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Developing Competitiveness of a Company Using a New Business Process Engineering Concept

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INDUSTRIAL MANAGEMENT

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Julkaisun nimike Yrityksen kilpailukyyn kehittäminen käyttäen uutta liiketoimintaprosessien kehittämiskonseptia		
Tiivistelmä Suomessa ja muissa länsimaissa yritysten toimintaympäristössä on tapahtunut 2000-luvulla kaksi laajaa ja merkittävää muutosta. Ensinnäkin länsimaiset yhteiskunnat ovat siirtyneet jälkitekollisesta aikakaudesta kohti informaatioajan aikakautta, ja toiseksi yritysten välinen kilpailu on muuttunut laajempien kokonaisuuksien, verkostojen väliseksi kilpailuksi. Näiden muutosten voidaan nähdä kulkevan rinnakkain toisen suuren yhteiskunnallisen muutoksen, globalisaation kanssa, jossa suuryritykset toimivat maailmanlaajuisesti yli maanosien ja valtioiden rajojen. Tämä tapaustutkimus luo taloudellisesti ja teknisesti kilpailukykyisen liiketoiminnan hallintajärjestelmän tehokkuuden ja laadun suorituskyvyn parantamiseksi keskikokoisessa elektronisia tuotteita valmistavassa yrityksessä. Tutkimus keskittyy yritysten kilpailukyyn tutkimiseen ja tutkimustulosten pohjalta kehittää kohdeyrityksen kilpailukykyä toteuttamalla prosessijohtamisen lähestymistapaa haastavassa ja dynaamisessa globaalissa liiketoimintaympäristössä. Teoriaosassa käsitellään liiketoimintaprosessien kehittämiseen liittyviä menetelmiä yrityksen strategisesta, asiakkaan kokeman laadun ja asiakkaan saaman lisäarvon näkökulmasta. Teorian pohjalta laaditaan liiketoimintaprosessien kehittämiskonsepti, joka koostuu vaiheittain etenevistä kehitystoimenpiteistä kilpailuedun kehittämiseksi ja ylläpitämiseksi case-yrityksessä. Tutkimus vahvistaa olemassa olevaa teoriaa liiketoimintaprosessien kehittämismenetelmästä (business process reengineering, BPR) ja sen toimivuutta kilpailukyyn parantamisessa yleisesti. Sen lisäksi tutkimus vahvistaa liiketoimintaprosessien kehittämismenetelmän toimivuutta 2000-luvun kilpailussa dynaamisessa ja verkostoituneessa toimintaympäristössä.		
Asiasanat Asiakkaan kokema laatu, kilpailuetu, strateginen johtaminen, liiketoimintaprosessien uudelleensuunnittelu, liiketoimintaprosessien hallinta.		

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Abstract <p>In Finland and other Western countries, companies' operating environments have faced two broad and significant changes in the 2000s. Firstly, Western societies have moved from the postindustrial age towards the information society age and, secondly, for larger entities, competition has changed from that between enterprises to that between networks. These changes can be seen to run in parallel with another major social change, globalization, under which large enterprises operate on a global scale across continents and state borders.</p> <p>This case study involves the creation of an economically and technically competitive operating management system so as to improve efficiency and quality performance in a midsized electronics manufacturing company. The study focuses on enterprise competitiveness and, based on the research findings, develops the case company's competitiveness by implementing a process management approach to its challenging and dynamic global business environment.</p> <p>The theoretical part of this thesis deals with business process development methodology for the company's strategy, the customer's perception of quality and perspectives on added value creation. On the basis of the theory, a process development concept is drawn up, comprising a number of sequential stages for developing and maintaining the case company's sustainable competitive advantage.</p> <p>The study confirms the existing theory of business processes development (business process reengineering, BPR) and its functionality for improving competitiveness in general. In addition, the study will strengthen the BPR's functionality in the competitive, dynamic and networked business environment of the 2000s.</p>		
Keywords Customer's perception of quality, competitive advantage, strategic management, business process reengineering, business process management		

