputs in another process inside a company, while the latter concerns the ultimate buyer. Internal suppliers can be measured as how they fulfil requirements of internal customers because each internal acceptor demands certain claims from previous processes. Business processes consist of the functional-spanned chaining of value-adding activities, which render specific customer demanded services and which outcomes are of strategic importance for the whole company. Business processes always begin and end at the customer.

³⁸ Gaitanides, M. et al. (1994), p.1-19 and Schmelzer, H.J. and Sesselmann, W. (2003), p.1-7; one has to note that indeed some definitions of BPM exist but all incorporate the sense of the given definition here

³⁹ Bach, V. and Österle, H (2000)

⁴⁰ Schmelzer, H.J. and Sesselmann, W. (2003), p.39-50

⁴¹ www.wordiq.com/definition/Business_Process_Management



Figure 2 The interrelated process chain⁴²

Business process officers (BPO) perform the executive functions of business processes and part-processes.⁴³ They incorporate responsibility for the effectiveness and efficiency of business processes as well as for the achievement of process-goals. Measurands serve as control factors for process performances. Ex ante, the most important parameter for process effectiveness is the customer satisfaction.⁴⁴

The process organisation builds a system in which an effective and efficient application flow can be ensured. It is necessary to identify, configurate and to imbed the business processes into a company's organisation. Most of the times, the implementation of BPM has to be followed by a change of the traditional functional organisation structure towards a process-oriented structure. If the current organization is functional organised, the task is to identify the customer-supplier-relationships between the functions, and for the functions to see themselves as part of a customer-supplier chain. Nevertheless, the following table gives information about the differences between functional- and process organisations. It would go too far here to describe those two forms of organisations in detail as well as the implementation steps towards a process oriented organisation but the following compilation should give a clear overview:⁴⁵

⁴²taken from www.iso.ch/iso/en/iso9000-14000/iso9000/2000rev9.html

⁴³ Schmelzer, H.J. and Sesselmann, W. (2003), p.39-50

⁴⁴ For more details concerning parameters I would like to refer the reader to chapter 5

⁴⁵ Compiled from Schmelzer, H.J. and Sesselmann, W. (2003), p.46-50

Functional Organisation	Process Organisation
<ul style="list-style-type: none"> • Vertical alignment • Intense division of labour • Performance orientation • Deep hierarchy • Departmental goals • Goal: cost efficiency • Centralized external controlling • Ratio projects • Redundancy, substitution processes • Complexity • Fragmented view over processes • Very limited flexibility • External orientation • High coordination complexity via departmental borders (many interfaces) • Ambiguous responsibilities 	<ul style="list-style-type: none"> • Horizontal alignment • Labour integration • Object handling • Flat hierarchy • Process goals • Goal: customer satisfaction, productivity • Decentralised self controlling • Continuous improvement • Concentration towards value-adding • Transparency • Holistic view over processes • Highly flexible • Internal and external orientation • Less coordination complexity via no departmental borders (few interfaces) • Clear responsibilities

Table 2 Functional vs. process organisations I.⁴⁶

Deming, among others, has described the need to adopt a holistic view of the organisation and its environment via systems thinking.⁴⁷ The outcomes of processes cross many different functions and will be dependent on many factors outside the routine operational control. That is why an understanding of the impact of individual decisions on the outcome of a multifunctional process requires an understanding of the interaction and linkages between parts of that process or system. These facts have led to a development of performance measurements systems, which provide information that is not supplied by traditional management accounting systems.⁴⁸ There is to note that horizontal and vertical leadership structure can coexist if this leadership is extremely communicative aligned. But in the long run it is only possible to achieve a fine capability if business process are embedded in a process oriented organisation. The spoken guideline applies that the structure has to follow the process, and the processes have to follow the strategy.

⁴⁶ Figure 10 in chapter 6.2 shows this difference again in form of a figure and embedded processes

⁴⁷ Cp. Deming, W.E. (1993)

⁴⁸ Cp. Zairi, M. (1994) and see chapter 5 for further explanations of performance measurement systems

A successful process controlling calls for transparency, the planning of processes as well as the control of the achievement of goals. Furthermore, it is necessary to have good coordination possibilities and efficient information provisions. Important tools concerning the process controlling are performance figures and the process reporting. Via operating figures it will be possible to measure the performance of each process. I will come back to the measurement part of business processes in chapter 5 and 6.

The two major goals of BPM - the enhancement of customer satisfaction and productivity – contribute to an enhancement of the enterprise value.⁴⁹ All company wide activities will be aligned towards the requirements of customers as well as other stakeholders via the formation and control of business processes. The continuous measurement and improvement of business processes is creating the basis for a continuous enhancement of process performances. These performance enhancements are based on the creativity, engagement and analytic expertise of employees, who bring forward the ideas of BPM via their own autonomy and motivation.

As said, activities that create added value are taking place in business processes. The object of a company is reflected in core processes, which describe the main activities of a company. Every employee has to identify him- or herself with the object of a company and has to know his or her responsibility in order to understand how his or her acting contribute to the company's success. Coherences have to be clear for everybody inside a company. The conditioning of past values is a helpful tool for such an assessment.

Furthermore, business processes can be divided into primary and secondary processes.⁵⁰ In primary processes the original added value is taking place, i.e. the immediate production and commercialisation of products for external customers. Normally, five to eight primary processes can be found in each organisation. Secondary or support processes, on the other hand, supply primary processes with services, for example via the provision of financial, personal and technical resources.

The following graphic gives information about these interactions whereas the primary or key processes have to be seen as parallel:

⁴⁹ Schmelzer, H.J. and Sesselmann, W. (2003), p.5et sqq.

⁵⁰ *ibid*, p.50-56

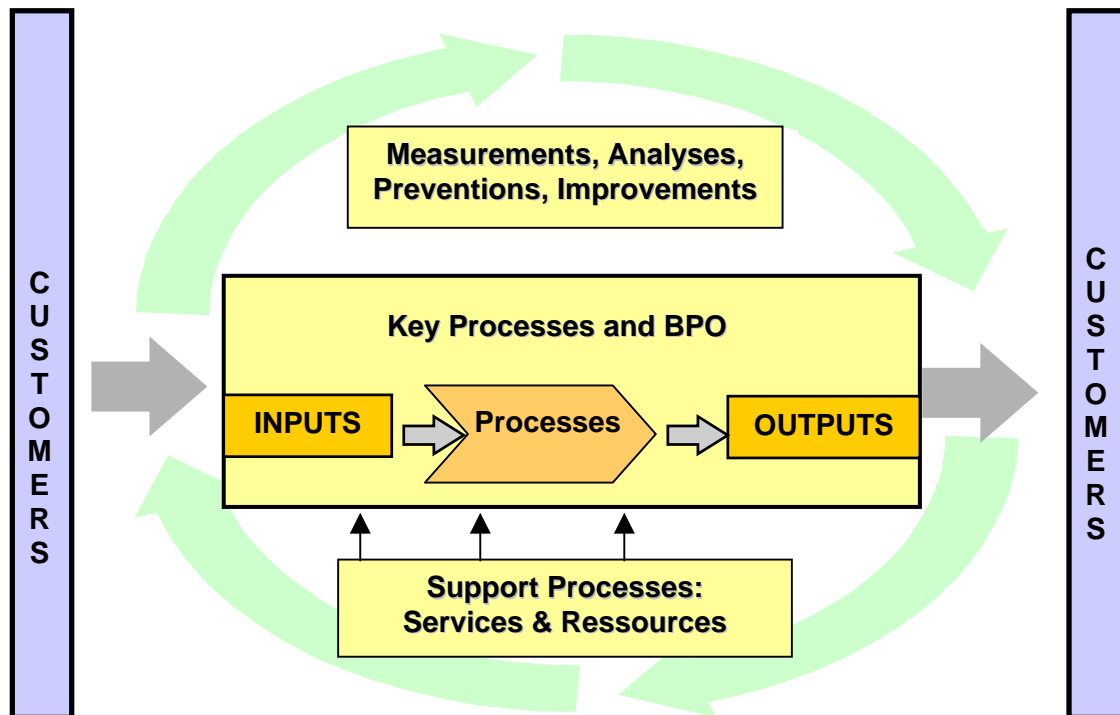


Figure 3 The Process Model⁵¹

For the decisions about the extension of core competences, in- or outsourcing of business- or sub-processes, the provision of resources and the reformation of business processes (business process reengineering), and a weighting of business processes is required.⁵² Here, checklists, process profiles, process portfolios and business process - success factor - matrixes will come into practice.

Business process models can be used to identify, define, configurate and evaluate business processes because those models contain ideal type of business processes that will relieve this job. Those models serve inter alia as modelling tools, thus as a managerial and information-technological illustration of business processes, functions, data and a company's organisation structure.⁵³ Business process models are geared towards core competences that can be characteristic for almost all industrial companies. One has to note that business processes have to be determined in a company-specific way. Companies with several business units may consist of business processes that appear several times. Therefore, it is possible to standardise business processes in order to get a consistent and universal "process landscape". Within those models service exchanges between business units and between suppliers and customers

⁵¹ In accordance to the ISO 9001:2000 process model but modified

⁵² Cp. Heilmann, M.L. (1996)

⁵³ Cp. Scheer, A.-W. et al. (2002) and www.sap.com

will become more efficient and transparent. But those company models always have to give a business specific leeway for adaptations.

We also have to deal with the problem of how business processes can be arranged and organised.⁵⁴ via the top-down-approach, the identification of business processes is emanated from the business strategy, which includes the definition of business fields and customer groups. Together with customer requirements these are the original data for the process identification. From there it can be derived which business processes are needed. Afterwards primary processes are identified first before a determination of the secondary processes can take place because the latter ones have to orient themselves towards the service requirements of the former ones. The following steps then consider process steps and worksteps. These identification and definition of steps should be made in workshops consisting of employees and management. Further, data are needed first for the identification of business processes and second for the specification of measurement categories. The former includes for example target markets, customer groups, customer requirements and strategic success factors while the latter targets at business goals, competitive strategy, strengths and weaknesses. The bottom-up approach on the other hand suggests that the identification of business processes should take place via a bundling of existing activities on the lowest process level to working steps, process steps and finally part- and business processes. This bundling is done via an analysis of operational and informational aspects. What impact these two different approaches might have on a company's performance as well as on the derivation of operating figures will be analysed later.

One can summarise that if a process is neither identified nor controllable there will be no possibility to measure its performance and thus there is no opportunity to enhance the process, respectively the company's performance. This statement refers to the importance of the measurability of processes that will be addressed in chapter 5 and the following.

3.2 The Qualitative Aspect of Business Processes

Quality management deals with process orientation in the sense of a responsible action in business processes.⁵⁵ It is also proved that process quality has an enormous impact on the success of every business. But there exists no exact definition for quality in the literature.

⁵⁴ The description has to be seen as a summary, i.e. no further details will be provided. For more information see Schmelzer, H.J. and Sesselmann, W. (2003), p.75-116

⁵⁵ Pfeifer, T. (2001), p.12

Quality can be seen as a compliance of a product's attributes with the customer requirements. Quality is therefore a subjective perception of each individual customer who evaluates a manufacturer's product in his or her individual understanding combined with a certain expectation.⁵⁶

Quality management in companies comprises two emphases: the product quality and the quality of workflows. Only a high quality of workflows enables a company to produce premium products. Processes are calling for preventive, attendant and scrutinising arrangements that ensure a certain product quality. Thus, each workflow is a direct or indirect arrangement that ensures product quality and customer satisfaction.

An optimisation of business processes is never possible without the process knowledge of employees. The concept of Total Quality Control (TQC) incorporates employees of all hierarchy levels and assigns to each employee a certain responsibility for the quality assurance that is determined by internal and external customer.⁵⁷ Within BPM, the highest responsibility is assigned to the BPO or quality management agents (QMA) respectively.

The principle of Total Quality Management (TQM) also contributes to these aspects because it is based on the concept of a continuous improvement of products and processes and is aimed at continually satisfying customer expectations regarding quality, cost, delivery and service.⁵⁸ Additionally, the European Foundation for Quality Management (EFQM), especially its Excellence Model for the European Quality Award (EQA), among others, attributes a role of fundamental importance to processes for evaluating an organisation's progress towards TQM. The continuous improvement issue will be further explained in chapter 4 under the topic KAIZEN as well as in the principles of the EFQM model.

When trying to produce a high qualitative product it is crucial to know what customers are requiring. One can only speculate about what the customers' demands are or can for example deploy customer-surveys to find out about it. According to the definition of quality given by the International Organisation of Standardisation (ISO)⁵⁹, which is asking for a degree that fulfils customer requirements in order to classify quality levels, one can draw the conclusion that customer satisfaction is the difference between the subjective expectation of an output

⁵⁶ Hoyer, R.W. and Hoyer, B.B.Y. (2001), p.53-62

⁵⁷ Taguchi, G. and Clausing, D. (1990), p.63-73

⁵⁸ Cp. Ishikawa, K. (1990)

⁵⁹ praxiom.com/iso-definition.htm#Quality

and the actual experience of a service perceived by a customer. Even customers have sometimes difficulties to define what their requirements concerning the companies' products are. Nevertheless, only a positive felt quality will lead to customer loyalty, which is essential for the survival of companies. Companies have therefore to convince their customers about the quality of their products as well as about their whole action inside their organisation. For this reason, the German car manufacturer Volkswagen opened a new glass manufactory in Dresden in 2001 in which customers can convince themselves about the quality of the production process by having the possibility to observe how a car is produced.

Leaving the customer perception behind, a company would consider qualitative products as outcomes with zero defects.⁶⁰ This freedom from errors assumes the stability of processes.⁶¹ Hence, one can talk about process quality if a certain process capability exists, i.e. a security of processes with regard to the compliance of customer requirements. In order to describe the quality and measurability of business processes, indicators such as customer satisfaction, effectiveness, efficiency and profitability have to be defined.⁶² Because of the fact that quality is so vague definable, the quality of business processes can thus only be described and measured from a multi-dimensional perspective, i.e. the quality of business processes consists of many single criteria in which many quality aspects, -dimensions, and -perspectives are included. Still, it is a very difficult task to find out the right determinants for the quality of processes.

It was the aim of this chapter to explain that BPM is an indispensable tool for all companies that want to stay competitive in this fast changing environment. Company wide courses of events cannot be seen separately any more rather as many parallel ongoing processes with a workflow throughout an enterprise. Every manager has to be convinced that the functional-spanned chaining of value-adding activities can only be managed by identifying and embedding processes into the BPM concept. The process orientation aims at minimising friction losses at the boundaries, lowering departmental egoisms and at enhancing the transparency of workflows. All actions are aligned towards external customers in a closed chain of internal supplier-customer-relationships. A competitive advantage can therefore be only achieved if business processes are highly qualitative, balanced and structured. This also calls for a numerical identification of business processes in order to know where the actual

⁶⁰ Cp. Crosby, P.B. (1986), p.27et sqq.

⁶¹ The concept of Six Sigma which is described in chapter 4.1.5 deals with the very detection and elimination of any kind of errors.

⁶² Niessen, v.A. and Redecker, G. (1997), p.880-882

standpoint of a company is and to implement any improvement actions that make a higher quality possible.

The following chapter will point out quality models, concepts and methods that are intercommunicated with the concept of BPM and aim at a sustainable development of companies.

4. Contribution of Existing Management Methods and Concepts with Regard to the Assessment and Improvement of Business Processes

Literature and praxis describe many approaches, concepts and methods of how company-wide problems can be solved and how the competitiveness of companies can be enhanced. The evidence of the quality-ability of companies mostly occurs via a certification of quality management systems under the terms of quality standards. Those standards also ask for an assessment of business processes.

In the following the most commonly used approaches concerning the assessment and improvement of business processes will be described that all aim at a sustainable development of companies, which in turn is highly relevant for the aim of this study. Their adaptability for the operative assessment and measurement of business processes as well as their relatedness to the concept of BPM will be pointed out.

4.1 Quality Standards, Total Quality Management Models, Improvement Methods and Hints for Measurement Requirements

4.1.1 The DIN EN ISO 9001:2000

Quality Management encompasses the leadership, organisation and controlling of quality.⁶³ The task of it is to secure that the requirements of customers and other stakeholder towards an organisation are fulfilled. The basics and requirements of quality management systems are determined in the set of standards by the International Organisation of Standardisation (ISO) - ISO 9000 et sqq. - in which companies will be certified in the framework of audits.⁶⁴ Quality Management after ISO is based on eight principles:⁶⁵

1. “Customer focus – i.e. organizations depend on their customers and therefore should understand current and future customer needs, should meet customer requirements and strive to exceed customer focus
2. Leadership – i.e. leaders establish unity of purpose and direction of the organization. They should create and maintain the internal environment in which people can become fully involved in achieving the organization's objectives

⁶³ Bühner, R. (1999), p.299et sqq.

⁶⁴ There is to note that the norm also asks for internal audits but an explanation about the requirements of audits would go too far at this point. Overall, process audits give information about how business processes fulfil certain requirements.

⁶⁵ www.iso.org/iso/en/iso9000-14000/iso9000/qmp.html

3. Involvement of people – i.e. people at all levels are the essence of an organization and their full involvement enables their abilities to be used for the organization's benefit
4. Process approach – i.e. a desired result is achieved more efficiently when activities and related resources are managed as a process
5. System approach to management – i.e. identifying, understanding and managing interrelated processes as a system contributes to the organization's effectiveness and efficiency in achieving its objectives
6. Continual improvement – i.e. continual improvement of the organization's overall performance should be a permanent objective of the organization
7. Factual approach to decision making – i.e. effective decisions are based on the analysis of data and information
8. Mutually beneficial supplier relations – i.e. an organization and its suppliers are interdependent and a mutually beneficial relationship enhances the ability of both to create value.”

It becomes clear that the ISO norms have the same orientation towards customers, processes, employees, and continual improvements as BPM as well as the EFQM model (see chapter 4.1.2) and in a wider sense the TQM models do. Those standards are also claiming for an assessment of business processes.

Quality standards are ex ante agreements that give suppliers a certain definition about what he or she has to do in order to fulfil fixed quality standards. Any company presenting such a quality certificate will increase its quality image vis-à-vis its customers. On the other hand, there are also sceptics who claim that a certified company may rest on its laurels and thus will disregard the need of any continuous improvement.⁶⁶ But ISO implemented many reforms concerning this aspect during the last couple of years, which leads to the conclusion that this particular statement is of lower relevance nowadays.

In the following the author would like to point out the fourth principle in more detail - the process approach: process orientation was, as just said, recognised as one of the most important prerequisites to achieve sustainable development. Within the ISO norm there is a process model described, which combines measurement, analysis, improvement schemes and the responsibility of the leadership in a control cycle.⁶⁷

⁶⁶ Franke, J. and Wilmes, J. (1996), p.792-794

⁶⁷ ISO 9000:2000 (2000)

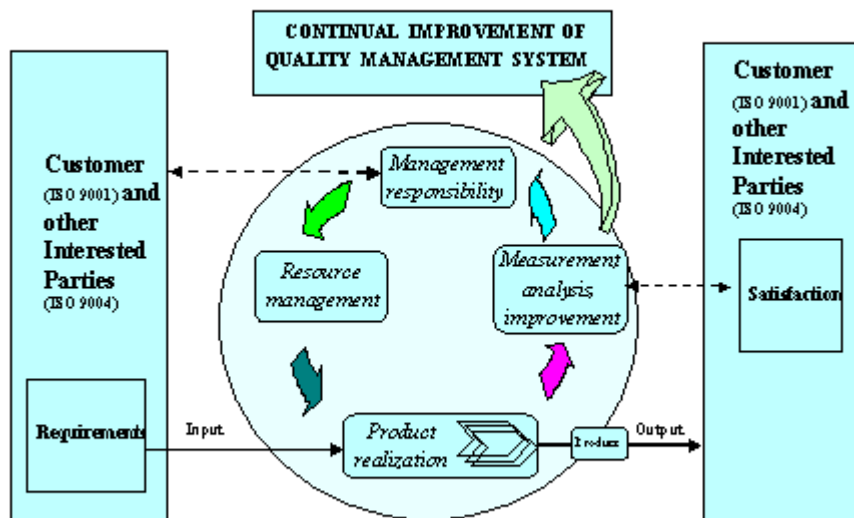


Figure 4 Model of a process-based quality management system⁶⁸

Much emphasis is on customer relevant processes. The displayed core-process product realisation starts and ends at the external customer, which is comparable with the BPM concept. With products, hardware, software, technical products as well as services are meant.

Unfortunately, requirements according to the product classes are not distinguished, which makes an industry-specific interpretation more difficult.⁶⁹ It is also not possible to find suggestions for the implementation of a process orientation. But on the other hand, this problem may contribute to a really intensive debate inside companies of how a process orientation can be implemented rather than just doing what the directive says.

With regard to the measurability and assessment of processes the norm asks for the determination of criteria and methods in order to be able to conduct and direct the processes.⁷⁰ Onward, the company is compelled to measure, monitor and analyse the processes. But again, the question how to do so is not answered there. This thesis will make a contribution to this aspect. Further on, the company has to make arrangements to achieve the planned goals as well as the continuous improvement of processes. These main extracts show clearly that the norm really requires measurements of the process performance, i.e. the necessity of process

⁶⁸taken from www.iso.ch/iso/en/iso9000-14000/iso9000/2000rev9.html

⁶⁹ Cassel, M. (2001), p.250-251

⁷⁰ Norm DIN EN ISO 9001:2000 (2000), p.17

controlling, as well as measurements for the monitoring of continuous improvements, that is also the aim of this paper to find out how that can be done. Instructions and recommendations about how the performance of processes and the organisation can be improved can be found in the norm ISO 9004:2000. A method for the identification of the stage of maturity of quality management systems is also displayed there but a description of all this would go too far here.⁷¹

4.1.2 The EFQM Model and Self-Assessment

A definition of the TQM concept was given in chapter 3.2. Again, quality in the sense of TQM means fulfilling the demands and expectations of stakeholders. The contents of TQM are concretised via the excellence model of the EFQM that underlies the EQA.⁷²

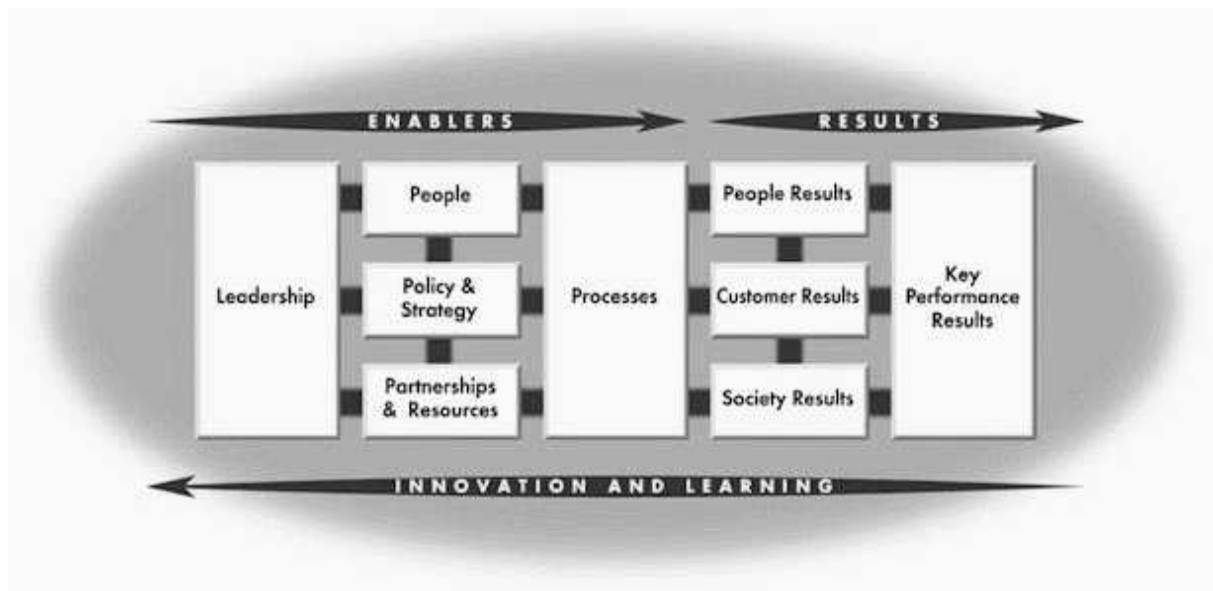


Figure 5 The EQA model

This excellence model among others such as the Malcom Baldige National Quality Award (MBNQA) (USA) and the Ludwig Erhard Preis (LEP) (Germany) act as a basis of valuation for international quality rewards. This model distinguishes between enablers and results. It is up to the enablers what outputs a company will achieve because it is their task to secure the supply of quality. It encompasses a catalogue of criteria that outlines fields of operations and classifies single areas that are weighted against each other. The weight of processes that count for the criteria of enablers as well as results is for example 14%.⁷³ Different models have different weightings. The sub-criteria of the enabler criterion processes refer to the design,

⁷¹ see therefore ISO 9004:2000 (2000)

⁷² www.efqm.org

⁷³ www.deming.de/efqm/modellgrund-2.html

leadership, and the type of implementation with respect to the improvements of processes. In this point, the model displays a stage of maturity of BPM.⁷⁴ Such a stage of maturity, which was also mentioned in the context of the ISO standards, points out if business processes are being measured and improved and if they are being structured as well as documented. It shows neither the results of the process measurement nor the changes of results before and after process improvements. Thus, no conclusions can be drawn about the actual state of quality of business processes. That means that the assessment criteria of such excellence models can only give a certain categorisation of companies on the way towards business excellence. No impulses for the improvement of the quality status are given. On the other hand, it can be expected that an existence of process assessment systems in connection with an implementation of improvement methods concerning business processes would lead to a very positive valuation with respect to the process criteria in an excellence model.