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Saarijärvi, December 2016

Terho Uusitalo

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Abbreviations

CRM	Customer relationship management
PM	Product management
PDM	Product delivery management
SCM	Supply chain management
SBU	Strategic business units
CEO	Chief executive officer
R&D	Research and development
BPR	Business process reengineering
BPM	Business process management
GPD	Global product development
CE	Concurrent engineering (CE)
PD	Product development
EDI	Electronic data interchange
TQM	Total quality management
QC	Quality control
QA	Quality assurance
TPM	Total productivity management
TPS	Toyota production system
COPQ	Cost of poor quality
NPS	Net promoter score
OTD	On-time delivery
FPY	First past yield
IT	Information technology
WBS	Work breakdown structure
KPI	Key performance indicator
CFI	Critical factor index
ERP	Enterprise resource planning
NPI	New product introduction
SaaS	Software as a service
Paas	Platform as a service
TTM	Time to market
IED	Intelligent Electronic Device
4Q	Measure, Analyze, Implement and Sustain
TIIM	Technology Innovation and Industrial Management
MakeLearn	Management, Knowledge and Learning
SIPOC	Suppliers, Inputs, Process, Outputs, Customers
SPI	Streamlined Process Improvement

Publications

1. Uusitalo, T. & J. Takala (2011) A Competitive Operative Management System in the Electronic Manufacturing Business. Presented at TIIM2011 Conference Proceedings, 31th March, 2011, Oulu, Finland.
2. Uusitalo, T. Business Process Reengineering in the Electronic Manufacturing Business. Presented at TIIM2012 Conference Proceedings, May 22-25, 2012, Lublin, Poland.
3. Uusitalo, T. Description of a Process Development Project. Presented at AManagement, Knowledge and Learning (MakeLearn) International Conference 2013 Zadar, Croatia. Active Citizenship by Knowledge Management & Innovation 19-21 June 2013.
4. Uusitalo, T. Strategy Implementation by Managing Business Processes: A Case Study in the Electronics Industry in Finland. Presented at Management, Knowledge and Learning (MakeLearn) International Conference 2014 Portoroz, Slovenia. Human Capital without Borders: Knowledge and Learning for Quality of Life 25-27 June 2014.

1 INTRODUCTION

The development of society and sometimes fast cyclical changes have a major impact on a company's operations and business environment. World economic growth has been very moderate in recent years, and it is expected to remain moderate in the near future. The Finnish Ministry of Finance's Economic Bulletin 1/2013 forecasts that the economy will remain in a state of moderate growth through 2013 and 2014, at least (Ministry of Finance 2014). The world economic outlook and the moderate market growth rate force firms to create growth and differentiate themselves from their competitors by developing competitiveness.

This case study involves the creation of an economically and technically competitive operating management system so as to improve efficiency and quality performance in a mid-sized electronics manufacturing company. The research is carried out with the aim of increasing the economic value of the studied company by applying a process management approach to its challenging and dynamic global business environment.

This case study focuses on enterprise competitiveness and, based on the study's findings, develops the competitiveness of the case company: ABB Ltd. Medium Voltage Products. The case company manufactures intelligent electronic device products, used in a variety of different applications in electricity network protection, monitoring and control.

The case company belongs to the electric and electronics industry and its market area includes both the domestic and worldwide markets. The electronics industry is highly competitive in all of its aspects, including marketing, design, product management (PM), productions and post-manufacturing services.

1.1 General competitiveness framework

From a broad perspective, the development of society can be understood in various stages, such as agricultural society, industrial society, service society and the information society (Toffler 1980, Crawford 1983).

Broadly considering the competitive environment inevitably raises the concepts of the information society, globalization and transnational corporations.

Castells (1996) considers the formation of the information society and how it has changed work and social life. He uses the concept of "informationalization",

which, in his opinion, reflects more accurately the modern form of social organization. In the information society, information production, processing and communication are key aspects of the company's business and an important form of exercising power.

The information society is characterized by different worldwide functions. These various functions in turn cover all aspects of production and consumption, such as capital, labor, raw materials, corporate and business management, information, technology and markets. A second feature of the information society is its ability to operate in real time at the worldwide scale, while a third feature is its focus on the core, consigning peripheral regions to a subordinate position. Castells (1996) characterizes this phenomenon according to a new international division of labor: the informationalization labor force is responsible for high-value returns, the low-cost labor force offers high volume production, while raw material producers and secondary producers account for low-value returns.

In the information age society, companies operate in a networked environment. Control and management change from a vertical and bureaucratic structure towards one that is low and horizontal. In the networked environment, companies meet increasing competition where products and technology evolve rapidly. Companies are forced to organize their operations according to processes and a team management approach. Competitiveness is maintained by continuous appraisal and improvement. Labor retraining is an ongoing process. New procurement approaches emerge. Traditional subcontracting evolves towards partnerships or strategic alliances, where contract manufacturers are active players in research and development (R&D) activities.