The criteria should serve as a basis for the valuation of the actual state. Additionally, they should be used as an improvement-control-tool, which gives a hint for the need of a continuous self-assessment of companies. Self-assessment has to be distinguished from audits in the way that it is more all-embracing and includes immaterial characteristics that are difficult to measure. Self-assessment has been defined by the EFQM as “*a comprehensive, systematic and regular review of an organisation's activities and results referenced against the EFQM Excellence Model. The Self-Assessment process allows the organisation to discern clearly its strengths and areas in which improvements can be made and culminates in planned improvement actions which are then monitored for progress.*”⁷⁵ It becomes clear that this is an attempt to measure the improvement progress and its potential. The award criteria build a framework of standardised items against which an organisation can measure its performance. Gadd describes in his article a very evident and understandable approach of how such a self-assessment can be carried out.⁷⁶ The phases described there encompass the field of data gathering for each element of the model and its sub-criteria, an assessment of these data gathered by using scoring charts and the plans and actions arising from the assessment. Self-assessment is a monitoring and learning tool of how the processes reflect the company's strategy (i.e. criterion policy and strategy) and which impact they have on the organisation's results, across the spectrum of employee and customer satisfaction, societal impact and business results (cp. figure 5). If a benchmarking mechanism is provided the company's status

⁷⁴ Schmelzer, H. and Sesselmann, W. (1998), p.39-43

⁷⁵ www.efqm.org/training/self_assessment/self_assessment.htm

⁷⁶ Gadd, K.W. (1995), p.66-85

can be assessed against best-in-class ones in relation to the nine elements of the model.⁷⁷ The Deming cycle of continuous improvement, i.e. the Plan-Do-Check-Act-cycle (PDCA), which will be mentioned again in chapter 4.1.6, points out a coherence between the “Plan”-phase, which is aiming at the achievement of improvement goals that will be assessed in the “Check”-phase, and the sense of the self-assessment method.⁷⁸

Moreover, the EFQM presents an assessment method for sub-criteria called the “RADAR Scoring Matrix”. It guides a company through the way towards improvement and should be seen as an ongoing improvement process within a circle. The assessment of the attributes takes place via an allocation of those to a degree of performance expressed in percent. Each criterion has a pre-determined weight. The RADAR logic, abutted on Deming’s cycle, should be addressed to each enabler sub-criterion and respectively the result elements to each result sub-criterion. It encompasses:⁷⁹

- Results, i.e. determination of the desired goals
- Approach, i.e. planning and development of the procedure used
- Deployment, i.e. implementation of the procedure
- Assessment and review, i.e. assessment and checking of the procedure and implementation

The investigation procedure of the EQA award consists of three stages:⁸⁰

1. Testing of the company’s presented self-assessment by a team of auditors
2. Company visit by a team of auditors and re-evaluation
3. Awarding decision by jurors.

The winner will be profiting from a big publicity- as well as marketing effect comparable with an ISO certification. Still, it is up to the specific company to create assessment criteria that describe the actual state of affairs and how to bring in improvement arrangements. The need for an all-embracing measurement system becomes apparent again.

The following chapters are dedicated to improvement methods and concepts with a focus on the enhancement of business processes. They all aim at improvements but vary in their

⁷⁷ The concept of benchmarking will be further explained in chapter 4.1.3

⁷⁸ Kamiske, G.F. and Brauer, J.-P. (2003), p.280-283

⁷⁹ www.efqm.org/model_awards/model/evaluation_tools.htm

⁸⁰ Bühner, R. (1999), p 305+306

objectives and in the use of different approaches. This will be disclosed and explained with regard to BPM and the need for measurements.

4.1.3 Benchmarking

Benchmarking is a continual and systematic procedure designed for the assessment of organisations, processes, products and services.⁸¹ The assessment is done via a comparison of one company with other best-in-class companies. It shows performance differences, discovers reasons for that, and suggests performance improvement possibilities as well as goals that are oriented towards those best practise companies. Companies implementing benchmarking have to ask themselves what other ones are doing better and why. Thus, it can be seen as a self-assessment tool as well.

With regard to BPM, benchmarking can provide some information about the structure and performance of similar but foreign business processes and thus will help each organisation in finding its definitions, designs and renewals of its own business processes. Benchmarking therefore requires knowledge of the own processes and performance. The goals are to check working procedures of the own organisation and to find out best solutions and improvement actions for problems in order to achieve over-proportional competitive advantages. Using processes as a benchmarking object is rather a new approach.

Concerning the be.st project as the subject of the empirical study, four benchmarking processes were determined and assessed within the circle of five companies. Furthermore the course of sustainable benchmarking can be subdivided into seven phases aligned in a circle:⁸²

1. Choice of the benchmarking processes, the benchmarking partner and determination of the target
2. Internal analyses: taking up of processes and data collection
3. Overall assessment of the processes
4. Cooperative benchmarking-workshops and best-in-practise sharing
5. Planning of the steps for a sustainable process optimisation
6. Implementation of these steps
7. Success valuation

⁸¹ Cp. Camp, R.C. (1994)

⁸² www.sustainable-benchmarking.de/projekt-konzept/benchmarking.html

It becomes clear that benchmarking especially in workshops is a suitable tool that helps companies to exchange experiences of business processes concerning the whole implementation of BPM as well as to find and improve measurement systems. This procedure except point four equals a common realisation of any benchmarking project.

4.1.4 Six Sigma

Six Sigma, developed by Motorola and successfully further elaborated by other companies such as General Electric, is a method used for the avoidance of defects as well as for the improvement of processes, based on data.⁸³ It aims at limiting the variation to a value of six σ (sigma), which is the standard deviation from a desired value. Six σ signifies the achievement of 3,4 defects per million opportunities (dpmo) and respectively reflects a rate of yield of 99,99966%. Thus, six σ comes close to the zero-defects-concept. The desired values are aligned towards customer requirements. The central question of this principle is therefore how companies can improve their processes in the sense of customer profits. The non-fulfilment of each customer requirement equals non-conformity, which in turn equals a defect.⁸⁴ A σ key figure can be determined by using a conversion table if the number of defects is known.

Key points of six σ are the customer-oriented determination of process goals, the systematic measurement of process performances, the deployment of statistical tools for the analysis of the result of measurements and the causes for deviations. An intensive education of Six Sigma experts is required as well as a consequent implementation of projects that aim at process improvements.

The following statements distinguish the measuring term “average” from “variance” by accentuating at the same time the focus on customer orientation: “often, our inside-out view of the business is based on average or mean-based measures of our recent past. Customers don’t judge us on averages; they feel the variance in each transaction, and each product we ship. Six Sigma focuses first on reducing process variation and then on improving the process capability.”⁸⁵ Input factors into a system result in an output, which can vary because of control and disturbing factors. The measurement of the variation sheds therefore more light on the process capability than the measurement of averages does. Each variation causes costs as well. Therefore, the reduction of the process variation leads to a reduction of costs and at the

⁸³ Cp. Magnusson, K. et al. (2000) and Klefsjo, B. et al. (2001), p. 31-35

⁸⁴ There is to note that this concept disregards the aspect that business process can be always improved, even if a company achieves 6 σ

⁸⁵ www.isixsigma.com

same time to an enhancement of customer satisfaction, turnover and output. The connection between customer requirements and process quality becomes obvious.

Six Sigma creates a connection between customer requirements and process quality. Within the concept Critical to Quality characteristics (CQC) are selected with customers and will afterwards be weighted and quantified. The sum of the CQC determine the process quality from a customer perspective and are essential for a high customer satisfaction. For each CQC a desired value will be given on which the measurement of defects and the variation will be related to. The method of Quality Function Deployment (QFD) plays an important role in the translation of customer requirements into CQC as it integrates perspectives of quality and market orientation. Furthermore it eliminates subjective influences and provides a more structures approach.⁸⁶

The past showed that it is not easy for companies to achieve a level of 6 σ . Six Sigma can be seen as a model for improvement in the sense of KAIZEN *and* renewal of processes, i.e. the design/ redesign approach known as DFSS (Design For Six Sigma) because levels between 4,5 and 6 σ create resistances that lead to new conception of business processes in the sense of business process reengineering.⁸⁷ To achieve 6 σ processes have to be under control.

Overall, the framework of Six Sigma consists of:

- A top management commitment
- An involvement of stakeholders
- A training scheme
- A measurement system and
- A formalised improvement methodology, i.e. the Define-Measure-Analyse-Improve-Control (DMAIC) cycle that is derived again from the Deming management approach.⁸⁸

The points concerning measurement involve information about measurement categories and about the definition and measurement of error rates, exploitation, defects of opportunity and dpmo, even in σ values.⁸⁹ Detailed information about the procedure of the analyses of

⁸⁶ Magnusson, K. et al. (2000), p.130-141

⁸⁷ Banuelas, R. and Antony, J. (2003), p.334-344

⁸⁸ for further details see Magnusson, K. et al. (2000), p.44-67

⁸⁹ Cp. Magnusson, K. et al. (2000)

measurement results respectively about the creation of a measurement infrastructure is also provided. This measurement infrastructure can be seen as a precondition for a learning environment in which process behaviour and the impact of improvement methods will become more transparent and distinctive.

Training schemes for so called black-, green-, and master-belts are necessary because Six Sigma presupposes knowledge about statistical tools, improvement methodologies and project management. A negative point is seen in smaller companies that cannot afford it to send employees to long-term trainings and to excuse them from their normal tasks.

In the following statistical tools are numerated, which are of significance for all phases of the DMAIC cycle and also play an important role as quality tools within the later explained KAIZEN concept:⁹⁰

- Pareto-Diagram
- Cause-Effect-Diagram (Ishikawa-Diagram)
- Histogram
- Control charts
- Spread-Diagram
- Bar-, Circle-, and Line-Chart
- Checking forms
- Flow-Charts
- Quality Function Deployment (QFD)
- Failure Mode and Effect Analysis (FMEA)
- Correlation- and Regression Analysis
- Test for the statistical significance (Chi-Squared, T-Test, Analysis of Variance)
- Design of Experiments.

In addition to these, Magnusson et al. distinguish seven groups of improvement tools where each group consists of seven single-elements.

Quality in the production line is quantifiable and it is possible to express it in numbers. To improve it, quality has to be measured and to be expressed in numbers before any improvement processes can be initiated. Via Six Sigma it is possible to assess the quality

⁹⁰ Cp. Magnusson, K. et al. (2000)

within a process, not afterwards. This is done by the already mentioned dpmo. After the measurement has taken place an optimisation of the process capability can be done with help of the DMAIC circle. It is essential to understand a process as well as all interrelations between the input factors determining the output. Desired values and tolerances have to be defined as well. Thus, there exists a direct relationship between the quality of a product and the variation of process parameters, i.e. the process variation measured in dpmo. This measurement of the process variation is important because it helps to control the whole process. For example, a variance reduction in the manufacturing process will lead to a reduction of production costs, which in turn will raise the reliability of the manufactured product all along the product life cycle. Quality levels do not improve by themselves, only if they are continuously improved. Enough perseverance is therefore very important.

4.1.5 Business Process Reengineering (BPR)

BPR has the meaning of a fundamental reconsideration and a radical redesign of business processes.⁹¹ It calls structures, systems and behaviours into question. The main features are again customer orientation, the company's alignment towards business processes, renewal of processes, structures and systems as well as quantum jumps of process performance. The aim is thereby to achieve dramatic efficiency improvements of factors such as time, quality, costs, and customer satisfaction. In deep crisis whether externally or internally provoked BPR is sometimes the only way to bring back the company on a competitive track.

Because BPR is a method that demands high efforts in terms of personal resources and an intensive coordination, it should be limited to those business processes, which are highly relevant and show serious performance deficits. Nonetheless, it has enhanced the consciousness of business processes on one hand and initiated the changing of processes on the other one. It is always up to the management to convince all employees about the need for a change as well as to prepare them accordingly in order to reengineer its business processes successfully. Motivated employees are those people who find innovative solutions and steer the whole project on the road of success. Additionally, it is quite obvious that radical changes implicate high risks of failure. In order to find out weak points of business processes an analysis of the actual state of those is indispensable.

KAIZEN in comparison to BPR asks for a step-wise and continuous improvement of processes, which will be described in the next chapter. But as said, process stability, which

⁹¹ Cp. Hammer, M. and Champy, J. (1994)

can be seen as a prerequisite to implement KAIZEN strategies, is often only achievable via BPR.⁹²

As a consequence, I suppose that the prospects of success of BPR projects are much higher if they are implemented within a BPM concept because such projects can be assigned to each specific process and do not need a rolling up of the whole organisational structure. Measurements help thereby.

4.1.6 KAIZEN

KAIZEN is a Japanese management philosophy aiming at a continuous improvement under the involvement of all employees of a company.⁹³ The focus of this philosophy is more on the process that is responsible for a certain output than on the output itself. Its target lies on a permanent enhancement of the process performance via an improvement in little steps compared to BPR. Process- and working steps within the business processes shall be improved. The orientation is aimed at the requirements of internal and external customers like the concept of BPM does. The abilities of employees are seen as the very important power that contributes to the solution of existing problems. The way of thinking as well as the behaviour pattern of the management has to be changed in a way that makes all employees feel that they are involved and responsible for the company's overall performance. KAIZEN is based on teamwork, which brings forward a better communication, the sense of responsibility and motivation. The employee suggestion system has therefore to be adjusted. The training and the empowerment of employees are here less complex and time-consuming than for Six Sigma.

KAIZEN targets at disclosing defects, problems and weak points that can be summarized as wastes.⁹⁴ Wastes can be defined as anything that is not of use for the customer and respectively as anything the consumer is not willing to pay for. Examples are errors of performances and idle powers such as stocks, defects, waiting times, insufficient information or an overflow on information, re- and double-works, unclear goals, no motivation, or inadequate coordination. But also the leadership behaviour, a lacking of problem consciousness and a deadlocked way of thinking can be seen as wastes.

⁹² Bond, T.C. (1999), p.1327

⁹³ Cp. Imai, M. (1992)

⁹⁴ Cp. Kostka, C. and Kostka, S. (2002), p. 59-66

The goals pursued by KAIZEN have to support the business goals of a company in the sense that they have a positive influence on the company's performance. That means that they have to be derived from the goals of business processes and sub-processes in order to support BPM. The most important tools for this were already been mentioned in the previous chapter. Also, the mentioned Deming improvement cycle PDCA (Plan-Do-Check-Act) comes here into play, which is a systematic and methodological guidance to plan improvements, to realise those, to check their impacts and to optimise so long until the improvement goals are being achieved.⁹⁵ It should be implemented continuously because improvement actions always exist.

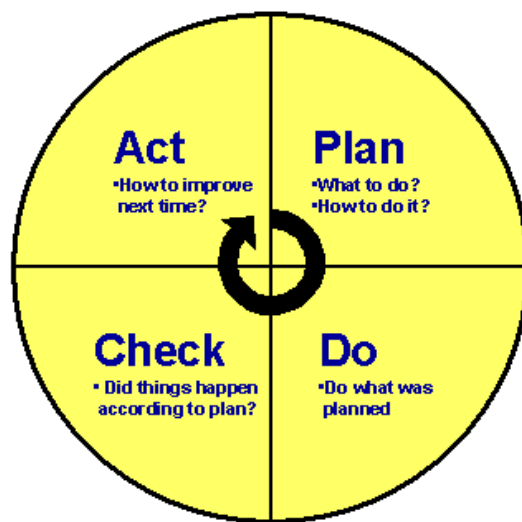


Figure 6 Deming's PDCA cycle⁹⁶

This very cycle can further be applied to each individual process within an organisation as well as to the network of business processes within the BPM concept. The following can nicely show this graphic:

⁹⁵ Cp. Deming, W.E. (1994)

⁹⁶taken from www.iso.ch/iso/en/iso9000-14000/iso9000/2000rev9.html

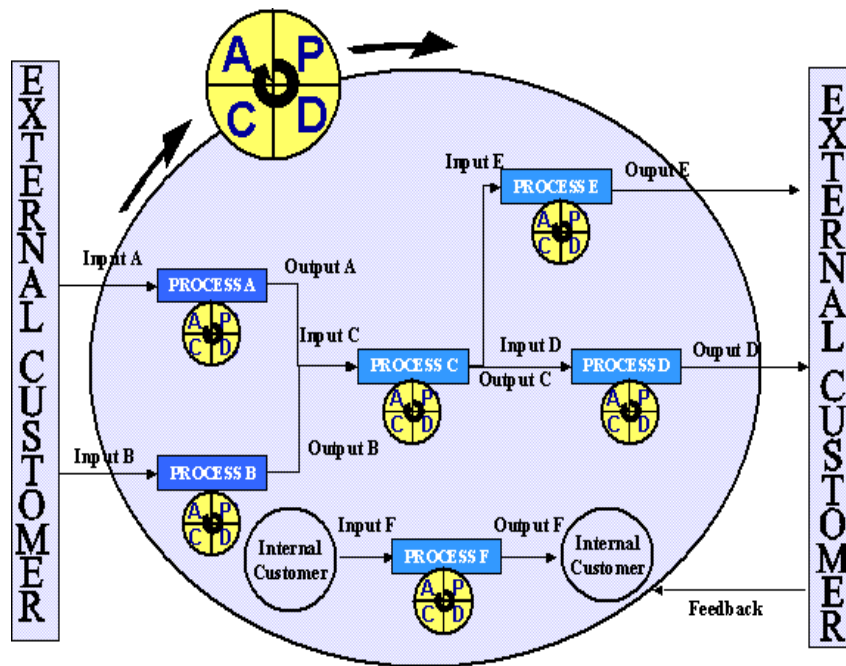


Figure 7 Network of interacting business processes⁹⁷

Visualising tools like blackboards help the KAIZEN teams to get a clear picture of the goals, action plans and implementation procedures. Finally, an enhancement of the process performance, i.e. quality, cycle times and costs, will have a positive impact on the process efficiency and thus also on the behaviour of employees via an active learning process as well as on the further development of the organisation's culture. With KAIZEN it is possible to discover all performance reserves as well as those of indirect areas such as the development and distribution division.⁹⁸

In addition, KAIZEN pays attention to the principle to “speak in data” since disclosed wastes can be clearly determined and visualized via measurands.⁹⁹ But unfortunately it does not explain how to do it. Nevertheless, its improvements in the sense of elimination of wastes can be measured as process time-, adherences to delivery dates- and process quality improvements, which will be described in chapter 5 under “process controlling”. Thus, there exists no additional measurement effort. Again, improvements have to be seen as never ending because the potential for it is always there. There is to note that measurements aimed at improvements of the total cycle time (TCT) are based on the same procedure but focus on the valuation of process barriers and the estimation of improvement potentials.¹⁰⁰

⁹⁷ ibid

⁹⁸ Schmelzer, H.J. et al. (2003), p. 244+245

⁹⁹ Cp. Kostka, C. and Kostka, S. (2002), p.23

¹⁰⁰ Schmelzer, H.J. et al. (2003), p. 233-237 and 320-324

4.2 Analysis of the Approaches towards BPM

It was the aim of this chapter to pinpoint intersections between the presented approaches and BPM. Quality-oriented models were described with regard to an assessment of a company's business processes and different improvement methods concerning an enhancement of business processes productivity respectively. The process-oriented quality management models can be seen as a basis for a further development of business process quality rating systems. In order to assess the quality of business processes, internal customer-supplier-relationships come to the fore. Adaptation possibilities with regard to BPM and the measurability of business processes and their improvement have to be assessed in a critical and objective way. Therefore, out of these approaches, aspects concerning the *modi operandi*, the directions for the assessment of goals, practical experiences and starting points for thoughts can be of usage and will be described in the following.

The stakeholder approach within the new DIN EN ISO 9001 et sqq.:2000 follows a monitoring concept that incorporates the interests of all parties. It can be nicely carried forward to the concept of BPM with reference to external as well as internal customers. In addition, the norm requires an adequate process documentation, a process controlling mechanism, i.e. methods for the surveillance and measurement of processes and customer satisfaction, an implementation of audits and gives advices for performance measurements and continuous improvements.¹⁰¹ But unfortunately the norm says "what to do" but not "how to do it". It is impossible to find answers on questions like how processes shall be structured, connected, managed, monitored or improved.

Core intention of the TQM models is an appraisal of the stage of maturity of companies that are on their way towards business excellence. The EFQM sub-criteria of the main criterion "processes" provide an informative basis for the determination of configuration characteristics in the framework of a process rating system. But, they only provide us again with advices of how the quality of a process structure can be described and on which directions the optimisation of activities should aim at. Thus, they are unsuitable for a continuous process monitoring. Some authors even claim that the management implementing TQM practises sometimes tend to devote little or no attention to other aspects such as market demands and

¹⁰¹ Cp. www.iso.org

competition, which will result in a misalignment between operational management practises and competitive strategy that in turn will lead to unsuccessful TQM implementations.¹⁰²

In order to be able to fulfil such quality standards set by ISO and the EFQM and to find solutions for the “how to do”-problem, companies should of course orient themselves on the criteria set by those organisations but should also apply additional concepts and methods that give clear indications for implementations. First, it is essential that the concept of BPM is fully understood and implemented. This includes the definition, structuring and documentation of all business processes. BPM can therefore be seen as the necessary basis in order to accomplish those standards most efficient. An orientation towards business processes eases and accelerates the implementation of the process oriented approach within ISO and thus QM. Second, since even the quality standards aim at improving business processes, companies should make use of the self-assessment method described in chapter 4.1.2 or other improvement methods such as the ones presented in chapters 4.1.3 – 4.1.6. BPR focuses on a process optimisation via a process renewal whereas benchmarking, Six Sigma and KAIZEN aim at a process optimisation via process improvements.