Held et al. (1999) define globalization as follows: "The concept of globalization implies, first and foremost, a stretching of social, political and economic activities across frontiers such that events, decisions and activities in one region of the world can come to have significance for individuals and communities in distant regions of the globe".

In his book, "What is Globalization?", Ulrich Beck identifies the following characteristic concepts related to the phenomenon of globalization:

- Operating environments, such as international trade and financial markets, are networked and expanded worldwide.
- Companies operate widely across national borders. Large global companies have a lot of influence and consequently a significant impact on the development of society.

- Information and communication technology is sophisticated and worldwide.
- Human rights must be accounted for to a greater extent due to worldwide news coverage.
- While governments have traditionally been the sole holders of political power, in the global society, large, global companies are also political actors and possess great economic influence.
- Awareness of environmental issues and their importance is increasing.

Globalization cannot be thought of as a single process. Beck recognizes a total of five distinct areas in which globalization takes place: information, ecology, economy, production and culture. (Castells 1996, Held et al. 1999, Beck 1997, TYT 2008)

Sklair (2002) states that the global economy is an economic environment dominated by large, transnational companies. Transnational, in turn, means processes and institutions that have a significant influence on society but do not represent any particular state. Globalization favors a consumer culture, in which the central ideology asserts that the maximum possible number of the world's population should consume as much as possible. Global transnational companies contribute to this consumer society ideology and strive to improve their own financial position (Sklair 2002).

1.2 Research context and motivation

In the previous section we discussed, at a general level, the broad competitive environment of the approach, such as the information society, globalization, transnational corporations and networked international trade and financial markets.

Figure 1 shows the identified competitive factors, interlinking the important themes of this study.

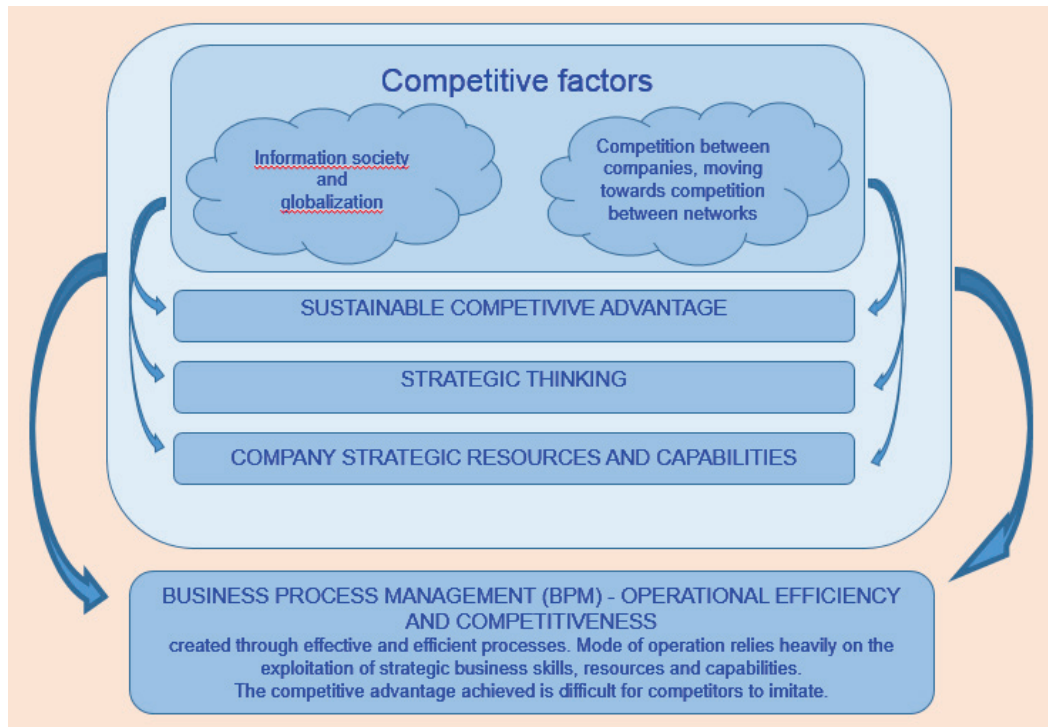


Figure 1. Competitive factors.