Thus, the EFQM and ISO criteria set the benchmark and work as catalysts whereas the concept of BPM helps to fulfil the certification requirements of ISO and the assessment criteria of the EFQM model for processes and brings the innovation process forward via the right implementation of its tools. Without the adoption of an overall BPM concept quality standards, their requirements, and even sustainable improvements can hardly be achieved or fulfilled. These aspects were also recognized by Biazzo and Bernardi, who developed further a guideline for the correct implementation of formal quality systems.¹⁰³ A process controlling system will be described in the following chapters.

Six Sigma builds up upon BPM as it presupposes the existence of business processes as a basis and focuses on customer satisfaction. It is a method based on data to avoid mistakes and to improve the process performance via a reduction of the variation. Factors that generate deviations have to be eliminated. Its focus is on a measurable enhancement of the customer value and the company’s performance – based on processes. The most essential aspect with regard to the assessment of business processes is the measuring infrastructure. Measuring procedures and –inquiry techniques should be developed in order to continuously improve

¹⁰² Tatikonda, L.U. and Tatikonda, R.J. (1996), p.5-9

¹⁰³ Biazzo, S. and Bernardi, G. (2003), p. 149-169

those. Experiences and recommendations out of the phase “measure” within the DMAIC cycle can be consulted but have to be complemented by other methods to build up a measuring infrastructure on the enterprise level. Here, a certain degree of statistical knowledge is required. Overall, Six Sigma can be seen as an integrated component of the BPM concept.

The continuous improvement of the process efficiency via the elimination of wastes under the involvement of all employees for a further development of the corporate culture is the basic principle of KAIZEN. This improvement method stands in a close relationship to BPM since it aligns responsibility to employees and aims at continuous improvements by fully understanding the measurement exigency. The leadership, organisation and controlling of processes build general conditions for the implementation of KAIZEN principles. A sign for monitoring is given by the “check-phase” of the PDCA cycle, which is the fundamental attention of this method. But even if companies are able to derive of operating figures, the author claims that it does not help them only to know what their actual performance is. They rather have to learn from the use of measurands and should draw consequences out of them in the same sense like the ongoing PDCA cycle. Hence operating figures should be re-used. This statement will be further investigated in chapter 6.

The relationships between benchmarking and BPR to BPM were already described in chapters’ 4.1.3 and 4.1.5. Because of the high risk and time effort BPR projects come along with companies should only focus on reengineering those business processes that either show drastic lacks in performance or those that have to be changed because of dramatic environmental or technological changes. KAIZEN on the other hand can secure companies from such upheavals as it aims at continuously improving business processes according to new and always changing external but as well as internal exigencies.

Indirectly but as well as directly, all presented models and concepts give hints for or point out the necessity of measurements. Measurements are needed in order to know how a company is actually performing and to improve its very outputs. Wastes in the sense of KAIZEN can be clearly determined and displayed via the use of operating figures. They allow translating concrete aims to improvement plans. Without measurements, nobody inside a company will be motivated to implement such methods because of missing quantifiable actual and desired values. Companies targeting at high effectiveness and efficiency need to include monitoring

and measurement mechanisms. At this point, companies must also know how to derive operating figures.¹⁰⁴

But as said, prerequisites for conducting measurements, for fulfilling QM standards, and for implementing improvement actions is an ex ante planning and definition of business processes. The following chapters build up on this and deal with valuation approaches of business processes. Starting point is a critical investigation of traditional performance measurement systems vs. the demands BPM sets.

¹⁰⁴ Cp. Purpose concerning the conception of a guideline for the derivation of operating figures.

5. How do you Control and Measure Business Processes?

The main goals of BPM are the enhancement of a company's productivity and its customer satisfaction. To achieve these goals the design of business processes has to be aligned towards customer requirements that in turn have to be monitored. Moreover, the gearing of business processes presumes planning-, controlling-, and coordination possibilities and an adequate provision of information.¹⁰⁵ These tasks will be performed by the method of process controlling. Controlling is an enterprise-intern instance that provides costs- and performance transparency by organising a company-spanning report system. To be able to execute this task, operating figures and performance measurement systems are needed.¹⁰⁶ Operating figures are defined as quantitative data that inform about business-academic issues by densifying the complex reality.¹⁰⁷ One can also talk about indices, characteristics or metrics. They provide decision-makers with information about the success of single objects. If operating figures with a different complexity are created that complement and describe each other, and are as well focused on one issue, one can talk about a performance measurement system.¹⁰⁸ To perform a certain task, operating figures have to be specifically chosen. Only the most important key variables are of interest.

Important instruments of process controlling are performance parameters, measurands and process reports.¹⁰⁹ Performance parameters provide information about the level of proficiency and the performance development of business processes. The success of process controlling and the effect of it on BPM are very dependent on the right choice and appliance of those performance parameters. BPOs are responsible for the right implementation of process controlling.

In the following, different traditional and widespread performance measurement systems will be presented and critically reviewed towards their adaptability to BPM. Afterwards, criteria concerning the requirements of operating figures will be established and the method of how business processes can and should always be controlled and monitored will be described subsequently.

¹⁰⁵ Schmelzer, H.J. and Sesselmann, W. (2003), p. 149et sqq.

¹⁰⁶ Weber, J. (1998), p. 14; also the ISO norms point out the necessity of process controlling

¹⁰⁷ Weber, J. (1998), p. 197 + 198

¹⁰⁸ *ibid*

¹⁰⁹ Schmelzer, H.J. and Sesselmann, W. (2003), p. 149et sqq.

5.1 Performance Measurement Systems in a Critical Perspective

5.1.1 Business performance measurement systems

Managerial performance measurement systems like the DuPont one record monetary data and serve as a planning instrument.¹¹⁰ The goal lies mostly in maximising the Return on Investment (ROI), which is the product of the net operating ratio and capital turnover. The ROI enables companies to make a statement about their situation. It allows them to analyse fiscal aspects as well as to assess the operational productivity. Every business performance measurement system has in common that only a valuation about the efficiency, liquidity and gain is taking place. But if monetary measurements are over emphasized, the real added value will be disregarded. A high return does not equal added values. In addition to that, if abilities and potentials as we have seen in the EFQM model are only measured in monetary terms, essential cause-and-effect-coherences will not be recognized.

Traditional business performance measures enable only a one-dimensional assessment of companies. Planned values can only be checked after a balance sheet was made. Nevertheless, those systems are very concise and make it possible to densify single measurands into an overall result and are therefore well comparable. The need for a multi-dimensional perspective becomes clear if the concept of BPM and the need for non-financial facts are understood. But also within this concept and with regard to the measurability of business processes, monetary factors are still a very important part that contributes to a well-balanced process assessment system.

5.1.1.1 Value-oriented corporate management

The aim of value-oriented corporate management is to increase the value of invested capital, and the goodwill of a company, i.e. the market value added respectively.¹¹¹ This added value is mostly termed as the economic value added (EVA).

A sustainable enhancement of a company's goodwill presumes an increase in growth and innovation, which in turn is based on a high customer- and employee satisfaction as well as on a high productivity. All these mentioned factors can strongly improve the field of BPM. Thus, BPM contributes to a high extent to an enhancement of the goodwill.

¹¹⁰ Cp. Horvath, P. (1996)

¹¹¹ Cp. Stern, J.M. et al. (2002)

The concept of value-oriented corporate management is not a performance measurement system by itself, rather it has to be seen as a leadership policy of a company in the way that it may direct its projects and investments to a value enhancement that will in the end be measured in a numerical number. The relation to BPM and to the leadership part as one enabler criterion within the EFQM model (which equals 10% of all points) underlines its importance even more.

5.1.2 Activity Based Costing (ABC)

The activity-based costing makes it possible to monitor indirect costs in a better way and to calculate products or services fairer according to the input involved as the classical cost accounting method does.¹¹² The aim is to create transparency about the costs in areas of overhead expenses, to influence cost drivers and to show costs of processes. Thus, it presumes the existence of business processes and covers a part of the process controlling. This process and activity analysis discovers elements such as cycle times, wastages, resources consumed and all costs related to these. The activity-based costing creates connections between the areas of process performances, resource consumption and managerial output. The implementation effort is dependent on the organisational structure of the enterprise, the degree of maturity of business processes and on the existing cost accounting system.

On the other hand the existing literature does not recommend process costs as the only parameter for the performance measurement of business processes because neither causes for the ineffectiveness and inefficiencies can be deviated nor can be a self-assessment/ -controlling implemented because employees will not gain any insight in the operative process flow as well as in the handling of their tasks.¹¹³ The focus on mostly internal factors is not enough for an essential all-embracing performance measurement system but can be seen as a very well usable complement. Other performance indicators have therefore to be found additionally.

5.1.3 Quality-oriented performance measurement systems

The appreciation of quality as a managerial vision led to the question of how quality can be measured. In the area of quality management, operating figures and performance measurement systems were therefore being developed.

¹¹² Cp. Horvath & Partner (1998)

¹¹³ *ibid*

Error prevention costs, appraisal costs, costs of conformity and costs of non-conformity were the first approaches towards a measurement system.¹¹⁴ But those measurements again showed the lack of a monetary one-dimensional perspective.

A multi-dimensional approach is provided by the Return on Quality (RoQ) measurement system of Kamiske.¹¹⁵ He states that the long-term prosperity of a company should be achieved and assured by an enhancement of the value of a company's performance in favour of the customer and by a reduction of the net-, support-, and idle power costs, as well as the blunder costs that can all be further subdivided. To put it in easy words, the aim of this system is to improve the company's profitability via the usage of TQM actions and the gain is seen as a function of quality. Here, the implementation is not taking place via the help of mathematical measurands rather utility- and cost saving potentials of the TQM concept will be clarified and hints for a catalogue of measures will be given.¹¹⁶ The RoQ-system tries to combine the objectives of customers with the company's ones. Target costing for instance makes it possible to derive prices out of customer expectations.

Advantages of those quality-performance-measurement systems are the multi-dimensional assessment of the relationship between QM activities and the company's success as well as the clearly accentuation of those cause-and-effect relationships. The goal of those quality-oriented performance measurement systems is the mapping of causality coherences with regard to the company's quality. The same concept can be used if we talk about process performance measurement systems with respect to process quality.

If we go further and want to assess the quality of service industries two models – the GAP-model and the SERVQUAL-model – come here into play.¹¹⁷ The SERVQUAL approach, i.e. service and quality, is seen as a very useful tool that investigates a company's quality performance by means of a company-internal and customer perspective. The interfaces of those two are investigated as well. It is a multi-attributive approach that puts the perceived quality into the centre, which is defined as the discrepancy between expected and actually perceived quality. The theoretical basis is provided by the GAP-model – a branch independent model of the service quality -, which distinguishes between the service provider and the

¹¹⁴ Cp. Wildemann, H. (1992), p. 761-782

¹¹⁵ Cp. Kamiske, G.F. (1996)

¹¹⁶ Kamiske, G.F (1996), p. 83

¹¹⁷ Bruhn, M. (2004) p. 1-34; beside this, the author presents a clear systematisation of many existing approaches for the measurement of service quality but these one-dimensional approaches can only be related to superior quality aspects and thus can provide us only with hints for the improvement of the service quality.

customer. The gaps are seen as the conflict areas between these interaction relationships. On the basis of these gaps and certain quality dimensions that encompass the potential-, process-, and result dimension, i.e. tangibles, reliability, responsiveness, assurance and empathy, a service company can be investigated and the level of quality can be assessed.

Each quality system whether it is complex or not has to be applied on a permanent basis and thus has to be institutionalised into a QM system.

5.1.4 The Balanced Scorecard (BSC)

Kaplan and Norton developed in the beginning of the 90ies a performance measurement system that should also include non-monetary aspects.¹¹⁸ Their concept was to provide an integrated system of multi-dimensional measurands that contributes to a transparent medium of strategic goals and methods. Their BSC encompasses financial and non-financial measurements as well as parameters for passed periods and drivers for coming performances. In addition, external (customers and capital providers) as well as internal (employees and processes) measurements shall be discovered. Its balance consists of different perspectives: a financial, an internal and a customer perspective supplemented with the field of innovation and improvement. When considering the time aspect, it can be clearly seen that the financial view relates to the past, the internal and customer perspective to the present, and the last one towards the future.

Connections between these perspectives and those of the EFQM become clear because visions and strategies have to be linked with the goals, measurements and actions of the company considered. As a leadership instrument it clarifies strategic goals and coordinates activities of the responsible persons in a comprehensive way. The whole incentive system is aimed at common goals.¹¹⁹

But also problems concerning the BSC come along: as presented, it considers the assessment of business processes only as a part perspective. Unfortunately, clear concepts for the implementation of such an assessment are missing, and the functional perspective still exists as well. But as defined earlier, business processes run over divisional borders. It is therefore difficult though to determine measurands for the different process goals although the disadvantage of one-dimensional measurement systems is eliminated. Accessorily, the target

¹¹⁸ Cp. Kaplan, R.S. and Norton, D.P. (1996) I. and Simons, R. (2000), p.186-203

¹¹⁹ Kaplan, R.S. and Norton, D.P. (1996) II., p.75-85

of developing measurement systems on different enterprise levels combined with a more responsible conduct of employees who should assess cause-and-effect relationships will become difficult to achieve if the concept of BPM is not yet fully implemented. Other authors' even claim that causal relationships about short- and long-term numerical goals as well as between financial and non-financial parameters are difficult to generate if no instruments exists.¹²⁰ Facts can be combined and retraced in a qualitative way but managers still suffer on quantifying their success factors.

Even in the beginning of the 90ies, the BSC and the first ISO editions did not fully consider the process perspective. It is therefore crucial that companies that have implemented the BSC should adjust it towards the concept of BPM and towards the actual business processes as well as events in order to stay up to date.

In order to overcome this problem, it is obvious that companies should monitor their performance via a process perspective. The internal perspective of the BSC, hence, should be fully dedicated to business processes. In addition, the market perspective has to be considered and assessed as well. If done correctly, the BSC then creates a direct connection between the business strategy, business plan and business processes and the derivable measurements will consider the competitive environment as well as the business political focal points and targets.

For each perspective different measurements and dimensions can be set dependent on the company considered. The following graphic shows a modified BSC in regard to BPM. Here, for each perspective the same procedure including the relevant operating figures can be set. Furthermore, the internal perspective is fully dedicated to business processes and the customer perspective is divided into internal and external ones.

¹²⁰ Fischer, O. (1999), p. 257-265

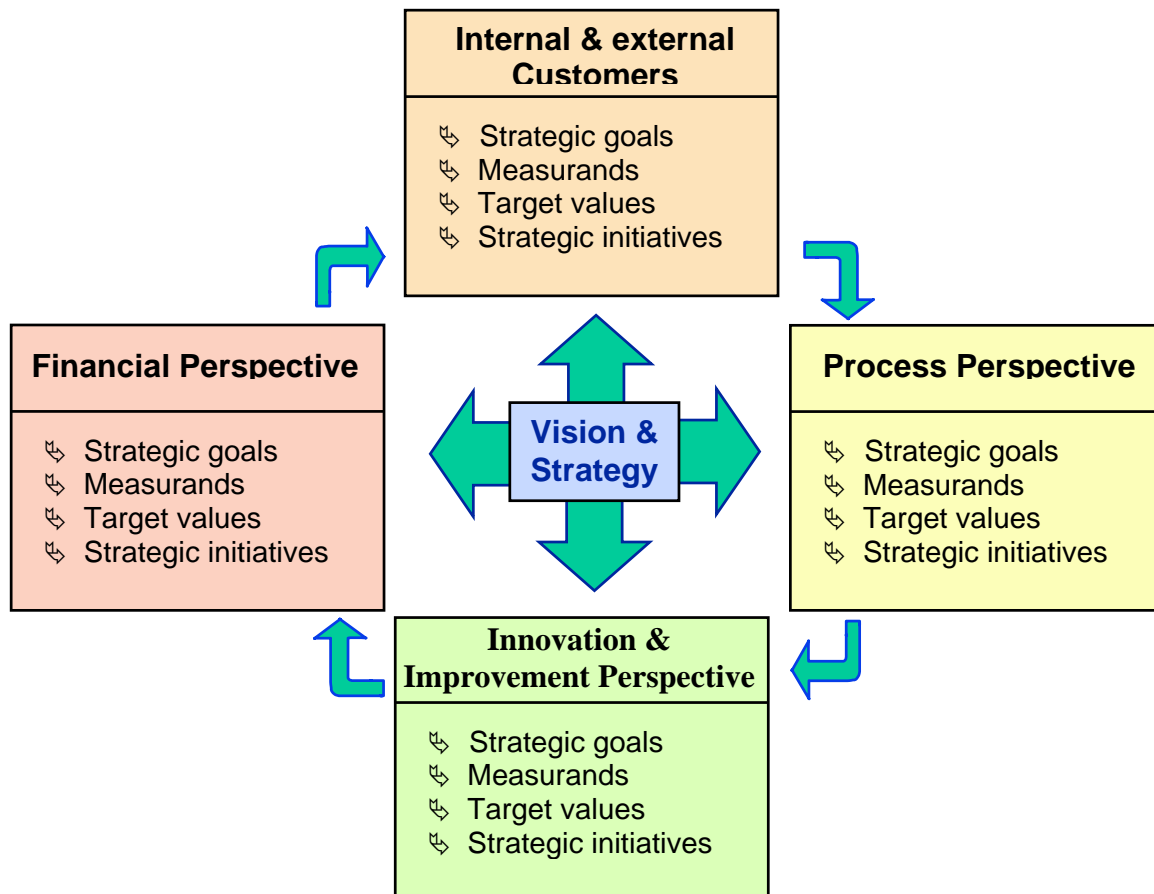


Figure 8 The modified BSC

Stausberg even claims that the different perspectives should not be arranged in a circle rather one below the other in order to act more effective.¹²¹ Thus, financial goals are followed by the fulfilment of customer requirements, the control of business processes, and the learning- and innovation perspective. From this arrangement, a clear strategy will be visible if you look at it from the top, and effects if one looks at it from beneath. I do agree with this approach because even a process-oriented organisation sees its ultimate goal in the financial area. But in order to achieve this, the very enterprise has to ask itself “which customers with which requirements do we have to serve in order to achieve our financial goals?” Then, it has to know “which processes are of major importance in order to achieve these customer demands as well as the financial goals?” followed by the question “which abilities are of great importance in order to control the key processes?” This causality is in one way very logical because it serves the process thinking but on the other hand it could be problematic for a company to classify its customers and their demands too hard. Rather, all customer requirements should be collected and weighted against each other in the sense that the major ones are gathered but demands from other ones were not forgotten. Cost-benefit-analyses should be implemented as well at

¹²¹ Note from his presentation at the workshop

this point in order to know which demands can be finely combined with the company's strategy.

Overall it can be summarized that the requirements for a multi-dimensional assessment of business processes can be well derived from the approaches of the BSC. Actually it is up to the companies to decide in which way their BSC will be adapted and modified according to the processes in use. Additionally, relevant assessment dimensions have to be defined and evaluation parameters determined. These parameters must then be assigned to different dimensions to avoid wrong weightings. Then it should be up to the importance of each process how much weight it becomes in order to achieve a balanced assessment of a company.

5.2 Analysis of the Systems and the BSC in the Triad of EFQM and Six Sigma

The presented performance measurement systems and the BSC showed several similarities between themselves and with regard to BPM. The description of the presented approaches illustrated further that traditional systems put too much emphasis on only monetary or one-dimensional aspects whereas the concept of BPM demands more, i.e. the need of a multi-dimensional assessment perspective with respect to customer- and quality orientation including non-financial aspects and the disclosure of cause-and-effect-coherences. Business performance measurement systems (including the value-oriented corporate management) and the ABC are approaches that consider monetary aspects, employee and customer satisfaction, and assign costs to activities or objects depending on the use of resources or activities. As BPM inter alia demands, quality-oriented performance measurement systems try to figure out causality coherences between QM activities and a company's success. But each measurement system by itself does not fulfil the demands of BPM, for example is not enough to only consider monetary aspects, internal costs, to disclose cost saving potentials or to look at qualitative aspects solely. This is only a partly assessment of the actual performance of a company and not an all-embracing performance measurement system in the sense of BPM. Each system has therefore to be seen as a complement in order to achieve a comprehensive multi-dimensional measurement system. The BSC on the other hand really incorporates a multi-dimensional perspective by trying to achieve a certain goal congruence between its four perspectives. As argued before the internal perspective should be fully dedicated to business processes and no attention should be paid to the functional division of a company. Measurements for each perspective have to be found as well.

Sometimes, it is even difficult to recognize where the boundaries of those concepts have to be set. In order to achieve synergies, different starting points as well as interfaces of the systems have to be discovered. If this is done, the approaches can then be combined and coordinated in a better way. The following is dedicated to that particular difficulty with respect to the BSC, the EFQM model, and Six Sigma.

As we have seen earlier, the EFQM model distinguishes between enablers and results and focuses on the *performance assessment* in comparison with best-in-class companies. The clearly and standardised catalogue of criteria helps companies to discover their strengths and weaknesses on a process level. The BSC on the other hand focuses more on value-drivers, which result in the assumption that not the philosophy of business excellence is in the front rather the implementation of the company's *strategy*. Resources have to be effectively allocated. A concrete measurement of the performance via key performance indicators is seen as the basis for a consequent improvement of the performance. Thus, the philosophies of TQM models, here the EFQM, provide a good basis for a successful application of strategic and monitoring models such as the BSC. Finally, Six Sigma supports the duo with the focus on *implementation*. It is then possible to achieve the required value-driver levels via clear quantifiable targets and milestones. Accordingly, the close relation between strategy and quality requirements from a customer perspective becomes clear. A continual improvement process on the basis of measurands and monitoring criteria can afterwards be successfully implemented as well.

The author Stein comes to the conclusion that all four perspectives of the BSC can be found in the EFQM model if an interpretation of these perspective into the EFQM sub-criteria is taking place.¹²² From her point of view, only society related issues are missing in the BSC but she claims on the other hand that out of the quality policy, parameters can easily be deviated and implemented into a company-specific BSC.

Overall, an all-embracing measurement system as a result of the combination of the EFQM model and the BSC can be complemented via the statistical methods of Six Sigma that aim at improving a company's outputs and customer benefits. But also the before mentioned approaches of the value-oriented corporate management, the ABC and the quality-oriented performance measurement system can flow into the four measurement areas of the BSC in

¹²² www.bva.bund.de/imperia/md/content/win-test/7.pdf

order to establish a performance measurement system according to the demands of BPM. Again, the success of such a system is very dependent on the degree of maturity of business process and on the effort the top management puts into the implementation of BPM. A structured control combined with a responsibility assignment and sufficient flow of information on the basis of targets and standards make then a benchmarking on an excellence-level possible.

This analysis has shown that traditional performance measurement systems show lacks in their foremost one-dimensional assessment perspective. But each system incorporates important approaches for an assessment of the process performance in the sense of BPM. Thus, the different perspectives cannot be regarded as not fulfilling the demands of BPM, rather as essential elements that have to be used when trying to assess the performance of business processes. The modified BSC makes hereunto an expedient contribution.

But even if the necessity for measurements is conceived, companies, especially SME that build the basis of the empirical study, might not have in use such performance measurement systems because of reasons such as lacking expertise, time effort, money problems, missing superior directives etc. In order to accommodate towards this aspect the author will try to simplify the complexity of those systems in the following by focusing on the most important measurements any company can and should make use of. This presentation or more precisely process controlling approaches described in chapter 5.3 will encompass process planning and monitoring aspects that include parts of the presented systems. But as a consequence of this analysis a list of characteristics operating figures have to epitomise is presented first.

5.2.1 A compilation of requirements regarding operating figures

Before it was argued that each performance measurement system is not fulfilling the contemporary requirements by itself. Problems concerning an all-embracing performance measurement system occurred because the perspective chosen was either only one-dimensional, too complex, or were in general words not fully dedicated to the requirements of BPM.

In the following, a list of requirements regarding performance measurement systems especially operating figures will be presented in a summarized way, in which measurands have to fulfil aspects of:¹²³

- Ability of compacting, which is the prerequisite to build measurement systems
- Acceptance (operating figures have to be accepted by everybody, thus measurands have to be understandable, close to reality and useful)
- Accountability (operating figures should be assigned to the persons in charge who are responsible for the measurements)
- Actuality
- Arguable measuring expenditure
- Automated ascertainability
- Commensurability (operating figures should be comparable and the use of standards helps thereby as they reduce the complexity of a system; this comes along with the focus on efficient and effective measures presented in chapter 5.3; further, they should contain necessary and not too detailed information in order to be comprehensible for everyone)
- Comparability to make assessments with other similar objects possible by using the same evaluation parameters
- Controlling relevance (operating figures should uncover calls for action and should serve as a controlling tool for process goals)
- Integration (measurands should show dependences between the target values and should make coherences transparent)
- Multidimensionality to overcome the problem of only assessing monetary parameters and to show interdependencies between the variables (cp. BSC)
- Objectivity (performance parameters should be related to quantifiable and measurable issues)
- Past- and future orientation in order to overcome the classic performance measurement problem (see chapter 6.5.1)
- Performance relevance
- Reference to causality (operating figures should refer to coherences between the process quality and the influenceable factors as well to the measurement system)

¹²³ Own development during the thesis and the be.st project; in accordance to Brown, M.G. (1997), p. 3et sqq.; Love P.E.D. and Holt, G.D. (2000) p.408-416; and Mayer, Ch. (1994), p. 95-103

- Reliability in the sense that a level of discrepancy should be pre-determined (cp. Six Sigma)
- Short reaction time
- Stability (not influenceable by too many factors)
- Stakeholder orientation to ensure that operating figures are understandable and show what the business is trying to achieve, that not only financial data is presented but also qualitative one, to extract comparative measures through benchmarking, and to report results on a regular basis
- Validity (in conformance with the process goals)

Furthermore, objects must be quantifiable and results of measurements reproducible to make measures possible. Measuring points should be made at the interface segue of two processes to assess the quality of the application flow and after an output is produced to assess the quality of results. This can be ascertained by checking the input of the next process.

5.3 Process Controlling

In the last chapter the complexity but also the restricted usage of single performance measurement systems in regard to BPM was pointed out. Further, it became clear that companies have to assess their business processes from a multi-dimensional perspective. What characteristics operating figures should therefore possess was shown in the end.

The aim of this chapter is not to go into too much detail regarding the characteristics of operating figures, rather to highlight how companies can always proceed in controlling their business processes and what measures shall be undertaken. The most important reasons for measurements will be given in a summarised form first, followed by planning and goal setting considerations that make an effective controlling of business processes feasible. Questions about how to monitor and what to measure will be answered in the last part of this theoretical study.

5.3.1 The need for measurements with regard to BPM

In the foregoing chapters, the necessity of measurements was often mentioned. Because of the fact that customer requirements have to be fulfilled, their expectations and demands need to be deviated into business goals that in turn have to be translated into numbers in order to control and improve those. The measurement of the business performance serves therefore as a monitoring mechanism. Measurements are also necessary to provide standards for business political comparisons and to create overall transparency. On the basis of measurements, each

employee is able to monitor his or her own performance by him or herself. The relevance of measurands has therefore to be accepted and understood. Measurements can also affect the motivation of employees if achievable but challenging targets are given. On the other hand, employee performances can be assessed and connected to a variable salary system. It is also an instrument to give hints for “costs of poor quality”, to provide a “feedback” about the improvements, to reason the use of resources, and to allocate resources to the most attractive improvement activities. Qualitative problems can be identified if the right operating figures are used and afterwards embedded in prioritising the resulting needs and actions.

Operating figures serve as a simple internal and external communication tool. It is easy to understand that numbers are not so vague as words and may therefore increase constructive problem solving. Furthermore, via operating figures it will be possible to gather information from all areas inside a company with the goal to summarize, edit and forward them, and any visualizing purposes will become more simple. The implementation of a measurement system could also mitigate the problem of focusing only on short-term results as well because appropriate measurement systems could ensure that managers adopt a long-term perspective thinking.

According to Stausberg¹²⁴, measurands are needed to describe and assess the strategy of a company, for example the market share, the enhancement of turnover, the productivity and inputs of processes etc. A management by objectives (MBO) will make this derivation process more efficient because departments can align their activities in accordance to the given aims. Finally, disturbance variables can be detected much more easily if operating figures are used.

After having described the necessity of measurements, the following is dedicated to planning-, goal deriving- and monitoring aspects of process controlling.

5.3.2 The planning

Process planning is a necessary precondition in order to measure and improve process performances.¹²⁵ It encompasses the selection of performance parameters, the determination of a measurement system and the planning of the process goals.

¹²⁴ Stausberg, M. (2003), p.12-15

¹²⁵ Cp. Schmelzer, H.J. and Sesselmann, W. (2003), p. 151et sqq.

In order to plan business processes efficiently, capability characteristics for each process must be derived and defined.¹²⁶ With help of these characteristics it will be possible to measure and control each process. Customer requirements have therefore to be translated into exigencies that are put as requirements towards the process. Moreover, each process should be eyed from two perspectives – effectiveness and efficiency. The former deals with the question if a process has met all internal and external customer requirements (for example “Has the product arrived on time?” or “Are customer requirements fulfilled?”) while the latter puts light into the cost side of each process, i.e. output vs. input, thus operating efficiency (for example “How much did it cost to deliver the product on time?”). The following figure shows the differentiation between efficiency and effectiveness as well as the flow of information inter alia if operating figures could be derived.

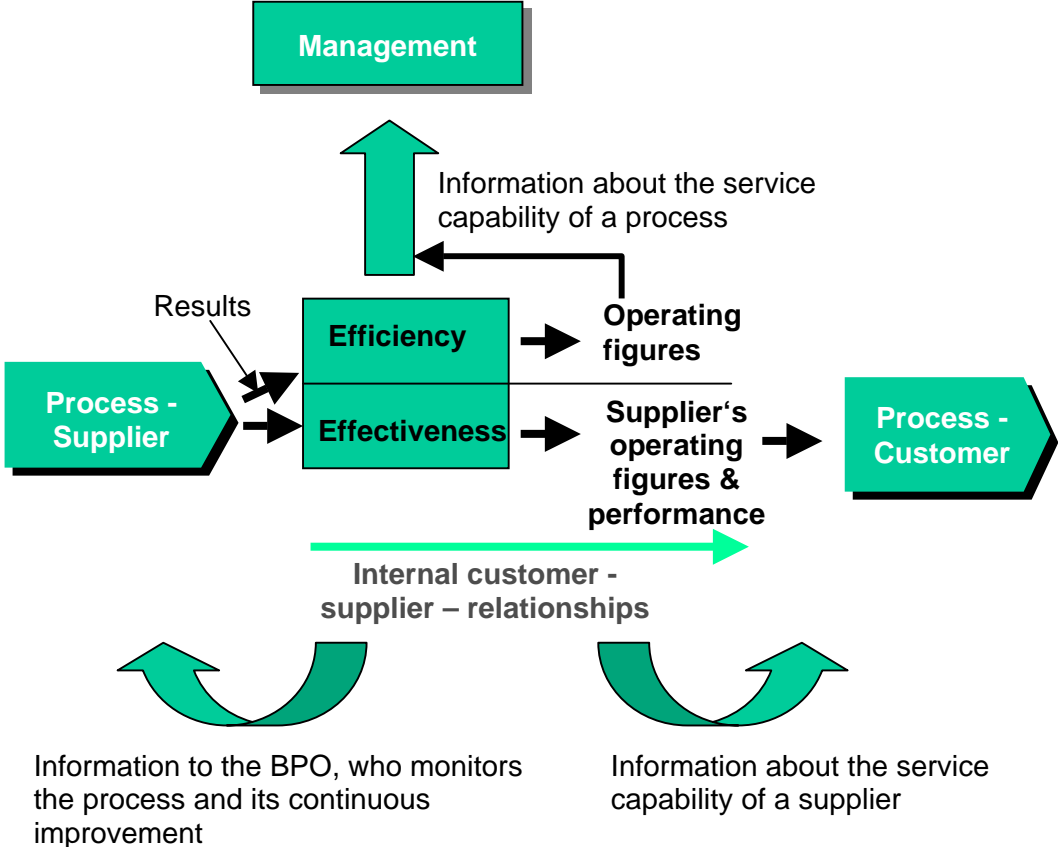


Figure 9 Efficiency and Effectiveness

Performance parameters give information about the standard of performance and the performance development of business processes. The success of process controlling is very dependent on them. Process parameters consist of measurands, respectively metrics that

¹²⁶ according to Stausberg, M. (2002), p.3-45

measure the actual value of business processes. It is furthermore essential to set quantifiable and controllable performance targets, which give information about what, where, to which extent, and until which date something has to be achieved. It is only possible to show deviations between the actual and desired value, to implement correcting actions, and to achieve learning effects if clear targets exist (see next chapter). The measurement of process performances presumes an existence of a measurement system (comparable with those presented above) but that in addition provides information about what, where, how often, how and for what shall be measured. Schmelzer and Sesselmann point out the following demands that have to be considered when choosing the right performance parameters:¹²⁷ controlling relevance, objectivity, acceptance, integration, past- and future orientation, responsibility and economic efficiency.

The survival of a company in the longer term depends on factors such as cycle time, quality, employee skills, productivity and costs.¹²⁸ In accordance to this statement,

- “customer satisfaction” (that sheds light into the aspect how internal and external customers are satisfied with the process outputs) as the most important parameter to determine the process effectiveness and
- “process time”, “adherence to delivery dates” (that give information about how fast customer wishes are satisfied and how well deadlines are kept),
- “process quality” (which shows how effective customer requirements are fulfilled), and
- “process costs” (that show which costs and resources are needed to meet customer requirements)

were chosen as the most important measurands to determine the process efficiency.¹²⁹ There is to note that in my eyes, the adherence to delivery dates and the process quality rather underline the qualitative (effective) aspect of business processes as they influence the customer satisfaction as well. Nevertheless, these measurements have to be seen as a section of many ones that encompass the field of effective and efficient operating figures and can be applied to any kind of company. The authors even claim that those parameters are the basis for a measurement of all business processes and hence as standard performance parameters for the internal and external process assessment. But as we will see later, SME might have cost and time dependent problems with such inquiries.

¹²⁷ Schmelzer, H.J. and Sesselmann, W. (2003), p. 153

¹²⁸ Bond, T.C. (1999), p.1319

¹²⁹ Schmelzer, H.J. and Sesselmann, W. (2003), p. 153

The overall goal can be seen in a reduction of process costs and process times while simultaneously the other parameters are kept constant or being enhanced. Process quality, process time, and the adherence to delivery dates can be derived from actual process events and incorporate a high actuality and explanatory power because they can be easily understood by every single employee. The presented concept of benchmarking may also come into practice here if the parameters of one process are compared with those of other processes in- or outside the company considered. It is very important to note that performance parameters have to be considered and controlled in a cohesive way. A certain synchronisation as a part of the overall process controlling has to be established in order to make an integrated compilation and evaluation possible. To achieve this, quality, costs and times of the same object have to be measured simultaneously. In the chapter 5.3.4 et sqq., I will explain these concepts in more detail.

In order to identify operating figures, measures have to be undertaken. Here, questions concerning what (definition of the operating figure and reasoning for its use), where (measuring point within the process), when (time of measurement), how much (amount of samples), who (responsible person for the implementation of measurements) and how (measuring procedure) have to be asked and answered.

5.3.3 The goals

Targets are the valuation standard in order to determine whether a process is effective and efficient or not.¹³⁰ But targets can only be set if the actual performance can be recorded and if future states are set and are of course known. This can be derived from investigating the always-changing customer demands by using the PDCA cycle for instance. Further, you first have to know which service capability each process actually has in order to derivate challenging but realistic goals afterwards. Therefore, actual measurement results have to be awaited until targets can be derivated. This derivation can be done via improvement potentials (actual and target values, e.g. in the sense of the plan phase of the PDCA cycle), by setting the strategy into action (for example BSC), out of customer requirements (targets via capability characteristics) or via benchmarking if other areas or companies have the same process but with a better performance capability.

A better described and practically more relevant derivation of performance targets was provided by Schmelzer and Sesselmann, who state that the targets of performance parameters

¹³⁰ ibid

can be determined via a bottom-up or top-down approach.¹³¹ The former one consists of a derivation of the process goals via customer surveys, process benchmarking, problem analyses, or comparisons of time. Its starting point lies at the lowest process level. If the derivation of process goals is done via benchmarking, this approach should then be combined with the business targets and with the results of customer surveys that consider their preferences. The latter approach on the other hand concerns the derivation of process goals out of the business strategy and business goals, thus out of the overall target system. Here, the starting point is build on business goals and customers. It presumes that business plans should be set and that the business strategy and thus the target values should be updated at least once a year. It incorporates the methods of the BSC and policy deployment.¹³²

But exactly this way of determining process goals has both a great impact on the extent process goals support business goals and on a company's performance. Setting an overall strategy is a widely recognised and indispensable approach that clarifies where a company is steering at and what it wants to achieve. The top-down approach, which was also mentioned in chapter 3.1 but focuses here on process goals, assures that business process goals support the achievement of business goals. The BSC builds up on the same system in which the four perspectives circulate around a company's vision and strategy. Via a process analysis within the bottom-up approach, it is also possible to determine the process goals but those must not inevitable support the overall business strategy. The methods of determining the process goals within this approach are very time consuming and let the assumption arise that a company might have problems in defining its overall strategy, problems in breaking down process goals from there, or problems of not having implemented or fully understood the concept of BPM. Freedom of overlapping and conformity of the strategy between process and strategic goals are thus not guaranteed. These coherencies will be further illuminated during the evaluation of the empirical study, also with regard to the derivation and usage of operating figures.

Overall, process planning embraces the following aspects:

- Determination of the performance parameters
- Determination of a measurement system and measurands
- Determination of process goals

¹³¹ Cp. Schmelzer, H.J. and Sesselmann, W. (2003), p.183-190

¹³² Cp. Hummel, T. and Malorny, C. (1996)

An adequate flow of information within the company and between all persons in charge is the prerequisite in order to cope with these tasks most efficiently. As said earlier, to realize a fine informational value, a process-spanned coordination of these measurands has to be ensured.

5.3.4 The monitoring¹³³

The actual purpose of process controlling is to make sure that all process targets will be achieved, i.e. to monitor those. This task can be fulfilled if deviations are recognized and corrected at an early stage. Another intention is the enrichment of the business process effectiveness and -efficiency via a better governing of the influencing factors (in order to achieve an ultimate learn effect).

Tasks of the process controlling encompass the following:

- Gathering of the measurands
- Target-actual-comparison to determine target deviations
- Cause finding for these deviations and
- Working out of actions if deviations occur

The methods used within the process controlling approach are periodic process assessments such as self-assessments, process audits, and process validations that inform about the process capability on one side, and ongoing performance controls on the other side. With an increasing stage of maturity, business process self-assessments can be replaced by continual performance controls, and stage of maturity statements and models can be replaced by process reports respectively. They give information about the level of proficiency and its development. Both methods and the elements of those can be found in the ISO requirements as well.

Within the controlling concept, business processes can be also mapped with help of a barrier portfolio. A barrier can be defined as each problem that hinders the flow of a business process. Depending on the business level, it is the task of the business (part-)process officers or KAIZEN teams to map business processes. Afterwards they have to decide which barriers have to be eliminated first in combination with introductory correction efforts. Workflow management systems could be a useful support in coping with these tasks.

¹³³ In accordance to Schmelzer, H.J. and Sesselmann, W. (2003), p. 191-214

To come back to the measurements again, business targets in the sense of BPM can only be achieved if the focus is on the efficiency and effectiveness of business processes. The several measurement possibilities mentioned in chapter 5.3.2 will be discussed below, which are in the end mapped in a process report.¹³⁴

5.3.4.1 Measurement of customer satisfaction¹³⁵

According to the foregoing chapters, customer orientation has to be seen as the success factor number one. This presumes the right knowledge and definition of customer requirements as well their right implementation. Finding the customer requirements is the task of the product planning process, which differs between the kinds of performances. Customer expectations determine which processes (main- and sub-processes) are necessary and which performance has to be generated. The determination of performance parameters helps how customer expectations and requirements can be fulfilled. The following methods can be applied to determine the customer satisfaction:

- Direct measurement via periodic inquiries of customers and inquiries after the delivery of process outputs
- Indirect measures via an inquiry of employees that are in contact with customers and an analysis of company-intern measurands such as delivery time, complaints, error ratio, Down Time System (DTS), Mean Time Between Service Call (MTBSC), guarantee cases, loss of orders, rate of repurchases, customer in- and outflow rate.

The effect of actions and improvements can only be assessed if measurements are done at regular intervals. After each measurement a variance analysis, a statement about the causes for this deviation and the elimination of these causes have to be carried out.

Overall, a measurement concept has to encompass the following aspects:

- Measurement of the actual value of the customer satisfaction
- Calculation of a customer-satisfaction-index
- Recognition of the central success factors
- Derivation of actions needed for an enhancement of customer satisfaction with respect to products, performances and business processes

¹³⁴ As stated in chapter 5.3.2, customer satisfaction, process time and process costs should be seen as measurements that determine the efficiency of a process, whereas the adherence to delivery dates and process quality put more light into the effective character of business processes. In this sense, the latter overlap with the former aspect.

¹³⁵ According to Schmelzer, H.J. and Sesselmann, W. (2003), p. 156-161

- Inclusion of the measurement results in a monitoring cycle
- Benchmarking.

5.3.4.2 Measurement of process time and adherence to delivery dates¹³⁶

The following statement can justify the focus on the measurement of process times: any shortening of process times has one effect on the process effectiveness and another one on the process efficiency. The former is based on the fact that shorter process times will lead to a higher flexibility which in turn leads to a higher turnover. The latter aspect follows the argument that a shorter binding on resources will be the result of a shortening of process times which in turn leads to lower process costs. Both together will direct any company to a higher operating profit. Time controlling in this context aims at an optimisation of process times in order to increase both process effectiveness and efficiency. Date controlling on the other hand aims at the achievement of a high adherence to delivery dates.

The process time of a business process is the sum of process times of single part-processes. It can be measured by the throughput- or cycle time. The former tells the time a development of a project need until an output is produced. Therefore the time interval from the beginning until the end of the processing is measured. The latter on the other hand can be calculated by a summing-up of process times of all part-processes including time-parallel part-processes. It gives information about the whole expenditure of time needed for the processing of an object as well as about the efficiency of business processes.

The process time of part-processes can be measured depending on the ratio of the measurement period and typical throughput-time as static- or dynamic process time respectively work package – process time. There is to note that the dynamic process time in contrast to the static one is more recommendable because it captures not only the finished but also the started and not yet finished objects within the measurement period.¹³⁷

The formula for the static process time (SPT) is:

- $$\text{SPT} = \frac{\sum(\text{end date} - \text{beginning date}) \text{ of finished objects in } (t_0 - t_{-1})}{\text{amount of finished objects in } (t_0 - t_{-1})}$$

¹³⁶ *ibid*, p. 161-172

¹³⁷ Thomas, Ph.R. (1990), p.27et sqq.

The formula for the dynamic process time (DPT) is:¹³⁸

- $$DPT = \frac{\text{amount of objects in progress at the end of the measurement period } (t_0 - t_{-1})}{\text{process velocity in } (t_0 - t_{-1})}$$

where

- $$\text{Process velocity} = \frac{\text{amount of finished objects in } (t_0 - t_{-1})}{\text{measurement period } (t_0 - t_{-1})}$$

The formula for the work package – process time (WP-PT) is:

- $$WP-PT = \frac{\text{order queue at the end of the measurement period } (t_0) * \text{measurement period } (t_0 - t_{-1})}{\text{order queue at the beginning of the measurement period } (t_{-1}) - \text{order queue at the end of the measurement period } (t_0)}$$

or respectively

- $$\text{Process velocity} = \frac{\text{order queue at the beginning of the measurement period } (t_{-1}) - \text{order queue at the end of the measurement period } (t_0)}{\text{measurement period } (t_0 - t_{-1})}$$

and

- $$WP-PT = \frac{\text{order queue at the end of the measurement period } (t_0)}{\text{process velocity of the measurement period } (t_0 - t_{-1})}$$

where the working packages consist of the planned and actually used working hours. The order queue is defined as the sum of planned working hours of all working packages considered multiplied by the degree of completion of the working packages at the moment of measuring.

Time efficiency in percent can be measured as well because each process time of a business process is the sum of the real processing-, the transfer-, and wait time. The real processing time has to be seen as the time that is used directly for the creation of an output while the other times are “deathly-times”.

The formula for the time efficiency (TE) is:

- $$TE \text{ (in \%)} = \frac{\text{sum of process times}}{\text{cycle time}} * 100$$

As noted, process deadlines in business processes can be measured as the adherence to delivery dates. It is defined as the parts of process outputs that are created without scheduling

¹³⁸ There is to note that the DPT relates to the present; it shows how fast the objects flow through a (part-) process

delays but within a measurement period. Interfaces of internal business processes are the points where this procedure will be taken place because each part process expects its inputs by a certain due date that equals the output of the foregoing part process. The value of the adherence to delivery dates will then be 1 if there is no scheduling delay or 0 if there is one.

The formula for the adherence to delivery dates (ATDD) is:

- $$\text{ATDD (in \%)} = \frac{\text{amount of finished objects}(t_0-t_{-1})\text{without scheduling delays}}{\text{amount of finished objects in}(t_0-t_{-1})} * 100$$

5.3.4.3 Measurement of process quality

As we have seen in chapter 4, high product quality presumes a high quality of processes, which is only achievable if the business processes are under control. They are under control if errors are a priori avoided. The concept of Six Sigma aims at reducing these errors by achieving a high σ level that comes along with a reduction of errors within a process. This error reduction affects both the customer satisfaction and the efficiency as well as the profit of any company in a positive way. If defects are avoided, no times, resources and costs are needed to discover, analyse and eliminate those.

The major measurands of process quality are the quality costs, the First Pass Yield (FPY) and the error ratio in connection with Six Sigma.¹³⁹ As explained before, the ATDD actually falls also under this category. Quality costs can be sub-divided into prevention costs, appraisal costs and failure costs. This sub-division brings problems with it because each single cost has a different impact on the efficiency. Another division into preventive costs (conformance costs) and blunder costs (non-conformance costs) comes again with the problem that the explanatory power suffers on an imperfect and imprecise cost input and –allocation. It is therefore better to detect those costs on the basis of activity-based costing.

Another approach in this field was done by De Toni et al. who created an instrument for quality performance measurement.¹⁴⁰ It is based on the classification quality into different types, regarding the overall quality in terms of quality offered, quality perceived and customer satisfaction, and quality costs. The total quality offered was sub-divided into in-bound-, internal-, and out-bound quality. Applying this division on two companies, quality measurement and quality performance levels could be mapped in a 3-ray diagram. The authors offer an approach that sub-divides quality in a logical way but the problems of quality costs were not perceived and the assessment of quality was again aligned towards functional

¹³⁹ According to Schmelzer, H.J. and Sesselmann, W. (2003), p. 172-178

¹⁴⁰ De Toni, A. et al. (1994), p.199-207

and not process-oriented organisations. How indicators on the basis of these companies can be found is well described and can be also adopted within the framework of BPM.