The object of the research is the case company ABB Ltd. Medium Voltage Products, and the subject is the competitive improvement of the case company by developing, both economically and technically, its competitive operating management system to improve its efficiency and quality of performance. One of the strategic objectives of the case company is a significant increase of its business volume.

As part of its strategic development, the case company has decided to investigate its existing business processes. On this basis, an R&D project was initiated.

The research was initially directed towards screening and identifying elements of the business process that create added value for customers. According to the guidelines obtained through this project, research was directed at improving competitiveness by developing business processes.

In the first stage of the study, a preliminary review of the current situation regarding PM, sales and marketing core processes was performed. Later, it was decided that all of the company's business processes would be developed.

For the case company, the aim of this business process development has been to strengthen proximity to customers, add value for the customer and improve customers' perceptions of the quality of the company's delivered products and

services. This, in turn, was seen as a means by which to achieve the profitable business growth objectives set by the company.

2 RESEARCH DESIGN

The case company manufactures intelligent electronic device products, used in a variety of different applications in electricity network protection, monitoring and control. The case company belongs to the electric and electronics industry and its market area includes both domestic and worldwide markets. The electronics industry is highly competitive in all of its aspects, including marketing, design, PM, productions and post-manufacturing services.

The research design is based on a study by Salmi and Jarvenpaa (2000). Scientific knowledge is accumulated through empirical observations and conceptual clarifications. In this new study, the findings either confirm or question the existing scientific knowledge. Figure 2 presents the business process reengineering (BPR) concept put forth in this study, which is presented in more detail in article 4.

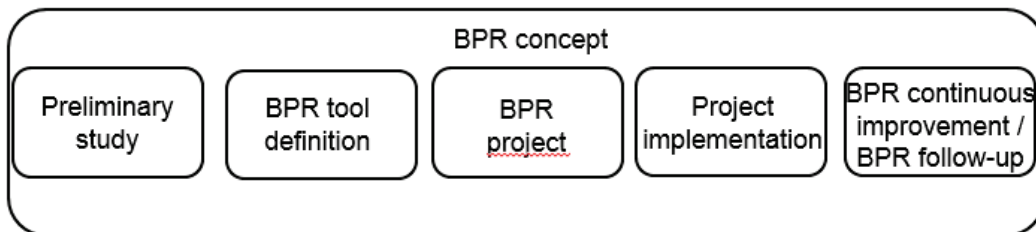


Figure 2. BPR concept.

Figure 3 presents the interaction between deduction, induction, and new information based on the BPR concept, which is deployed in the modified version of Salmi and Jarvenpaa's (2000) model.