Overall it can be summarized that quality costs as a measurement for the process quality have the disadvantages of a low actuality, restricted explanatory power, no direct relation towards the customer satisfaction and no description of the reasons for quality defects. These disadvantages are not shown by the concepts of FPY and error probability (σ) because these are more understandable and can be derived from actual process events. An increasing FPY leads at the same time to lower blunder costs and to a higher customer satisfaction. Additionally, via the error rate (dpmo) it is possible to compare the performance capability of different business processes within or between organisation(s).

First Pass Yield (FPY) is the percentage rate of output that is already error-free after the first process flow path and show that no reworking is necessary.¹⁴¹ If the output is error-free, the FPY has the value 1, otherwise 0. The FPY of a whole business process is calculated by the multiplication of FPYs of each single part process.

The formula for the FPY is:

- $$\text{FPY (in \%)} = \frac{\text{amount of finished objects } (t_0 - t_{-1}) \text{ without reworkings}}{\text{amount of finished objects in } (t_0 - t_{-1})} * 100$$

After this measurement, reasons have to be found how these errors occur. Thus, an improvement cycle has to be started, which consists of the measurement, an analysis of the deviations, a removal of the causes for deviations and a control of the effect of improvement efforts.

The error rate comprises all process errors and relates those to the sum of process outputs. The measurand is denounced in percent as defects per million opportunities (dpmo) where a defect can be defined as the deviation from a desired value. According to Magnusson et al.¹⁴², the process performance shall be enhanced via an improvement of the variation in order to get a better controllability, to reduce the spreading and to improve the centring. All σ values are related to critical to quality characteristics (QTQC).¹⁴³ These CQC are derived from the customer perspective. Thus, the method of Quality Function Deployment (QFD) should be

¹⁴¹ Thomas, Ph.R. (1991), p.117et sqq.

¹⁴² Cp. Magnusson, K. et al. (2000)

¹⁴³ Cp. Chapter 4.1.4

implemented, which makes it possible to translate customer requirements into CQC. For each CQC within a part-process error data have to be determined in order to calculate the yield of this part process. The yield of the whole business process then equals the multiplication of the yields of each single part process. There is to note that dpmo and σ can also be related to other performance parameters beside the process quality such as customer satisfaction, process time, adherence to delivery dates and resource deployment. One could argue that a better process quality automatically improves the just mentioned factors, but those have always to be weighted dependent on the competitive environment and the company considered.

Both, FPY and dpmo focus on the yield, whereas the defect rate is not considered within the FPY calculation because it only focuses on the hit rate. Only dpmo detects the number of errors directly and provides therefore more meaningful information about the process quality. Hence, the correlation to blunder costs, cycle time and customer satisfaction is higher within this concept. But the gathering and analysis complexity for dpmo is superior than for the FPY.

5.3.4.4 Measurement of process costs

Costs serve to assess operational performances in monetary terms and to discover weak points during the creation of services. Costs shall be calculated fair according to the input involved respectively in dependence of the absorbed resources. This demand is satisfied within the concept of activity-based costing because indirect costs will be allocated in dependence of the absorption of process resources.¹⁴⁴ It shows which resources are being used by business processes, part-processes and process steps and how much the creation of process output costs.

Because of derivation problems for the causing of ineffectiveness and inefficiencies and allocation problems of cost centres to the processes, process costs have a limited explanatory power and should therefore not be seen as the only parameter to determine the performance measurement, rather as a complement.¹⁴⁵ Nevertheless, process costs are important because they show economic effects of performance changes and process improvements. Business decisions can therefore be better performed than it would be possible with classical cost accounting methods. BPM is a good and in fact a necessary precondition for the

¹⁴⁴ Cp. Horvath & Partner (1998)

¹⁴⁵ Schmelzer, H.J. and Sesselmann, W. (2003), p.179

implementation of activity-based costing because of a favourable cost-value-ratio. The following procedure for the implementation of activity-based costing reveals this point:¹⁴⁶

1. Definition of business processes, part-processes, process steps and objects
2. Determination business process and part-process officers
3. Allocation of cost centres to part-processes and process steps
4. Determination of the total costs for part-processes and process steps
5. Determination of reference parameters (i.e. cost drivers and cause variables) for the allocation of process costs to process performances
6. Planning of activity quantities for part-processes and process steps
7. Determination of quantity-dependent and -independent costs of the costs centres of part-processes and process steps
8. Planning of process costs on the basis of planned process amounts
9. Determination of the process cost rate
10. Calculation of the process performances on the basis of process cost rates

The implementation effort is again very dependent on the organisational structure, the structure of cost centres, the degree of maturity of business processes and on already existing cost accounting systems.

As said, the outcomes of each single business process as well as the calculation mechanisms have to be documented and are exemplified here:

¹⁴⁶ translated from Schmelzer, H.J. and Sesselmann, W. (2003), p.180

Business Process/ Part-Process:		Person in Charge:		
Performance Parameters	Definition of the measurand	Calculation of the measurand	Target values	Degree of achievement
Process time	Throughput time (SPT): time effort in working days for processing the object	$SPT = \frac{\sum(\text{end date} - \text{beginning date}) \text{ of finished objects in } (t_0 - t_{-1})}{\text{amount of finished objects in } (t_0 - t_{-1})}$	X working days	
Adherence to delivery dates	ATDD: part of objects that was produced without schedule variance	$ATDD \text{ (in \%)} = \frac{\text{amount of finished objects } (t_0 - t_{-1}) \text{ without scheduling delays}}{\text{amount of finished objects in } (t_0 - t_{-1})} * 100$	e.g. 95%	
Process quality	FPY: part of projects that was produced without reworking	$FPY \text{ (in \%)} = \frac{\text{amount of finished objects } (t_0 - t_{-1}) \text{ without reworkings}}{\text{amount of finished objects in } (t_0 - t_{-1})} * 100$	e.g. 90%	
Process costs	Personnel hours (PH): work effort in hours for processing the objects	$PH = \frac{\sum(\text{personnel effort of finished objects})}{\text{amount of finished objects}}$	e.g. 130 PH	

Table 3 An example of a process planning and controlling document

5.4 Concluding Remarks and Transition

In chapter 5 different performance measurement systems were analysed regarding their adaptability towards BPM. Basic requirement for any measuring intention is the process thinking in the sense of BPM and an understanding of the areas that are in reference with it, which directly or indirectly, as argued in chapter 4.2, demand the measurement of business processes.

It was pointed out that financial but particularly non-financial measures are needed in order to realize the task of assessing a company from a multi-dimensional perspective. Each presented measuring system incorporates elements that are of use when trying to assess a company's performance in terms of its business processes. The modified BSC (figure 8) can be seen as a very suitable measurement system for companies that have implemented BPM. It is a very helpful tool for such a purpose but not a must. As it was not the purpose of this paper to create a new measurement system that fulfils all demands of BPM, chapter 5.3 simplified the complexity of existing performance measurement systems. This was accomplished by describing essential planning-, goal deriving-, and monitoring approaches that are of value for any company, which is searching for the right procedure concerning operating figures. These controlling approaches are the basis for any kind of measurement intentions, independently if performance measurement systems are in use or not. At this stage it has to be reminded that the penetrating power of controlling intentions in general and measurements in particular is very much depended on the degree of maturity of business processes.

When trying to find the right parameters for assessing the performance of business processes it was argued that those should contain information about how efficient and how effective each process is working. This can be achieved by focusing on internal and external customer-supplier-relationships. It was further pointed out that goal settings are necessary in order to describe the efficiency and effectiveness of business processes and to continuously improve the performance of those in the sense of TQM. To determine the goals, two different methods were identified, i.e. the top-down vs. the bottom-up approach. Which consequences these approaches entail will be deeply investigated in the coming chapters. Target-vs.-actual value comparisons combined with proximate cause findings and follow-up actions if deviations have occurred are the key principles of the monitoring concept of business processes, which was exemplified in the end.

The author will try to consult these latter aspects within the following empirical study, which will shed light into corporate reality, i.e. how companies actually measure the performance of their business processes and which measurement systems they are applying for this purpose, if any, as well as which problems they might have with operating figures in general. For this purpose it is important to experience and to investigate not only what operating figures are in use to determine the process performance rather to find out how those companies are proceeding in deriving them, and for what and in which areas they use it for. Organisational and strategic questions were therefore asked in form of a questionnaire. Additionally, problems and experiences concerning operating figures could be further discovered within a workshop. The hypothetical cogitations that arose during this theoretical part and which are also stated in the very purpose of this paper will be scrutinised here as well, in form of an abductive study.

6. Empirical Study regarding Operating Figures

6.1 Introduction

This part is dedicated to the empirical study – the be.st project – and its findings. First, it is necessary to present the be.st project and the participating companies in order to understand the context. In addition, the workshop and the developed questionnaire are needed to be explained as well. Second, the author will try to compile the empirical findings in form of an analytical report but with regard to the questionnaire, the workshop that in turn is influenced by the actual stage of affairs of the project and is therefore divided into the participated companies, and to the theory. Third, in order to carry out an abductive study, the empiricism and the theory have to be pulled together. This will be executed in chapter 7 in which the derived hypotheses will be investigated as well. It will close with a guideline for the derivation and re-usage of operating figures since it was found that the companies had difficulties in doing so. This guideline will encompass the aspects stated in chapter 5.3.

The reader shall gain insight into the use and derivation of operating figures but also into problem fields that come along and are interconnected with them. Limitations concerning the practical implementation of theories will become clear. I will not go into any further details regarding previous workshops within the be.st project that concern the implementation and assessment of business processes but tie up to the topic of this workshop.

6.2 Context – the be.st project and the participating companies

Be.st (benchmarking for sustainability) is a project of future e.V. that wants to establish connections between the challenging requirements of sustainability and the application of modern management concepts within SME.¹⁴⁷ The goal of sustainability is to combine and balance ecologic, economic and social aspects in order to create a sustainable future for the economy and society. Medium-sized businesses should not look at this as a painful task to implement, rather as a part of the leadership in order to act competitive, ecologically compatible and socially fair. Therefore, the following approaches within the project were considered and integrated:

- Benchmarking – to learn with and from the best (cp. Chapter 4.1.4)
- Process orientation – to align all managerial activities towards all interest groups (cp. Chapter 3-5)

¹⁴⁷Cp. www.sustainable-benchmarking.de

- EFQM model – as an integrated concept for a corporate self-assessment by the EFQM (cp. Chapter 4.1.2, 4.2, and 5)
- Cooperation – as the basis for a successful exchange of experiences.

The project started in March 2002 and will be realized until 2005 within five medium-sized companies from different industries. Diverse consultants created and accompany the be.st project. It is scientifically attended by the “Wuppertal Insitut für Klima, Umwelt und Energie GmbH” (a German institute that is concerned with the climate, the environment and energy) and by a working group that deals with ecological efficiency and sustainable development for companies - “Ökoeffizienz und Zukunftsfähiges Unternehmen”.

The following table shows the participating companies of the project, their products and number of employees:

Company	Products	Number of employees
CB Chemie und Biotechnologie GmbH	Chemical products for the treatment of surfaces	50
GEALAN Fenster-Systeme GmbH	PVC profiles for windows	615
HYCHEM GmbH	Detergents	80
JOWAT AG	Adhesives	350
Siegenia-AUBI KG	Window-fittings	1700

Table 4 The be.st companies

The be.st consultants have aimed at combining present management concepts in a way that lead those SME on the track of a sustainable economicalness.¹⁴⁸ A bridging between

1. a complementation of the EFQM model about missing sustainability points (towards sustainable excellence)
2. an appliance of the EFQM model on processes
3. a gathering and assessing of business processes
4. a cooperative approach for a best-practice sharing and implementation of benchmarking results
5. an improvement of the performance via process innovations based on benchmarking

has therefore been undertaken.¹⁴⁹

¹⁴⁸ Again, for simplification reasons the phrase SME is applied to all participated companies at the workshop.

As this project relates to the concept of BPM and benchmarking, the following business processes were chosen as the best suitable ones for these five companies because of their comparable application flow:

- Maintenance Process
- Customer Service Process
- Product Development Process
- Order Processing Process
- Internal Logistics Process

In order to get a more practical reference to BPM, the following figure describes how those business processes can be embedded into this concept in contrast to a functional oriented organisation:

¹⁴⁹ The excellence model of EFQM was introduced to the participating companies. Also, a self-assessment-form was conceived by the be.st team in which the benchmarking processes of the companies were assessed by BPO and QMA following the EFQM criteria and the RADAR method but edited and classified into company related, process spanned, process specific or non relevant fields, for more details see www.sustainable-benchmarking.de and www.efqm.org.

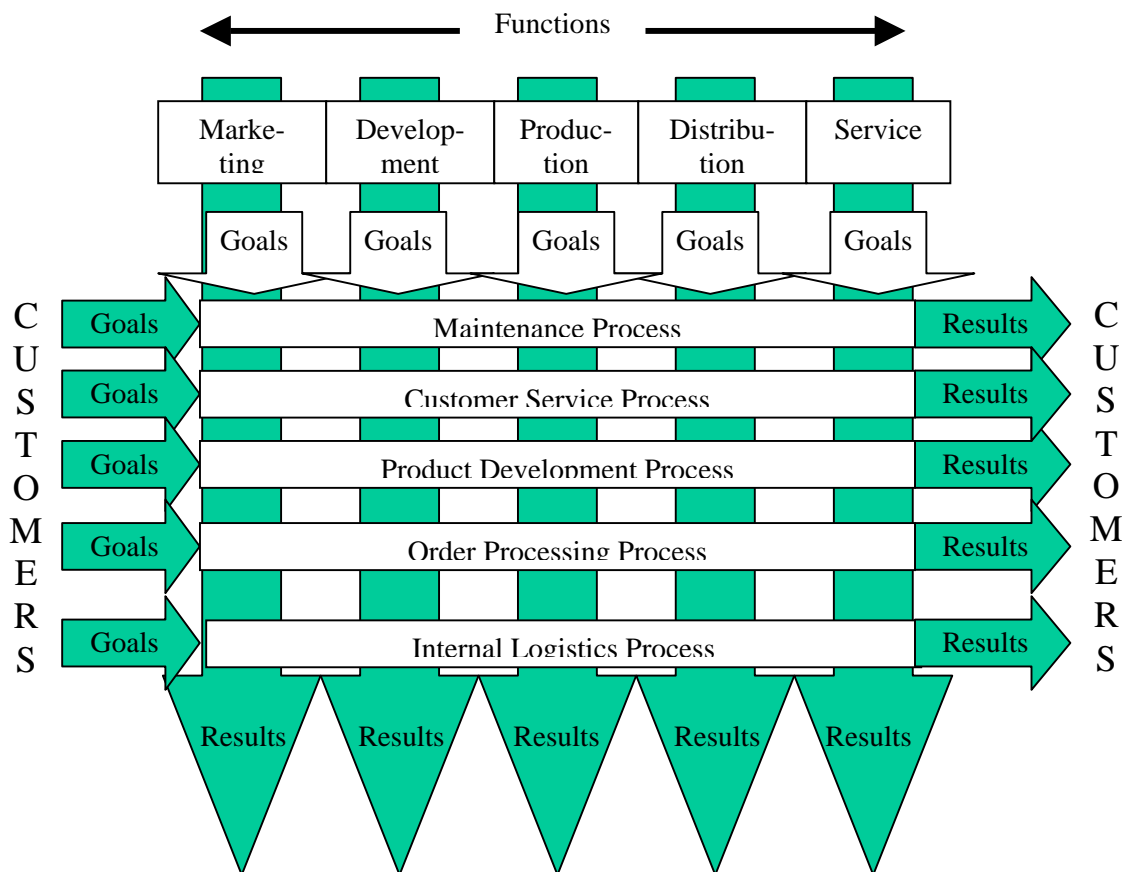


Figure 10 Functional vs. process orientation II.¹⁵⁰

Ex ante but in relation to the foregoing chapters, the inside of these processes has then to be subdivided into part- and sub-processes in order to make all internal customer-supplier-relationships visible, and from whose inputs and outputs operating figures can be derived from.

Furthermore, the project was executed in seven phases:

1. Choice of the benchmarking process and –partner; setting of the objectives
2. Internal analysis: process recording and data gathering
3. Holistic assessment of the processes
4. Cooperative benchmarking workshops and best-practice sharing
5. Planning of actions in order to optimise processes sustainable
6. Implementation of these actions
7. Assessment of the success.

¹⁵⁰ Cp. Table 2 in chapter 3.1

6.3 The workshop –“operating figures for business processes”

The workshop took place on the 13th of July 2004 between 9am and 4pm at the headquarter of HYCHEM GmbH which is located between Frankfurt and Fulda, Germany. The participants were consultants of the project and project leaders respectively quality management agents (QMA) of the above mentioned companies. Delegates of Siegenia-AUBI were not present because of the fact that they still had to implement the concept of BPM within their merged companies and did not feel ready yet for a workshop concerning operating figures.

The purpose of this workshop was to gather and exchange information about the actual stage of affairs in regard to the be.st project and the implementation of the BPM concept. BPO and quality management agents of the participated companies made a short speech about this and mentioned statements to the use of operating figures with their companies. Then, Michael Lörcher, one of the consultants, presented the be.st-online-process documentation. There, all necessary information concerning the benchmarking processes divided into the companies is listed and mapped. Afterwards, graduate engineer Mr. Stausberg¹⁵¹, who can be seen as quite an expert in the area of operating figures and measurement systems, held a speech about the topic “operating figures”. He explained the attendants the necessity of measurements, the difference between efficiency and effectiveness, and aspects concerning internal customers and suppliers. Furthermore, he subdivided operating figures into supplier-, disturbance-, and control ones. Finally, a two hour exchange of experiences concerning the topic of operating figures took place in which delegates presented the measurands they are actually using and asked questions concerning specific problems. Myself also acted as a questioner in the sense that I tried to get answers relating my questionnaire and hypotheses. This very questionnaire will be presented in the following chapter.

As a possible topic for a next workshop, employment-, environment-, insurance protection and –management was proposed. It will take place at the headquarter of JOWAT GmbH at the 26th of October 2004.

6.4 The Questionnaire

The questionnaire was sent to the contact persons of the henceforth four companies one week before the workshop started. It was developed in order to get some ex- ante information about measurements the companies undertake at present, to find questions and problems that could be asked and solved during the workshop, and to draw some conclusion after the workshop

¹⁵¹ www.ib-stausberg.de

was held. But unfortunately this pre-inquiry was not as effective as I thought of it before, because only 2 out of four were answered, namely by HYCHEM and JOWAT. I received the third one by CB Chemie during the workshop. The representative of GEALAN did not have the time to answer it at all. So, it was only possible to make a comparison of two answers in advance. Nevertheless, a comparison of the three submitted questionnaires is done in chapter 6.5.1.

To get now in more detail, the following questions were asked:

- In which field do you use/ are you planning to use operating figures inside the company?
- Are there individual operating figures according to the divisions?
- Are the operating figures connected with a target system?
- Is each target provided with a concrete target value?
- Which purpose/ appliance is served via your operating figures?
- Are operating figures implemented within the BPM concept?
- Which operating figures do you implement concerning the benchmarking processes?
- How many operating figures are defined for business processes?
- How were operating figures defined and derived (e.g. out of internal and external customer requirements)?
- In which way were/ are operating figures implemented (e.g. top-down, bottom-up, workshops etc.)?
- How is the gathering of operating figures organised and who gathers operating figures (e.g. BPO, QMA, etc.)?
- How do you gather and evaluate operating figures? Do you use visualising tools, statistical methods, the RADAR method or other aids?
- To whom are evaluations communicated and how?
- How often do you measure?
- Is the gathering of operating figures geared to special success factors?
- Do you use the concept of internal and external benchmarking during the evaluation of operating figures?

The reader is kindly asked to refer to the appendix (chapter 9.1) where the whole questionnaire as well as the predetermined answers are presented. There is to note that the questions asked are related to the very purpose of this thesis but also to the stage of affairs of

the best project. Hence, questions could not have been asked in more detail because of the theme which was brand new for all participating companies and the time effort it would have taken to fill out the questionnaire in the sense that the probability to get any answers would have been even lower. Regarding the benchmarking processes, the internal logistics processes were excluded within the questioning because too many overlaps with the other processes exist. In addition, as the term logistics deals with availability of materials or products, that should reach the right customer in the right amount, quality, efficiency and effectiveness, operating figures of the other processes should include such measure as internal customer-supplier-relationships are considered.

6.5 Evaluation

6.5.1 Evaluation of the questionnaire

After having compared the answers of HYCHEM, JOWAT and CB Chemie, it became clear that not so many but fundamental differences exist. A detailed comparison of the answered questionnaires is displayed again in the appendix - chapter 9.2. Empty fields have to be considered as not answered.

Regarding the first question, none of companies has implemented the BSC yet, only HYCHEM and JOWAT are planning to do so. It was surprising to read this because this concept was proved successfully in the recent years and actually helps companies in combining different assessment perspectives (cp chapter 5.1.4). Nevertheless, every company implements financial controls as well as quality related ones. Which operating figures are explicitly in use can also be seen in appendix, chapter 9.2. The answers concerning the target agreement between the areas of operating figures in use were also different as HYCHEM still plans such a target agreement and JOWAT looks only at distributional operating figures in order to see how the vending tendency develops. Hence, the answer should have been “no” as we consider target agreements via talks. But anyway, causes for better or worse vending figures begin at the business processes. So, if operating figures like the vending ones cannot be broken down to the very point where they arise, improvement actions can only be implemented in an ineffective way. Employee talks about target agreements only take place at CB Chemie as they plan them not always but in dependence of each employee.

As we can further see from question B, each company uses operating figures according to the classical value chain, whereas JOWAT mentioned other operating figures they use in connection with customer demands. This does not indicate that the companies have not fully

implemented or understood the concept of BPM, it only validates that divisions still co-exist next to a process-oriented working and that operating figures are used for those (cp question E).

The next question about whether operating figures are connected with a target system was only confirmed by CB Chemie, which assesses the performance of employees via those values and connects it to a bonus system. Here, the motivation effect that was mentioned during the previous chapters becomes clear. HYCHEM and JOWAT do not have such a system, which comes along with the statement that their operating figures were implemented rather bottom-up than top-down (cp question E 4) but also with organisational and informational problems that will be discussed later. But independent of this, each target is provided with a concrete target value in each firm.

There is also to note that operating figures as a controlling-, information-, and reporting instrument are only seen as such by HYCHEM and CB Chemie whereas JOWAT only agreed on the first aspect. Also, only HYCHEM and CB Chemie implemented target vs. actual value comparisons *and* defined deviation limits as well. JOWAT on the other hand only uses the first one.

This questioning stands in the following context:

Operating figures that are used for target vs. actual value comparisons serve like a compass of a sailing ship and are therefore present related. Targets, the knowledge of customer requirements as well as the definition of deviation limits comes along with this.

Other operating figures serve as a weather station respectively as an information system in the sense that they are future oriented. When a company looks at the past course of events, it may assume that if the mode of operation continues like this, the overall performance will follow the same path. But this thinking is wrong as it may turn out that the performance is diminishing. The following context explains this:¹⁵² considering the BSC, certain success factors exist that serve as future oriented indicators. If it turned out that the employee performance and -satisfaction was decreasing in the past, this will sooner or later have a direct impact on the process performance because it is depending on the employee qualification and satisfaction. In turn, if the process performance decreases, the customer satisfaction and

¹⁵² This derivation is based on Stausberg, M. (2004) but goes in this context beyond it

finally the financial results will be lowered as well since a company is dependent on the buying behaviour of customers, which is influenced by well working processes that should meet customer demands. Thus, these indicators can be seen as an information system in the sense that the performance of a company is predictable to a certain extent. The coherence of such indicators can be simplified by using operating figures.

The following graphic explain this cause and effect context demonstrative:

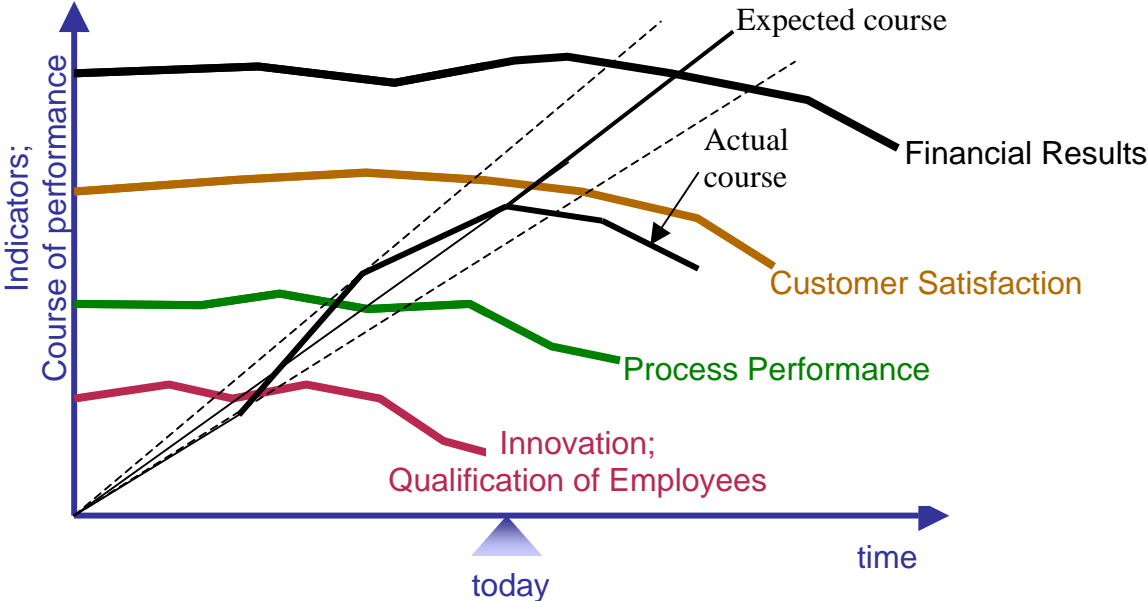


Figure 11 Early indicators of the BSC

In turn, other operating figures serve as a reporting tool like the news in television and are therefore past oriented. Financial figures fall under this category. Thus, JOWAT should normally use operating figures for reporting purposes as its makes use of those in the field of financial controlling but did not mark this.

This temporal context is depicted in the following figure:

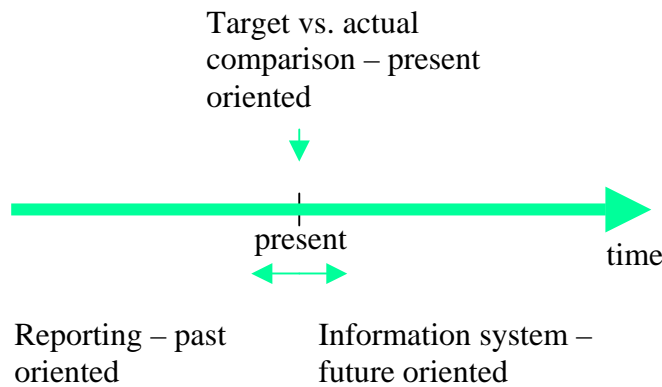


Figure 12 Temporal placement of operating figures

A consideration or discussion about the use or non-use of operating figures within the benchmarking processes (E 1) is not taking place here, as it is not the purpose of this paper to judge about the use of certain measurands. It is only interesting to know how measurements are undertaken within the project and to gather information about the use as well as problems that might occur with those. I will come back to this in the next chapter as well as to the amount of operating figures used (E 2) in order to examine the hypotheses.

Furthermore, customer requirements are seen as the most influential force in the derivation of operating figures. Moreover, BPO and QMA incorporate the functions of gathering and receiving information about operating figures. Of course, it is ultimately the management to whom the figures are communicated to, but this happens not all of the times (see E 7 JOWAT). This is done via reports, graphical illustrations or placards inside the company. Special mapping tools are not in use. Measures are made quarterly or monthly but only JOWAT made a statement that they measure to a predetermined frequency but did not mention how often this takes place. Internal or external benchmarking for a comparable evaluation of operating figures is not undertaken by any of the firms.

6.5.2 Findings of the workshop

6.5.2.1 CB Chemie

Inside CB Chemie, process-oriented working as well as high labour productivity could be achieved during the last year. The turnover rose about 12% and extra working hours diminished. It was reported that this is due to the fact that BPM could be implemented successfully and all employees can now identify themselves within this very concept. But still, problems concerning target agreements exist that underline the necessity of exchanges in

order to solve problems like pressure and non-willingness. Overall, operating figures are implemented but they are always searching for new and comparable ones.

The company possesses key (primary) processes for which the derivation of operating figures was done under inclusion of employees and officers and via the top-down principle. Neither informational nor organisational problems in this regard were reported which comes along with the fact that a clear target system is implemented. An overall acceptance regarding operating figures could be achieved throughout the company but was, to make it clearer, influenced by the following negative (-) and positive (+) factors:

- Motivation (+)
- Implementation of deviation analyses (+)
- Clear understanding of the purpose (+)
- Fomenting of fears because of acquaintance- and inquiry problems (-)
- Exertion of pressure because the performance of each single employee is measured by operating figures and combined with a variable salary (-)

Excursus:

Furthermore, the customer-effort-process was mentioned as a problematic business process, for which it is hard to find appropriate operating figures. Laboratory employees that get their instruction from sales representatives implement this process. These in turn get know special customer requirements that shall be solved on the basis of experiments. Each laboratory employee does not have any contact with the potential customer. The question arose how the job performance of these employees can be assessed by means of operating figures.

First of all, there is to remind that job performances of each employee inside CB Chemie are connected with a variable salary system. An assessment of the job performance of laboratory employees could come along with a limitation of their acting and creativity. Secondly, it should be the ability and task of the sales representatives to assess potential customers and thus also to assess the relevance of the experiment. How many working hours shall be invested into an experiment should be dependent on the possible size of an order. At last, laboratory employees will work meticulously in order to solve a customer problem or to fulfil customer wishes, so that in the end it can be said whether such a problem could be solved or not. In fact, it should also be assumed that these employees embody their jobs with body and soul.

Hence, the assessment of laboratory employees about an effective and efficient acting in terms of operating figures will be difficult because this customer-effort-process should be rather seen as a corporate investment in order to gather new customers. Merely a setting of time standards should take place, which in turn should be dependent on the degree of customer acquisitions. Thus, it is a question of the personnel assessment how far employees are quick and able to solve these requirements. To evaluate their work on the basis of operating figures is therefore very difficult, if not impossible, and to connect them to the variable salary system is rather counterproductive.

Solutions concerning this problem could be to:

- Gather the costs of the experiments and compare it with the sales value of the attained product
- Include laboratory employees in the customer contacts because they might understand the chemical problem more than the sales representatives
- Rename or reorganise the process
- Assess and measure the costs and efforts of the sales representatives
- Implement cost-benefit-analyses of the experiments
- Letting assess the experiment by the sales representatives and customers on the basis of a little questionnaire

After all it can be concluded that this very problem lied rather in an organisational problem than in finding the right operating figures for this process. It turned out that operating figures for this constellation of the process couldn't be derived in a simple way. The purpose of each business process has to be clear and this company must rather react unbureaucratic and flexible in finding solutions for this very problem.

6.5.2.2 GEALAN

In the meantime, more than 160 business processes were set up in the view of a high growth and certification intentions. With the exception of logistics, there exist administrative and distributional problems that are in connection with a little number of operating figures. Furthermore, it was confirmed that everybody inside the company – employees, BPO, QMA and the management – have to be committed to the concept of BPM in order that a process-oriented thinking can be dispersed into the whole corporate culture.

Operating figures are defined for every process. Concerning reclamations it was recognized that an allocation fair to the input involved is very important in order to make the present business processes more effective. Customer and measurement related requirements are defined as well. However, velocity problems in the application flow of processes were detected, which make a better structuring of the business processes inevitable. This awareness is cohered with the fact that business processes must always be optimised.

The derivation of operating figures is not followed by a certain scheme (top-down or bottom-up), rather mixed. This statement let us recognised the missing of a clear target system as well as the neglect of the management to provide the employees with clear goals. The participants agreed on the fact that if this would be given, the derivation and deduction of operating figures would be simpler. Thus, the reconciliation of goals and measurements suffers from this.

6.5.2.3 HYCHEM

Here, operating figures are defined for each business process whereas the question arose if the found operating figures are the right ones in terms of the explanatory power and to what extent their implementation can be retrieved within the BSC. HYCHEM is planning to use the BSC in the near future. Unfortunately there was not enough time left to discuss this problem but as described in chapter 5.1.4 operating figures have to be allocated to the several perspectives of the BSC. Moreover, since the BSC can be used as a comprehensive strategic management tool, the measurands concerning business processes have to be aligned towards the internal/ process perspective that in turn has to be subdivided into the several primary and secondary business processes. On the other hand, operating figures can then be combined to few ones that make an overall look easier.

In general, the company is in the search of other operating figures whereupon the insight, necessity and acceptance of operating figures was last but not least achieved because of the internal and external auditing purpose. This comes along with the statement of HYCHEM's project leader that the be.st project and the new ISO editions motivated the use of operating figures. It was quite interesting to hear this because it indicates that such an ISO certification has really a strong effect on an organisation's situation. It was reported that inside the company, a certain work of convincing regarding operating figures was necessary. But this, finally, led to an understanding that operating are applicable to determine the efficiency and

effectiveness of business processes but also to assess the efficiency statement of employees that in turn rouse the comprehension of safeguarding of jobs.

In the meantime, different operating figures are used for an assessment of business processes (see the appendix, chapter 9.2). Time entries on all interfaces are consulted to measure the throughput time and to ensure these measurements twice. Internal customer demands are consulted for this purpose as well. In addition, the importance of customer satisfaction and – feedback was underlined several times. In order to pursue defects and to initiate improvement actions, the company uses the failure mode and effect analysis (FMEA). This is a preventive method, which investigates ex ante what things in regard to business processes could be done wrong, which effects this would have and how this possibility could be prevented. It will be assessed by probabilities and meanings for customers. Thus it is a tool for the preventive assurance of the quality, but can also be used if failures are already known. Here, defects have always to be seen as a non-fulfilment of certain requirements.¹⁵³ The use of the FMEA analysis was reflected in good audit assessment concerning the internal measurements and can therefore be advised for any company.

Acceptance regarding operating figures was also achieved within the company whereas their derivation is carried out bottom-up. Hence, the importance and derivation of operating figures is totally understood and done on the employee level, but the management however - it was reported - could not and cannot provide the subordinate levels with such a convincing because of a lack of understanding. In addition, the absence of a target system out of organisational reasons became apparent.

6.5.2.4 JOWAT

A delegate of JOWAT reported that the whole company is now divided into business process whereas a certain resonance problem concerning operating figures exists. In the beginning of the 90ies the company had to battle with special releases that were only opposable via measurements, the implementation of target values and actions. From there it could be observed that operating figures, especially relative ones, were recognized as a must very early. As visualizing tools simple excel graphics were shown by the BPO.

Even though that the strategy- and information flow via the top-down approach was mentioned here as the desirable one, the bottom-up approach with its lack of clear goals

¹⁵³ For more details see www.fmeainfocentre.com

occurred here as well. This absence of a management by objectives (MBO) turned out to be in connections with delays in terms of the time it took until operating figures were accepted by the management. Exerting pressure on employees and sentences like “just do this and that” without any provision of targets are not very helpful when it comes to reconciliation talks.

Here, the same as at HYCHEM occurred, because everybody except the management accepted and uses operating figures as a indispensable controlling tool and after a discussion with these BPO and QMA is turned out that they suffer a lot from this very problem because their work in this field is neither awarded nor appreciated. This will be sooner or later reflected in the motivation of these employees.

Furthermore, the delegates talked about the problem of finding the right operating figures in terms of the input definition. But this again allows a conclusion to be drawn about the same organisational problems between the divisions and the information- and communication policy within the whole company. If BPM would have been fully and successfully implemented, a definition problem of inputs as well as the allocation of operating figures concerning certain business processes would not occur. Thus, business processes have to be fully understood by everybody inside the company and have to be documented in order to know what the input and the output is/ should be and to derive operating figures.

As indicators, special releases, superposed quantities, reclamations, complaints, goods returned, and blends were mentioned. Altogether, JOWAT is divided into 25 business processes that were proposed by employees and BPO. Operating figures were also brought up, a total of 47 (HYCHEM has 40 in use). But in the beginning, part-processes were forgotten and some main processes turned to support processes. The connection with the lack of MBO becomes clear again.

The derivation of operating was carried out after a few reconcilements and consequently “on a gut level”. Overall it can be said that operating figures are now accepted on the employee level whereat a lot of convincing was necessary. I assume that even this was done by the BPO and QMA. And also here, the new ISO editions were mentioned as a motivation factor for the derivation of measurands.

Having reported the actual stage of affairs of the companies regarding measurements, the following is dedicated to an abductive analysis.

7. Analysis and Overall Results

In this chapter the author wants to compile the findings of the empirical part with those of the theoretical one. In more precise words, the results of this paper are the consequence of an analysis which combines the cognitions of the empirical study in dependence on the investigated companies with those of chapters 3, 4, 5.2 et sqq, the hypotheses and vice versa. Chapter 7.1 is then concerned with the guideline for the derivation and re-use of operating figures.

The adaptability and alignment of quality methods, -standards, and -concepts regarding BPM showed the lack of only determining the stage of maturity of business processes and setting directions (cp chapter 4.2). A high stage of maturity is demanded when it comes to the derivation of operating figures because processes have to be determined, documented and controlled. The findings of the questionnaire and workshop showed the same as this thought was shared by all participants. Further, BPM was implemented in different stages. That is why SIEGENIA-AUBI did not participate at this workshop. Nevertheless, this concept is highly appreciated and brought every company a higher turnover as well as a better customer understanding, which is necessary in order to become more effective. The alignment of a whole organisation towards business processes took and still takes about 2-3 years. To cope with problems regarding measurands such as the mentioned end-of-pipe-problem that made it difficult to define operating figures for the downstream processes because of too many upstream ones, companies have always to orient themselves on internal customer-supplier-relationships within the organisational structure of BPM that are the final key for the derivation of operating figures. Interfaces have to be defined as well. In fact, the economy and the quality of business process have to be detected.¹⁵⁴

Via the empirical evaluation it became clear that a certification by ISO or EFQM is eminently respectable and affects the publicity of a company to a high extent. Moreover, the EFQM model was consulted during the realisation of the be.st project as its divisions were regarded as very suitable when it comes to an implementation of BPM. These standards support the dispersion of process thinking and consider the need for process controlling mechanisms but lack on guidelines. The description of the process controlling concept and the guideline regarding the derivation of operating figures tried and will try to counter this aspect.

¹⁵⁴ This comes along with the speech held by M. Stausberg

The indispensable need for measurements was many times mentioned during the critical examination of management methods and concepts when it comes to an effective monitoring of business processes. Object in most of the existing performance measurement systems is a one-dimensional assessment of the whole enterprise and not the business process level or the single processes by themselves. In order to implement a process orientation, tools and methods are needed that were missing in the past due to a lack of experiences regarding the monitoring of process oriented organisational structures and monitoring methods that have to be broken down to the process level. It was argued that such an embracing assessment must incorporate a multi-dimensional perspective. The modified BSC as presented here copes with these requirements but has to be complemented in order to guide companies through their way of dividing, assessing and monitoring business processes. When considering the investigated companies, it turned out that none of them makes actually use of a performance measurement system as described in chapter 5.1, only HYCHEM and JOWAT are planning to apply the BSC in the near future. Financial and quality oriented measurements are undertaken in all departments of the companies that still co-exist next to an organisational alignment towards BPM. This could be seen as an indication that performance measurement system in general and even more tailored to the BPM requirements, come along with a great implementation effort. But the matter of opinion of the management could be also the cause that such a system is not implemented yet. This needs further investigation but the latter assumption should be kept in mind when considering the derivation of business goals and operating figures. I will come back to this in chapter 8.

During the study of measurement systems and controlling approaches, different backgrounds of the authors came to the fore as traditional controlling editors used many complex mathematical models concerning the validity of measurements systems but disregarded the process perspective while other authors like Schmelzer and Sesselmann tried to derive more up to date and practical ones that showed cost-benefit-problems on the other hand and reflected their activity in affiliated groups such as Siemens.

There is also to note that none of companies was familiar with the concept of Six Sigma that demands a lot of pre-knowledge concerning controlling and statistical aspects. Furthermore, it is difficult to modulate. This is maybe the reason for a rather moderate spreading, especially in companies that cannot afford to employ high-skilled employees as well as longsome implementation efforts. As this concept assumes an understanding of controlling mechanisms,

the investigated companies have in my opinion still work to accomplish before Six Sigma could be applied.

The workshop also showed that the derivation and determination of operating figures was mostly done via the bottom-up or a rather mixed approach starting at the employee level. HYCHEM, JOWAT and GEALAN fall under this category. This was connected with the lack of a target system, which led to a declining motivation of employees and to complaints about the managerial behaviour. Only the employees of CB Chemie are provided with a clear target system that was connected with no complaints concerning intra-corporate guidelines and the derivation of operating figures.

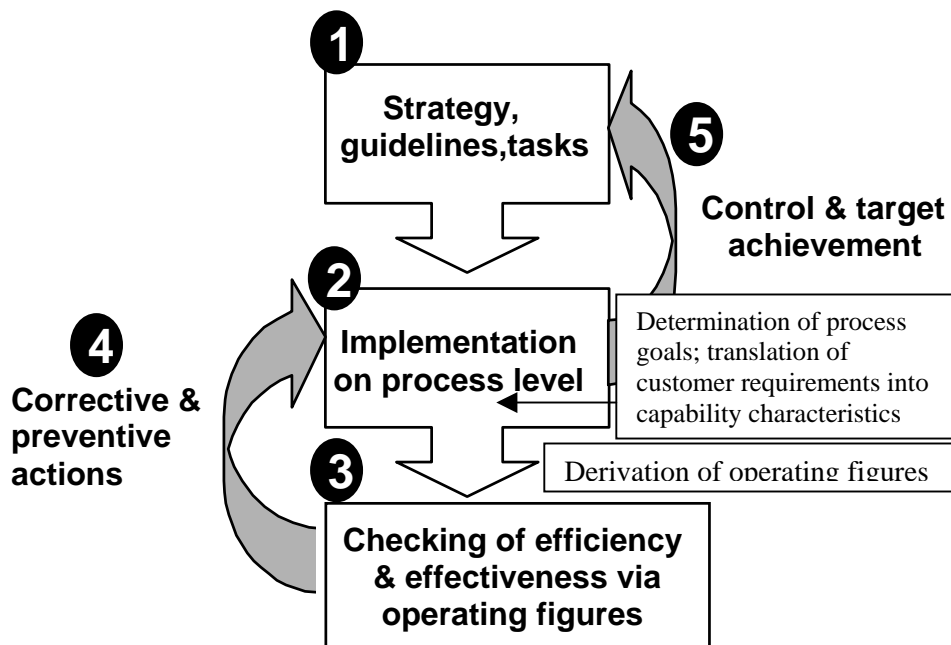
Via the top-down approach business processes, customer requirements and process goals are derived from the overall business strategy and its goals. This leads to guidelines set by the management that concern the whole enterprise. Every employee then knows where the ship is steering at. Thus, solutions will be more strategic-conformable because business goals and customers build the base of operations.¹⁵⁵ Concerning operating figures, the derivation of those will thus be easier and the management will also play an active role in deriving and using them for evaluations. Internal cooperation will thereby be supported.

Within the bottom-up approach, as the results of the workshop showed, BPO or QMA were the only people that are anxious in defining process goals and in deriving operating figures. Having the lack of a target system they have to deduce and identify business goals from several sources of information like customer surveys, process benchmarking, problem analyses and time comparisons. This is a very time consuming method. By doing this by themselves, it is not ensured that business processes support the achievement of business goals. The same counts for operating figures as they reflect these goals. Here, the probability of actualising the process goals and operating figures on a regular basis will be even lower than in the top-down approach because employees do not have the knowledge about how the direction has changed. These updating actions of business goals should be the task of the management anyway. Furthermore, the management does not appreciate the BPO's or QMA's work as it should be and the whole job is hence combined with a great heaviness and less motivation. The entire organisation will become more and more sluggish that in the end may lead to a less competitive position.

¹⁵⁵ Also, the overall process controlling becomes more effective via a top-down approach, cp. Chapter 5.3.3.

The following figures show the difference between the top-down and bottom-up approach concerning the identification of business goals and the derivation of process goals and operating figures respectively. Figure A makes the context between a target system and the derivation of operating figures on the process level clear. Point 4 and 5 are related to the reuse and reconciliation that will be discussed afterwards. Figure B describes the procedure of the bottom-up approach whereas the bolts are signs of complications within it:

A. The top-down system:



B. The bottom-up system:

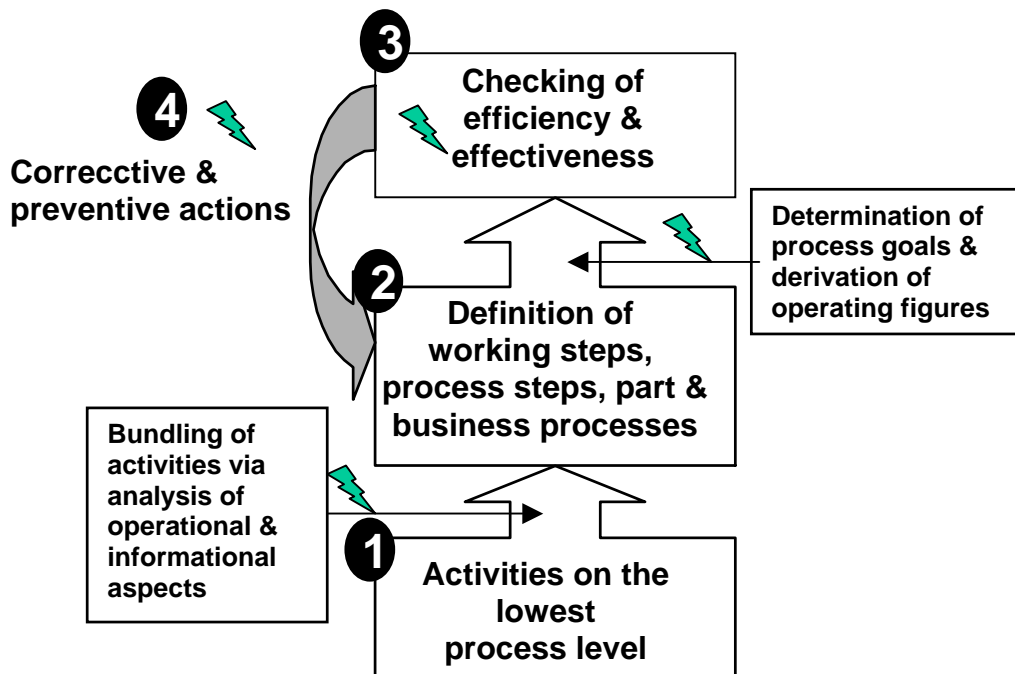


Figure 13 The top-down vs. the bottom-up system

So, it can be concluded that within the top-down approach business processes, business goals, external customer demands and internal customer-supplier-relationships are defined and aligned towards the company's strategy first (cp chapter 3.1). This foregoing strategy

implementation via a MBO makes the following derivation of operating figures more effective because business processes support the achievement of business goals and not vice versa.