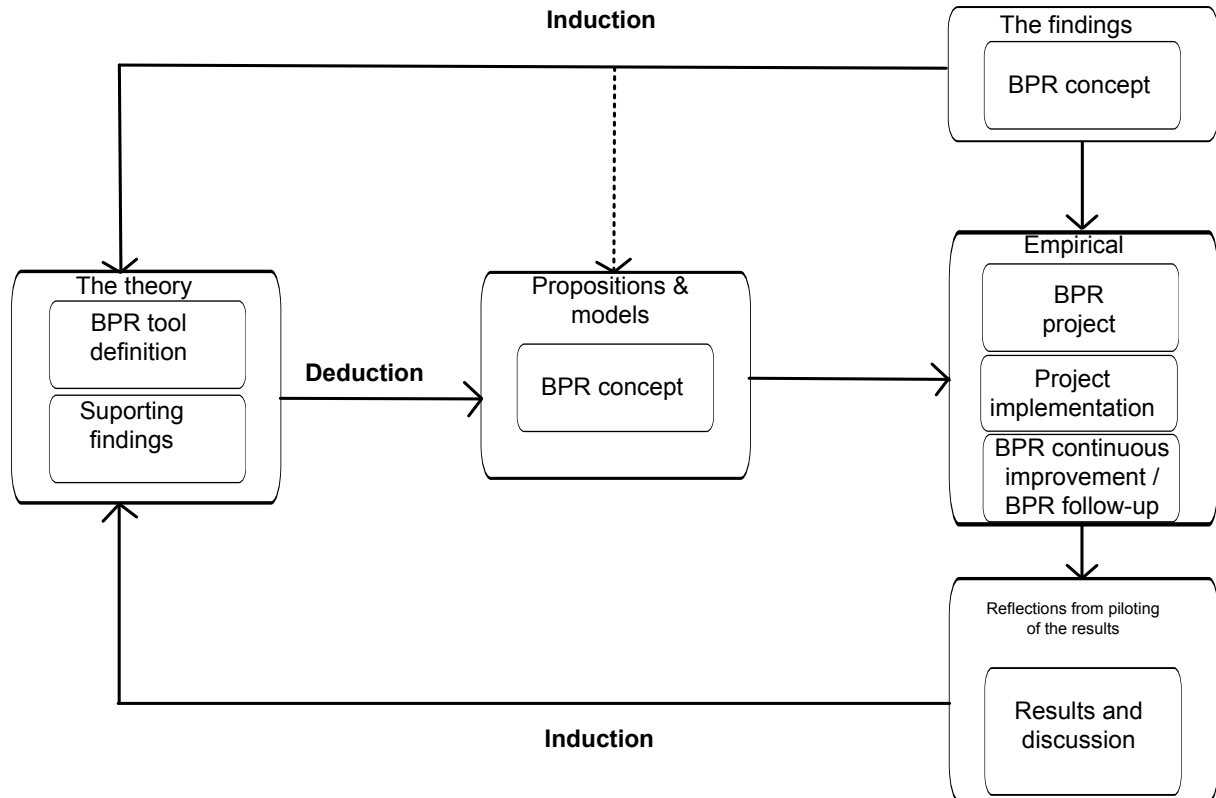


Figure 3. Modified model, Salmi and Jarvenpaa (2000).

The BPR concept (Figure 2) is deployed in the Salmi and Jarvenpaa model (Figure 3) as follows: “BPR concept” (created in this study) represents the findings and key result of this study; “BPR tool definition” (Uusitalo 2012) represents the theory that was used in the study; “BPR concept creation” (Uusitalo 2011, Uusitalo 2012, Uusitalo 2013, this study) represents the hypotheses and models; the empirical section comprises the “BPR project,” “Project implementation” (Uusitalo 2013) and “BPR continuous improvements / BPR follow-up” (Uusitalo 2014, this study); and “Results and discussion” (this study) represents the use of the results, while closing the loop by returning to the theory.

2.1 The objectives and scope of the study

The aim of this study is to identify the requirements for and main obstacles to the economic competitiveness of electronic manufacturing companies. Key areas for the improvement of competitiveness are identified as follow:

- Customer focus, customer's perception of quality, added value creation for the customer, a better understanding of customer requirements, and strategic marketing alignment.
- Product portfolio management, the development of new technologies, and product and service positioning in the market.
- Improving on-time delivery (OTD), faultlessness of delivery and cooperation with suppliers, as well as technological development of products manufacturing.

The development of society and sometimes very fast cyclical changes have a major impact on a company's operations and business environment.

Enterprise competitiveness must be continuously developed in order to maintain its position in the fierce international market. This study focuses on examining the case company so as to improve its economic and technical competitiveness, thereby differentiating the company from its competitors. The goal is to permanently improve the company's competitiveness.

In order to maintain and improve its competitive edge, a company must secure a number of important factors in key areas – including customer satisfaction, sales, manufacturing, PM and product requirements – in line with the expectations of the market.

The case study method is used in this research to identify the case company's most critical business process areas. Based on such findings, the intention is to increase customer intimacy and the customer's perception of quality by implementing development actions. Qualitative research methods are used in the form of in-depth expert interviews and workshops.

2.2 Contribution of the study

The study was initiated in 2008 when the author switched from a leadership to a quality and performance development assignment. His work on improving competitiveness-oriented activities began in 2009. The author works full-time at the case company as a project manager of the development team, and has carried out this work-related research at the University of Vaasa on a part-time basis. Working as both a development manager for the case company and a postgraduate student of the University of Vaasa was found to be a good starting point for this research. Possessing the role of development manager afforded the author active participation in the study as carried out in the case company.

With the exception of the first article – for which Terho Uusitalo acted as a corresponding author while Professor Josu Takala was a secondary writer – the author is solely responsible for all articles presented in this thesis. The author is also solely responsible for the design and implementation of data collection, analysis of the results, and compiling of the results and conclusions. Table 1 present the practical measures applied during the study, research inputs (input data) and outputs / relationships to competitiveness improvements.

Table 1. The practical measures applied during the study, research inputs (input data) and outputs / relationships to competitiveness improvements.