Via the bottom-up approach on the other hand, a process analysis on the lowest level is implemented first, followed by bundling actions in order to identify business processes as described in chapter 3.1. But by starting from an existing determination of tasks, a selection of the activities according to customer requirements, added values and business goals can only take place very limited. Therefore, it will become difficult to detect activities without customer value. Having inadequately determined process goals will indeed lead to a derivation of operating figures but these ones are not conform to the business strategy and may therefore become redundant in the sense that they cannot be used for any learning effects and improvement actions. The risk to include excessive details that are of no practical usage for company-wide assessments is much lower via the top-down approach.

When considering the BSC again, its structure sets up on the vision and strategy of a company. Thus, the top-down approach regarding the identification of business processes and determination of process goals supports this procedure indubitable. In this context there is to note that if HYCHEM and JOWAT are planning to implement the BSC they will be only successful in doing so if the internal problems that cause the bottom-up approach can be solved.

In principle, the hazard to insist on the existing, i.e. functional-oriented organisation, is much lower when BPM is dispersed top-down as reorganisation actions have to be implemented, explained and defended by the top-management that all in turn determines the adequacy of operating figures on the process level. Here, the role of the management in connection with the determination of business processes, process goals and consequently the deduction of operating figures becomes apparent again. As before stated, I will come back to this in chapter 8.

Let us now turn to the usage of operating figures. We know from the answers of the questionnaire that operating figures are gathered by BPO or QMA, oriented on customer requirements and frequently reported either within the same level or to the management. But what will be done with them when they are collected? The answer should be simple but no one had one. After a discussion with the consultants and Mr. Stausberg, the group found out

that this goes back to very purpose of operating figures. It does not help only to know how the company or each business processes was performing and to reported the results, operating figures should further be used as a learning and improvement instrument in order to bring the company and its business processes forward (compare figure 13). They show us how efficient the whole organisation worked and how effective customer demands could have been met. They further help to achieve business goals and to monitor those. The measurement of these performances serves as an inspection of the goals where improvement actions can be derived from. As the concept of BPM in relation to KAIZEN conveys that improvement actions should take place on a continuous basis, operating figures are the most unbureaucratic tool for this. Thence it indicates that they have to be embedded into the previous mentioned PDCA cycle by Deming in order to set the planning and doings numerically, to check if targets could be achieved and to implement consequences. With consequences, any improvement actions are meant that result either from target deviations or lead to new plans.¹⁵⁶ Measurements are not only crucial to assess whether targets could be achieved or not, they are also helpful to evaluate results, to compare and benchmark, to plan improvements and to implements strategic improvements actions. This comes along with the statement of McNair et al.¹⁵⁷ who state that if a measurement is “not part of a continuous improvement, then the critical linkage between performance and evaluation is broken”. Measurement is “the beginning of an improvement, because if you cannot measure the activity, you cannot improve it”¹⁵⁸. This cycle should be continuously used as new goals and improvement possibilities always exist. In chapter 7.1 I will explain this re-use of operating figures in more detail since it can be finely embedded into the guideline for the derivation of operating figures.

A question that was also mentioned during the workshop concerns the fact that some operating figures are not transparent enough and are hence not used for any evaluations. The answer for this is quite easy: if internal customer-supplier-relationships are obvious, demands will become clear as well. Moreover, if the conformity about the targets is adhered as well, then the explanatory power of the derived operating figures is high.

In this context it was affirmed by every participant, that using less operating figures than more is the better way in order to assure a fine explanatory power of each operating figure. Reworking can also be gathered very badly if too many operating figures are in use. This is

¹⁵⁶ The reader is kindly referred to chapters 3, 4.1.6, 5.3.3 and 5.3.4.

¹⁵⁷ McNair, C.J. et al. (1990), p.28-36

¹⁵⁸ Harrington, H.J. (1991), p.39-44

also confirmed by the fact that all employees who do not have very much experience in the field of controlling and statistics must identify themselves with the corporate goals and must *understand* the operating figures in use. The motivation will also be enhanced because employees who know how to achieve challenging goals and understand which impact their work has on a few operating figures, will be more willing to put additional effort into their jobs than those who do not understand the coherences and the sense of operating figures. Thus, the claims of Paul¹⁵⁹ can be partially disproved as no *chaotic* conditions and coordination problems appeared in these investigated companies when operating figures were implemented. This statement has to be related to the number of measurands in use. Only intra-organisational problems exist that led to problems when operating figures were applied but not the operating figure by itself was responsible for this. Also, I am not of the opinion that managers or employees may tune or manipulate customer surveys and operating figures on purpose as it will result sooner or later in the very outcome and competitive position of the company. But on the other hand, I agree with the author's other proposition because operating figures can trouble if they are connected to a variable salary system as we have seen in the excursus of chapter 6.5.2.1. I also agree that competitive advantages result rather from clear organised, flexible and unbureaucratic (process-oriented) company than the thinking that operating figures can cover all performance areas of a company that *automatically* lead to a better position. Thus, a corporate culture of communication, motivation and self-responsibility has to be supported and controlled by measurements but not vice versa. It does not help to claim somebody if target values could not be achieved, rather reasons and problems for this have to be found.

Another point was to assess the cost-benefit-problem of operating figures. Of course, many measurements bring a lot of effort with them but a company should solve this problem via its internal target agreements and considerations. Superior targets should be determined according to the BSC for instance, which in turn might be difficult if managerial problems exist. Also, one has to keep in mind that these measurements are "long-term investments", which also counts for the implementation of performance measurement systems. On the other hand, cost-benefit problems are dependent on the amount of operating figures in use, on the operating figure by itself and by the degree of maturity of business processes. The corporate strategy plays also an important part when it comes to discussions about costs.

¹⁵⁹ Paul, J., (2004)

If one deliberates about how often measurements should take place, this can be simply answered by the following saying: the shorter the measurement intervals within ongoing performance controls are, the faster the reaction on deviations can be and the more intensive any learning effect will be. If controls are being made too late the risk will increase that there is not enough time left to implement any corrections. Thus, measurements and deviation controls should be frequently executed.

The following points about the application areas of operating figures were elaborated during the workshop by BPO and QMA, which can be seen as a sign that the content and advices of the controlling aspects in chapter 5.3 are accounted as practical relevant by at least these employees:

- Efficiency statement of employees
- Reporting, e.g. management review
- Analysis of business processes
- Planning
- Internal and external communication
- Controlling and timing
- Benchmarking

As the workshop further showed, the financial as well as the operative world of company should participate together there in order to gather and exchange problems and opinions relating operating figures from both sides. The same actually counts for the management as acceptance and strategic problems occurred many times. But this, on the other hand, would not be possible because open discussion would stand under pressure and it will not be the intention of different managers to exchange themselves there as they may compete with each other.

The feedback of the workshop was quite positive because it inspired every participant in reference to operating figures. So, everybody could catch incitations and won more secureness concerning the subject. Furthermore, organisational as well as structural problems could be recognized and especially this exchange of experiences made the whole workshop more fruitful. The restriction on only a few operating figures was accepted as necessary as well as the embedding of them into the PDCA circle. This was even more understood as we talked about continuous improvements that are reflected and built on this very circle (cp.

Chapter 4.1.6). Unfortunately there was not enough time as well interests left to make an example of the derivation and use of operating figures within a benchmarking process.

According to the evaluation of the empirical study, benchmarking can be clearly recommended as a comparison and exchange instrument that makes a learning and helping from each other possible and very valuable. Applied within a project such as the best one it unfolds its whole effectiveness.

As the subject “operating figures for business processes” seemed many a times to be more in the fledging stages for some delegates, a possibility for the derivation of operating figures with regard to BPM and process controlling will be given now.

7.1 Conception of a Guideline for the Derivation and Re-Use of Operating Figures

As ascertained during the workshop, the investigated SME had problems in deriving operating figures. When looking at the literature on the other hand, measurement approaches are either not aligned towards business processes or much too complex for any practical purposes, especially for SME. These companies face also problems when it comes to ISO certifications or EFQM self-assessments because to get qualified in those standards the creation of operating figures is demanded but guidelines concerning this are missing.

In this chapter the author wants to conceive a rather practical guideline for the derivation of measurands. This guideline shall satisfy the purpose that it can be used by anybody –experts as well as inexperienced employees that cope with process measurements – by focusing on the essential aspects of measurements. This procedure will interconnect the points mentioned in chapter 5.2, 5.2.1 but in particular the planning, goal and monitoring requirements of process controlling stated in chapter 5.3. We have seen that processes and standards have to be controlled and aligned to ensure that the companies are serving their customers and supporting the people who are serving the customers or producing the products or services. Work standards that measure the degree of an efficient performance and customer service standards that measure the quality of services to the customers must be realistic and achievable but challenging in order to focus on a best-in-class position. Measurements allow the management to manage by fact rather by intuition. As said, the company’s focus must be on improving the customer’s perception of it, its products and services. Therefore, customer satisfaction must always be measured. But to do this, a company must know where it stands

and gather continuously information about customer requirements. Listening to their complaints, identifying and measuring the performance of business processes that are responsible for poor or good services or products and implementing corrective actions are indispensable for developing a great QM philosophy. As described in the theoretical part, performance assessment systems incorporate a documentation function (pinpointing the actual state), a planning function (setting of target values), and a controlling function (comparison of target vs. actual values). They describe the standard of performance in the dimensions of costs, times and quality, and orient themselves on success factors that are influenced by customer wishes, the competitive situation of a company and strategic goals. This underlines the top-down approach as well. They have to be defined and aligned towards certain control points within the business processes.

This shows that certain requirements have to be fulfilled first before a derivation of operating figures can take place. The guideline will be given now:

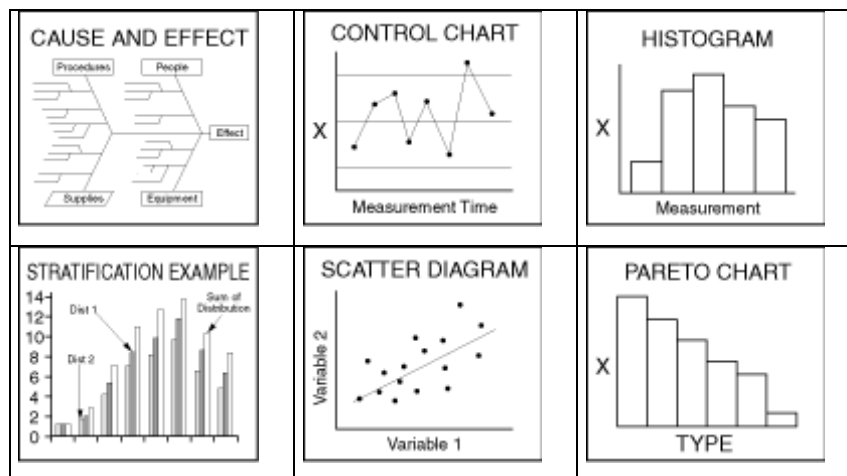
1. **The prerequisites:** Break your business goals down to process goals, at best via the top-down approach as explained before. Identify and map your key and support business processes. Analyse who the customers are. The essential customers are the external ones as they secure the success of the company. Here, internal- and external-, primary- and secondary-, main- and ancillary customers can be distinguished. Map this in a table.
2. **“Which requirements do our customers have?”** For an optimal formation of the business process, it is essential to gather the requirements of internal and external customers. After having done this, weight those demands in order to know the major requirements. Weight criteria could be the turnover and growth of the customer, the impact on business processes, etc. Map this again in a table or use a matrix that will shed more light into these interdependencies.
3. **“What makes our customers satisfied?”** Derive performance characteristics out of process requirements. They serve for measuring and controlling the process capability and are derivable from customer demands. Examples are “products with freedom from errors” or “on-time delivery”.
4. **“How shall we arrange our processes?”** Business processes can be well described via flowcharts and flow-tables. These tables should contain data about when a process step is made, who is the responsible person/s for the implementation of a process step, and how/ what the applied procedure is if rules or norms have to be considered. Several formation figures can help thereby.

5. **“Which operating figures mirror our performance?”** Any business process should fulfil customer requirements on one hand, thus should create high quality, and should cause low costs on the other one. It was often mentioned that the process assessment has two dimensions: a quantitative one, which equals the efficiency and a qualitative one that equals the effectiveness of business processes (cp chapter 5.3.2). The former sheds light into the cost side, i.e. output vs. input (costs). Questions like “How much did it cost to deliver the product on-time?” or “How much were (certain) costs of the process?” come here into play and may concern the cycle time for example. But also other simple numbers can be put into a relationship that gives information about the efficiency. The latter is an expression if a process has met all requirements. Questions like “Did the product reached the customer on-time and is he/she satisfied with it?” or “Is the product error-free?” concern this aspect. The FPY (first pass yield), the error ratio, and the adherence to delivery dates are examples for this (chapter 5.3.4.1 et sqq.). In common, put a desired output in relation to the actual one (this is dependent on your output definition). Therefore, find for each process at least one operating figure that is related to the efficiency and another one that reflects the effectiveness of this process. It is important to achieve a balance between quantitative and qualitative data.
6. **“How shall we measure?”** Translate the goals, action plans and internal and external customer requirements into process performance measures. Use as many proactive measurements as possible because they provide immediate feedback and allow time for corrective action before problems have any impact on the customer (cp chapter 6.5.1 and figure 12). But use also reactive measures to take advantage of feedback after the customer has purchased the product or service. Examples of these are warranty claims, customer complaints, and surveys.

The further measuring procedure is related to the main- as well as sub-processes and includes:

- the definition of measures that are dependent on internal and external requirements,
- the determination of the measuring point, for example measures on the input, the inside happenings of a process, at the output and at the surfaces if possible and if the cost-benefit-ratio allows it,
- the point in time of measurements,
- the data collection procedures,

- the measurement frequency and the amount of samples,
 - the determination of who is responsible for the implementation of measurements,
 - and the initiation of feedback loops.
7. **“How do we find the right process goals?”** The definition of appropriate performance targets must be based on the known process capability, the competitor performances and on customer requirements. The development of plans towards the achievement of process performance targets can only take place if the actual performance of processes is known. Therefore, it is better to implement measurements first before targets are set. Approaches concerning the determination of goals are improvement programmes such as KAIZEN, the alignment towards changing customer demands and business strategy, and benchmarking.
8. **“How do we display operating figures?”** There exist many mapping tools such as line charts, area diagrams, bar charts, pie charts and several others that compare certain trends as well. It would go too far here to describe the advantages of each diagram, but some graphical examples are shown below:¹⁶⁰



9. **“What shall we do with the information derived from operating figures?”** As we found out before, these findings have to be reported to the management and feeded back within the process level. Furthermore, consequences have to be drawn of the measurements as described earlier in order to learn from the mistakes and to improve the performance of business processes. Areas for improvements have to be defined because your competitors never sleep, customer requirements always change and business process can always be optimised. Update your action plans and performance

¹⁶⁰ For further information please see www.sytsma.com/tqmttools/tqmttoolmenu.html; in this context I want to state that all of these companies should make more use of visualising tools as they are not too complex or difficult to understand.

targets, redesign processes where appropriate and improve the management of teams, individuals and suppliers. Compare on a regular basis the process capability to customer requirements against all measures and begin at step 1. Thus, an embedment into a continuous improvement cycle is indispensable- whether it is the PDCA one, the DMAIC method of Six Sigma or the RADAR method of EFQM does not matter because each cycle incorporates the same meaning. The following code of practice explains the role of operating figures within the PDCA cycle in a summarized form:

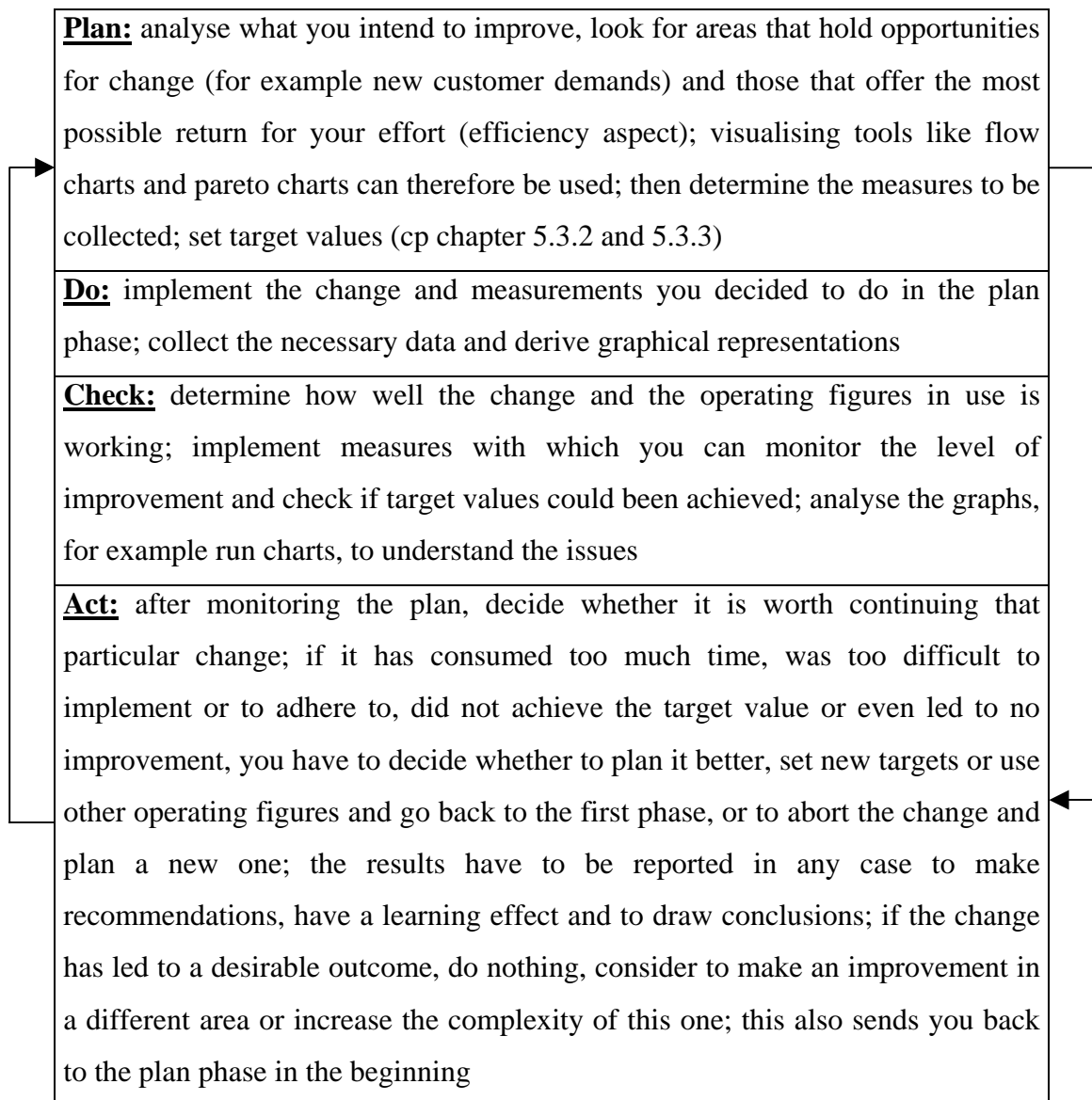


Table 5 The PDCA-cycle specified for the re-use of operating figures

This complex field regarding the derivation of operating figures can be better illustrated by means of a clearer interrelated picture. The numbers in the following figure are connected to

the points of the guideline. Self-assessment as stated in chapter 4.1.2 has to be seen as a feedback tool that gives a review about organisational activities including operating figures.

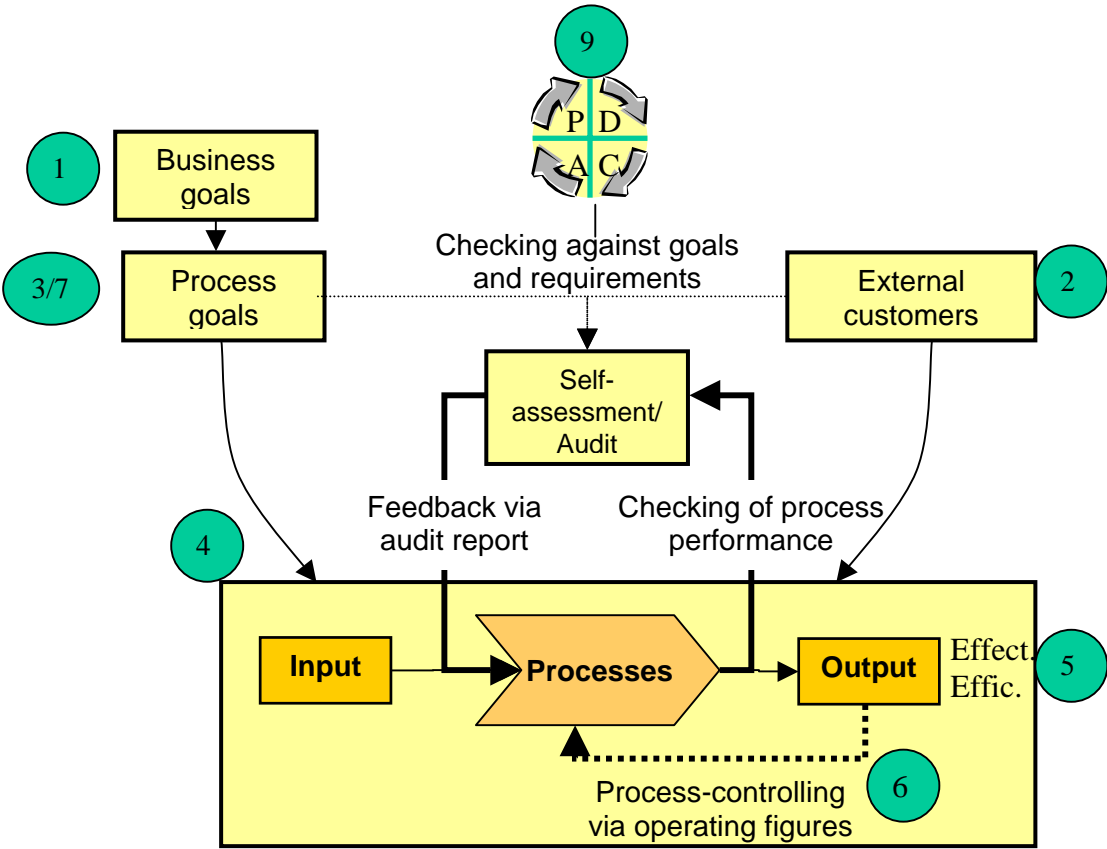
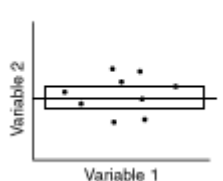


Figure 14 The derivation of operating figures connected with the check-up and improvement of business goals

This procedure can be applied to any business processes. The author would like to illustrate this and takes the simplified benchmarking process “Order Processing” here as an example: the definition and documentation of this process is presumed. One goal of the order processing is the quality, i.e. the customer satisfaction that is jeopardized by late deliveries. Thus, the adherence to delivery dates can be seen as a success factor of this business process. Lets assume it was preconcerted that the adherence to delivery dates is only ensured if the products are not more than one day too early or too late delivered. Out of this, the unpunctual delivery quota or the day of delivery-deviation-index can be deduced, that is calculated quarterly. The following table shows these coherences:

1. Reference parameter	2. Goal	3. Risk	4. Critical Success Factor
Quality	Customer satisfaction	Delayed delivery	Adherence to delivery date

5. Definition	6. Operating figure	7. Measurement	8. Evaluation
Unpunctual delivery for all deliveries more than 1 day too early or too late	Unpunctual delivery quota [in %]= $\frac{\text{unpunctual deliveries}}{\text{total orders}}$	Quarterly; Difference: delivery date according to confirmation of order – date of signed delivery note	 <p>[x-axis = orders; y-axis = days +/- 0]</p>

Or:

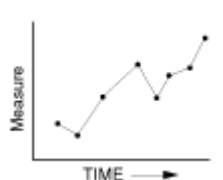
6. Operating figure	7. Measurement	8. Evaluation
Day of delivery-deviation-index [in days/ order]= $\frac{\text{sum of deviations}}{\text{amount of orders}}$	See above	 <p>[x-axis = quarters; y-axis = index]</p>

Table 6 Derivation of operating figures exemplified by the order processing process

8. Conclusion

8.1 Consolidated Findings

It was the aim of this paper to process the existing literature in the field of QM and controlling – measurement systems are included here – in order to generate a more interconnected picture with regard to BPM. The empirical study fed the field of operating figures in addition.

The alignment of companies towards the quality of business processes is a major factor for a company's success. Beside the definition of the term business processes, it was discussed what the meaning of quality in business processes is and that it can only be described in an approach that considers different dimensions and perspectives. Moreover, the final customer only buys a product if it is meeting his or her qualitative claims. Business processes have therefore to be adjusted to the qualitative perception of the customers and must be structured as internal customer-supplier-relationships in order to meet external but as well as internal demands. When being on the search for operating figures, companies should orient themselves on these very relationships in order to cover the qualitative perspective.

In order to live up to the expectations of ISO and to realize the advices set by EFQM, the concept of BPM should be implemented in order to achieve those most effectively. This concerns all mentioned approaches mentioned in chapters 4.1.3-4.1.6. It was shown that those imply the need for measurements in a direct or indirect way. The implementation and fulfilment of these approaches is definitely simplified by a fully understanding of BPM. Thus, BPM can be seen as a prerequisite to bring companies on the right track to success and sustainable development.

The concern of continuous improvement programs was many times accentuated since it can be seen as an integrated component of BPM. Stepwise improvements of business processes under a greater involvement of employees and with a focus on customers and the elimination of non value-adding activities are the key principles of KAIZEN. Especially the PDCA improvement cycle is a simple but very effective method and learning tool not only usable for an organisations' course of events but also for the re-use of operating figures. This applicability towards operating figures should be more accentuated in the literature and is therefore emphasised here.

Independent if performance measurement systems are deployed or not, it was argued and ultimately confirmed that the controlling procedure presented in chapter 5.3 is very applicable in praxis with its focus on process goals and operating figures that have to reflect the efficiency and effectiveness of business processes. Target settings by allocating responsibilities that should motivate employees are an essential factor for monitoring- but as well as improvement purposes but target-vs.-actual value comparisons combined with the cause findings if deviations have occurred are even more important in order to implement learning effects in the sense of the continuous improvement cycle. In this context the employee motivation of all investigated companies except CB Chemie was clearly inhibited since process goals and operating figures were derived bottom-up. This can be further related to figure 11, to organisational and informational problems within the companies and to the non-usage of performance measurement systems as a result that no target system was provided by the management. Bottom-up will lead, as it was argued, to an ineffective derivation of operating figures because strategic non-conformity has a negative impact on the overall performance. In addition, BPM requires a new alignment of corporate activities towards internal and external customer demands, which cannot be preserved if one emanates from the existing, i.e. functional oriented corporate leadership. Process goals and consequently operating figures have to be reconciled with business goals and not contradictory! An MBO makes the derivation of operating figures more effective because departments can align their activities to the given aims. Top-down is therefore the better way (cp figure 13).

The evaluation of the questionnaire and workshop was very enlightening since attitudes towards operating figures became clear and the fields of usage could be investigated. The complex theory of measurement systems seems to be not availing on those SME as internal but also implementation problems occurred. Nevertheless, any of these companies should put more time and effort into the field of operating figures if they want to work in a most efficient and effective way. This call goes firstly to the management than to the BPO or QMA as their work is rather hindered than supported and appreciated. Thus, internal problems such as the managerial commitment towards the usage of operating figures have to be solved in those companies first. This can be done via discussions and a final implementation of the top-down approach.

In the following remarks I will therefore delve into the often mentioned and important role of the management when it comes to the derivation of operating figures and the determination of

business processes in general. But first I would like to refer to the hologram metaphor that actually concerns innovations but which can be used in the figurative sense to BPM and the top-down approach.¹⁶¹ a hologram describes the instance to build the whole into its parts by allowing groups, here the employees, to self-organise them and to solve problem according to an overall mission (top-down). The principle of requisite variety states that organisational units – here the business processes – are part of a larger environment – here not only the whole organisation but also its customers that make the company work – that has always to be analysed by them in order to detect and disclose errors. Operating figures should also reflect the environment, whether customer demands on the macro level or internal customer-supplier-relationships on the micro level, but as it is always changing due to innovations, competitors, customer demands etc. it has to be permanently scanned and thus business processes, -goals and operating figures must be modified accordingly. “Any control system must be as varied and complex as the environment being controlled”¹⁶². This can be carried forward to the PDCA cycle. If employees incorporate multiple skills and understand the environment, they are maybe able to shape the context and their work will become more attractive and easier to them. According to the principle of minimum specs, managers should define – regarding the vision and strategy – no more than necessary in order that the lower levels, here the business process ones, understand the overall strategic mission but stay still flexible in order to be able to adjust to the changing environment. Therefore, employees shall rather be guided than leaded, which means that the need for measurements has to be understood but the top-down approach in setting goals should not be too stiff. The principle of learning to learn can also be applied in the context of operating figures since a form of double-loop learning should take place that calls, as a result of the transforming environment, the criteria of the evaluation process as well as past practices into question, here the derivation of- and the operating figures by themselves (cp figure 14). Single-loop learning on the other hand represents traditional monitoring activities in which actions can only take place after something has been measured (cp figure 12 and the re-use of operating figures).

Coming back to the role of the management within HYCHEM, GEALAN and JOWAT, there is to mention that if it would succeed in concretising and breaking down the business goals to the process level and connect these goals with those of the process employees, a form of a self-controlling of the company via the process level could be initiated. A reliable navigation system would able the BPO to have an impact on the process outputs with regard to the

¹⁶¹ Cp. Morgan, G. (1996), p.73-118

¹⁶² *ibid*, p.112

business goals. Under these circumstances, the responsibility for business processes will not become a burden anymore rather a motivation incentive. In a consequently process-oriented organisation a higher significance must be acknowledged to the process responsibility than to the division responsibility. BPO can cope with this task via the help of navigation systems and monitoring tools in form of assessment systems that identify actual and past states of the efficiency and effectiveness of business processes. The outputs of business processes can therefore be combined with the long-term business goals. A precondition for this is that business targets are disclosed and discussed on a regular basis in order to set general conditions and rules for the work of employees that are determined via those goals. Taking into account these boundary conditions, the process orientation can be implemented easier. The derivation of performance measures will here be congruent with the company's strategy and encourage the achievement of goals (top-down). The freedom of overlapping is furthermore ensured. Operating figures should be in context with a target system because the involution of measurands would otherwise be incoherent and no causality relations would become clear. They should not be uncoupled of each other but have to complement each other in order to establish a measurement system that helps to manage the process organisation. Operating figures should therefore focus on SMART goals, i.e. the target should be specific, measurable, aligned towards business goals, realistic and timed¹⁶³, and must be directly influenced by employees in order to correct deviations. Since requirements may change over time, operating figures have always to be called into question. "Performance measures have to reinforce the activity that is in the best interest of the company. Dysfunctional behaviour may result from inappropriate metrics: if you measure me in an illogical way ... do not complain about illogical behaviour."¹⁶⁴

The necessity about the re-use of operating figures was finally confirmed as all companies recognised the embedment of found measurands into the ongoing PDCA or similar improvement cycles (cp table 5). I would recommend that this re-using aspect but also the top-down approach that was clearly desired from all employees within the workshop including the role of the management should be incorporated and underlined within the ISO editions and the process controlling concepts.

The aim of the conceived guideline for the derivation of operating figures was to bypass restraints in coping with this job. I think that I have contributed in this field. The achievement

¹⁶³ Cp. www.sustainable-benchmarking.de/_download/HALProzessreife.pdf , p.9

¹⁶⁴ Bond, T.C., (1999), p.1319

of a healthy balance of quantitative and qualitative measurands (times, costs and quality) was often mentioned there and hopefully understood as well. Users of the guideline should really consider it as such one since the whole context is bigger. I would also like to note that it could serve as a basis for a further development of an all-embracing measurement system that meets the demands of BPM.

The connection between empirical findings and the literature study concerning organisational aspects of the implementation of BPM and measurements could be disclosed and showed that the empiricism supports the theory in several aspects and vice versa, whereas the latter seemed sometimes to be too complex for SME. The coherency between BPM, QM and measurement systems became via this critical incorporation of the literature more apparent. In this way, the empirical findings that connected theory with praxis could be evaluated more cohesive and explicit.

Finally, in order to derive a better interconnected picture I would like to round this chapter off by presenting the following graphic that tries to map all mentioned areas together and positions the investigated companies accordingly:

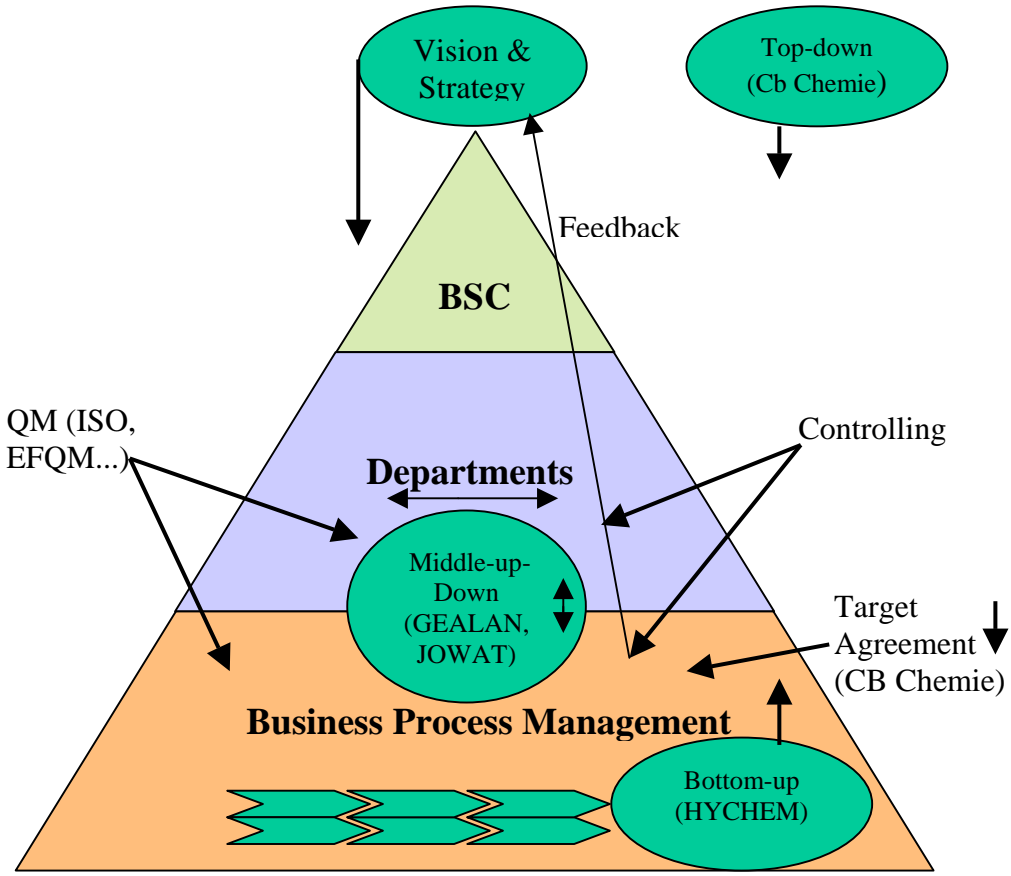


Figure 15 The pyramid of classifications

In this figure, certain classifications have been carried out: the pyramid describes the traditional functional-oriented organisation on a level above BPM since business processes are broken down from departmental actions and the overall strategy. They describe the lowest but most important level of an organisation with all its internal and external customer-supplier-relationships. In turn, the BSC is allocated at the top, as it is an all-embracing management tool that describes all areas of a company it is concerned with. Its vision and strategy alludes to all areas of an enterprise – departments and business processes (cp figure 8).

The field of QM can be allocated to the departments as well as to the business processes because quality standards are concerned with both views whereas their focus turns more and more towards the latter one (see new the new ISO editions).

As described earlier, the traditional rather one-dimensional controlling takes place at the departments whereas the multi-dimensional more quality oriented controlling falls into the category of BPM. But exactly this segue brings problems with it as one has to differentiate between department-related and process-oriented operating figures. Here, target-vs.-actual-value-comparisons have to be taken place. The derived operating figures on the process level should incorporate efficiency- and effectiveness aspects, and have to be communicated upwards in order to draw consequences and embed them in an improvement cycle. But as we have seen during the empirical study this reporting can also rest on the two lower levels. This underlines the establishment and connection of operating figures towards a superior target system like the modified BSC.

Moreover, the top-down approach has to be allocated on the same level as the vision and strategy because process goals as well as operating figures are derived from there. The bottom-up approach, on the other hand, is placed on the process level since process goals and operating figures are determined here. When trying to allocate the studied companies to the different approaches, the investigation showed that CB Chemie is the only company that derives its process goals top-down by having clear target agreements as well. HYCHEM, on the side, has to be assigned to the bottom-up approach since process goals and operating figures are set by the BPO. All intra-organisational problems were already discussed during the evaluation of the empirical part. GEALAN and JOWAT stated that their derivation of operating figures and the setting of process goals is rather taking place by seesaw changes, here called the “middle-up-down-approach”.

An improvement cycle for operating figures was described in table 5. When moving a level upwards, the same classifications as in figure 15 can be applied to the PDCA cycle:

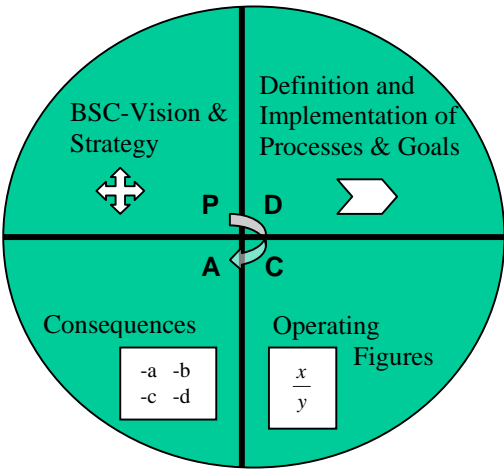


Figure 16 PDCA on a higher level

Here, the BSC with its setting of the overall strategy can be allocated to the plan phase of the cycle. The business goals have then to be broken down towards the process level by defining and implementing business processes and their goals in dependence on external customer requirements that can be further translated into internal customer-supplier-relationships and targets. Operating figures have to be seen as the monitoring tool in the check phase from where consequences have to result. From there, reports have to flow again upwards to the management, which plans new or improves the results from the foregoing goals. One level underneath sits the PDCA cycle of table 5 in combination with the guideline of chapter 7.1. An effective performance measurement system should be anchored in all areas of an improvement cycle!

This picture has to be seen as not an all-embracing one because such coherences can be derived under different circumstances. Thus, it is expandable on different levels. Concluding, I think to have achieved and confirmed most of my desired goals and hypotheses. I also hope to have delivered a deeper insight into the spacious field of BPM and operating figures.

8.2 Outlook

Even though BPM has achieved a lot of attention during the last years, the topic with regard to controlling and QM aspects is still not very thoroughly explored and leaves therefore much room for further researches. Every mentioned area I presented here leaves much space for being explored in more detail. Coherences between the different methods, concepts and standards enlarge the field of investigation even more. Also, every single aspect can be examined more deeply, especially a further development of the guideline, the conception of an implementable performance measurement system and further investigations about the managerial qualities in the sense of BPM. Longitudinal studies could enlarge the field of empirical findings even more that in turn can be combined to many aspect of the theory.

This topic is subject to radical changes, triggered by always-changing environmental factors, customer demands, controlling aspects and new-alignment of organisational structures. It is predictable that BPM with all its influences and the use of operating figures, especially in SME, will gain much more importance in the near future. But simultaneously I think that the complexity in this very field will rise as well because as we could retrace from the past, new expectations and requirements will come to the fore consecutively.

9. Appendix

9.1 The questionnaire

Questionnaire for the preparation of the workshop “operating figures for business processes”

Please fill in an “X” in the appropriate brackets

Questions	Answers
<p>A. In which field do you use/ are you planning to use operating figures inside the company?</p>	<p>Strategic Controlling (Balanced Scorecard): yes () no () planned () If yes, which operating figures are derived from the internal/ process perspective?:</p> <p>Financial Controlling: yes () no () planned () If yes, which typical operating figures are being used?:</p> <p>Quality Management: yes () no () planned () If yes, do you measure for example: <input type="checkbox"/> quota of reclamations <input type="checkbox"/> error ratio <input type="checkbox"/> quality costs <input type="checkbox"/> scrap rate <input type="checkbox"/> other operating figures:</p> <p>Target Agreement : yes () no () planned () If there are talks about target agreements, which operating figures did result?</p> <p>Other performance measurement systems:</p>

<p>B. Are there individual operating figures according to the divisions?</p>	<p>Finance: yes () no () planned () Distribution: yes () no () planned () Procurement: yes () no () planned () Logistics: yes () no () planned () Production: yes () no () planned () Others:</p>
<p>C. Are the operating figures connected with a target system?</p> <p>Is each target provided with a concrete target value?</p>	<p>yes () no () If yes, how does the target system look like?</p> <p>yes () no () If yes, which are your targets?</p>
<p>D. Which purpose/ appliance is served via your operating figures?</p>	<p>- Controlling/ Planning: yes () no () If yes, were</p> <ul style="list-style-type: none"> • actual vs. target-value comparisons implemented? yes () no () • deviation limits defined? yes () no () <p>- Information Systems (e.g. for the distribution): yes () no ()</p> <p>- Reporting (e.g. for the QM): yes () no ()</p> <p>- Other:</p>

<p>E. Are operating figures implemented within the BPM concept?</p>	<p>no ()</p> <p>planned ()</p> <p>in progress ()</p> <p>yes ()</p> <p>If yes, which types of measurands are used?:</p> <ul style="list-style-type: none"> - <u>financial or cost oriented</u>: yes () no () - <u>performance oriented (e.g. cycle time)</u> : yes () no () - <u>quality oriented (e.g. adherence to delivery dates)</u>: yes () no () - <u>customer oriented</u>: yes () no () - <u>other</u>:
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E. 3 How were operating figures defined and derived (e.g. out of internal and external customer requirements)?	
E. 4 In which way were/ are operating figures implemented (e.g. top-down, bottom-up, workshops etc.)?	
E. 5 How is the gathering of operating figures organised and who gathers operating figures (e.g. BPOs, quality management agent, etc.)?	
E. 6 How do you gather and evaluate operating figures? Do you use visualising tools, statistical methods, the RADAR method or other aids?	
E. 7 To whom are evaluations communicated and how?	
E. 8 How often do you measure?	
E. 9 Is the gathering of operating figures geared to special success factors?	yes () no() If yes, which are the success factors?:
E. 10 Do you use the concept of internal and external benchmarking during the evaluation of operating figures?	yes () no () If yes, on which business processes?:
Other comments:	

Gathering of possible topics for the workshop:

Which topics do you want to discuss? E.g. "How is a good operating figure characterised?"	
Which concrete questions do you have?	
What shall be discussed during the workshop?	
Which expectations do you have?	
Other comments:	

9.2 Comparison of questionnaires

Comparison of the questionnaires “operating figures for business processes”							
Questions/ Answers	Comments/ Divisions	HYCHEM	Comments/ Miscellaneous	JOWAT	Comments/ Miscellaneous	CB Chemie	Comments/ Miscellaneous
A. In which field do you use/ are you planning to use operating figures inside the company?							
Strategic Controlling (BSC)		Planned		Planned		No	
Financial Controlling		Yes	Managerial ones, EBIT, CF etc	Yes		Yes	ROI, oper.figures conc. yield, return, productivity etc.
Quality Management	1 Quota of reclamations 2 Error ratio 3 Quality costs 4 Scrap rate	Yes; 1,2,4	Other oper.figures: returns, supplier assessment, QA-Audits	Yes; 1,2,3,4	Other oper.figures: goods returned, superposed quantities	Yes; 1	
Target Agreement		Planned		Yes	Distributional oper.figures	Yes	Dependent on each employee
B. Are there individual operating figures according to the divisions?							
Finance		Yes		Yes	Miscellaneous: Product development, customer retention and -winning, other	Yes	
Distribution		Yes		Yes		Yes	
Procurement		Yes		Yes			
Logistics		Yes		Yes			
Production		Yes		Yes			Yes

Personnel		Yes		Yes	winning, other support processes	Yes	
C. Are the operating figures connected with a target system?		No				Yes	Employee assessment, bonuses for successes
Is each target provided with a concrete target value?		Yes	But target values are Not yet connected with a system; at present better than the quarter before	Yes	Process specific	Yes	
D. Which purpose/ appliance is served via your operating figures?							
Controlling/ Planning	If Yes, were 1 target vs. actual- value comparisons implemented? 2 deviation limits defined?	Yes; 1,2		Yes; 1		Yes; 1,2	
Information Systems		Yes		No		Yes	
Reporting		Yes		No		Yes	
E. Are operating figures implemented within the BPM concept?		Yes		In initiation		Yes	
Financial or cost oriented		Yes		Yes			
Performance oriented (e.g. cycle time)		Yes		Yes		Yes	

Quality oriented (e.g. adh. to del. dates)	Yes		Yes		Yes	
Customer oriented (e.g. reclamations)	Yes		Yes		Yes	
E.1 Which operating figures do you implement concerning the benchmarking processes?						
Maintenance Process	1 Time of Non-use 2 Time for repairing 3 Productiv. of maintenance 4 Adh. to delivery dates	1	Miscellaneous: Productivity of the personnel	1,2		
Customer Service Process	1 Quota of reclamations 2 Customer complaints 3 Customer satisfaction 4 Costs of amiability 5 Costs of guarantees	1,2,4			1	
Product Development Process	1 Time for product developments 2 Degree of innovations	1,2				
Order Processing Process	1 Adh. to delivery dates 2 Quota of reclamations 3 Cycle time	1,2,3			On time payments; for the logistics process: recognition of lacks, Adh. to delivery dates, shipment and transportation 1 without lacks	1,2,3
E. 2 How many operating figures are defined for business processes?		40		47		

E. 3 How were operating figures defined and derived (e.g. out of internal and external customer requirements)?		Via partnerships, external and internal customer demands		Orientation towards existing operating figures, and customer demands (for the possibility of monitoring the processes)			
E. 4 In which way were/ are operating figures implemented (e.g. top-down, bottom-up, workshops etc.)		Bottom-up		Workshops, talks between management, QMA, and BPO			
E. 5 How is the gathering of operating figures organised and who gathers operating figures (e.g. BPOs, QMAs, etc.)?		BPO and QMA		Each BPO gathers the data and reports it to the QMA in predetermined intervals			

E. 6 How do you gather and evaluate operating figures? Do you use visualising tools, statistical methods, the RADAR method or other aids?		Quarterly in reports, graphical illustration		The QMA gathers the data in a table and reports it to the management			
E. 7 To whom are evaluations communicated and how?		In reports to the management and QMA		QMA, Management; sometimes with feedback to the BPO		Via talks between employees and monthly placards	
E. 8 How often do you measure?		Quarterly		According to the predetermined frequency		Monthly	
E. 9 Is the gathering of operating figures geared to special success factors?		No		No			
E. 10 Do you use the concept of internal and external benchmarking during the evaluation of operating figures?		No		No		No	

Other comments concerning the inquiry, use and evaluation of operating figures:			It is Now in the probational phase. It will be detected if the chosen operating figures are practicable and if they are usable as controlling measurements.			
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