Article	Practical measures	Input data	Output / relationship to competitiveness improvements
# 1	1) A theoretical framework of quality and business-related development measures is established. 2) A theoretical framework of the necessary quality and business-related development measures is established.	Literature review: 1) Quality 2) BPR Interviews: 1) 48 interviewees classified according to seven different organizational functions. 2) 29 questions classified according to four main categories.	Baseline definition of the study: 1) A theoretical framework for quality and process management is identified Interview: 1) An overall view of the organization is composed. 2) The most demanding aspects of necessary business processes development measures are identified.
# 2	2 A theoretical basis for the business processes development measures is created.	1) BPR literature. 2) Workshop documentation: identifying and designing development measures.	Appropriate BPR development framework measures from the case company perspective are identified.
# 3	Organization-wide working groups execution and projects implementation on that basis.	Company-specific identified BPR framework.	1) BPR implementation. 2) Implementation of work breakdown structure (WBS), pilot project and information technology (IT) project.
# 4	BPR: 1) Project work. 2) Steco management working group – project control and monitoring.	Company-specific project plan.	BPR continuous improvements / BPR follow-up: 1) BPR subprocess reengineering. 2) Subprocess reengineering follow-up. 3) Continuous improvements follow-up.

2.3 The structure of the study

The structure of the present study is that of an article dissertation. The research focuses on study of the profitability of the case company. The aim of the study is to improve the competitiveness of the case company in the long-term.

2.3.1 Articles

In the theoretical part of the first article, the focus is on quality and the development of quality-related issues. The empirical part of the case study provides an overview of the organization's current status from a qualitative perspective. From the basis of the first article, the study is directed towards the development of business processes, with important areas being customer relationship issues and customer's perception of quality.

The second article presents a comprehensive theoretical review of the business processes. The empirical part contains a description of the design and implementation of the business process development, and the preconditions are set for the next phase, in which business processes development projects are implemented.

The third article deals with the redefinition of the practical business process project, which was carried out in the case company. All business processes were renewed in the BPR project carried out in the case company.

The fourth article deals with measures of how the process management practices are implemented, as well as the related continuous improvement approach to these processes.

2.3.2 Publications in the dissertation

The dissertation consists of seven chapters. The first chapter addresses the case company, the main purpose of the study, company competitiveness factors, research background and motivation.

The second chapter presents the study's research design: the objectives and scope of the study, its contribution and its structure.

The third chapter considers the theory of business processes development as a means by which to improve the company's competitiveness. The available

business processes literature and commonly used business process development tools are evaluated.

The fourth chapter describes the research methodology, including the acquisition and usage of existing knowledge, empirical materials and data.

The fifth chapter presents and analyzes the results achieved in a detailed manner.

The sixth chapter briefly reviews and summarizes the most relevant achieved results.

The seventh chapter offers some discussion and conclusions.

2.3.2 The research propositions

The study results are considered through the lens of the four presented research propositions. Figure 4 parses the interaction between the propositions and research objectives of the study.

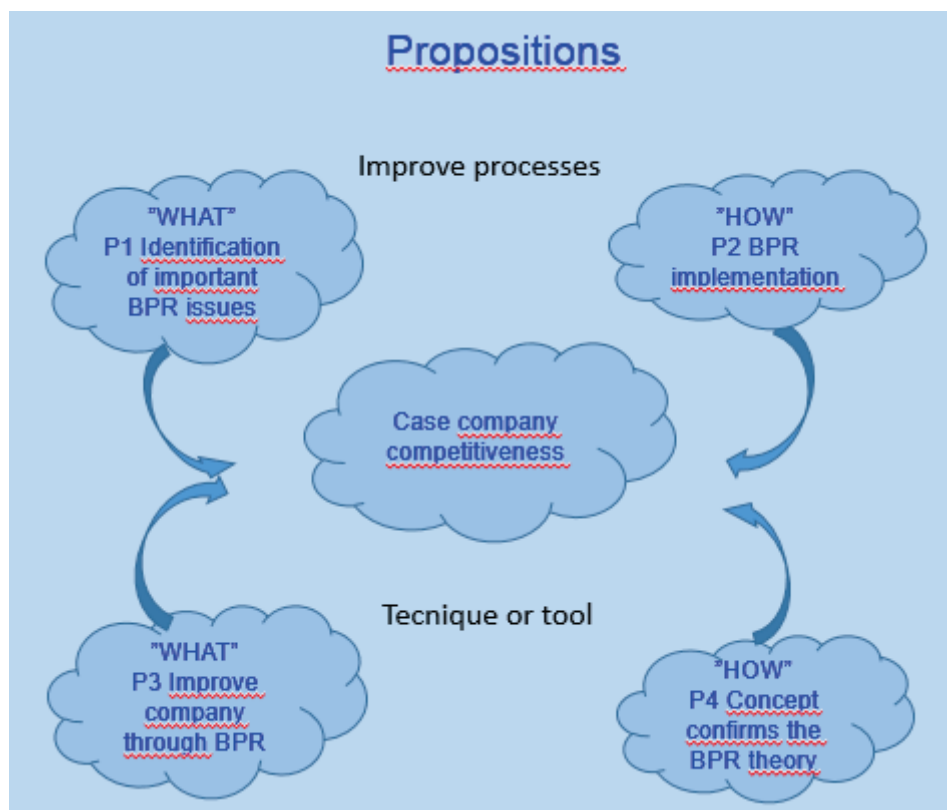


Figure 4. The interaction between propositions and research objectives.

The preliminary propositions of this study are:

P1: The resolution of the main identified relevant BPR issues improves the operational competitiveness of the electronics manufacturing company in the 2010s in a challenging and dynamic global business environment.

P2: The improvement of a sustainable competitive advantage can be achieved through BPR implementation in practice.

P3: The development of business processes significantly improves the company's competitiveness.

P4: This study's construction (Figure 2) confirms the existing BPR theory.

The subject of study emerges through the four scientific articles, which in turn support the propositions. Table 2 presents the way in which these articles contribute to the scientific propositions.

Table 2. The interconnection between the propositions and the articles.

Propositions / Articles	Article 1	Article 2	Article 3	Article 4
	<p>1) As a result of the survey, the views of the organization's key personnel regarding matters that require development were explained extensively.</p> <p>2) Finally, the most promising development areas were nominated according to the indications of the critical factor index (CFI) product group for one item, Prod#3, and key performance indicator (KPI) group for four items: KPI#2, KPI#3, KPI#4 and KPI#5.</p>	<p>1) The theoretical premise was formulated for the BPR development measures.</p> <p>2) The appropriate BPR development measure, from the case company perspective, was identified.</p>	<p>The BPR framework:</p> <p>1) Preliminary investigation of the company's capabilities.</p> <p>2) Identification of the organization's development actions.</p> <p>3) Process development objectives.</p> <p>4) BPR development methodology.</p> <p>5) Project objectives.</p> <p>Project implementation:</p> <p>1) WBS.</p> <p>2) Pilot projects.</p> <p>3) IT development.</p>	<p>Business process management (BPM) implementation:</p> <p>1) Implementation of the BPR framework and concept development.</p> <p>2) Promoting a development-oriented organizational culture.</p>
<p>P1: The resolution of the main identified relevant BPR issues improves the operational competitiveness of the electronics manufacturing company in the 2010s in a challenging and dynamic global business environment.</p>	<p>Effectiveness – major: The importance of the survey for identifying development areas at an early stage of the research is undeniable. Another observation made during the study is that the survey act as an instigator of development, such that members of the organization were prompted to consider potential development matters in their own areas of responsibility.</p>	<p>Effectiveness – major: The importance arises from the identified theoretical premise of BPR and this concept's fit to the case company's development framework.</p>	<p>Effectiveness – supporting: The importance arises from the identified practical arrangements of the development measures.</p>	<p>Effectiveness – minor.</p>
<p>P2: The Improvement of a sustainable competitive advantage can be achieved through BPR implementation in practice.</p>	<p>Effectiveness – minor.</p>	<p>Effectiveness – supporting: Creating guidelines for the development of measures.</p>	<p>Effectiveness – major: Design and implementation of key development measures.</p>	<p>Effectiveness – major: Outlining the development measures regarding the study object (BPM).</p>
<p>P3: The development of business processes significantly improves the company's competitiveness.</p>	<p>Effectiveness – minor.</p>	<p>Effectiveness – supporting: Creating guidelines for the development of measures.</p>	<p>Effectiveness – major: Implementation of practical development measures.</p>	<p>Effectiveness – major: Implementation of practical development measures.</p>
<p>P4: The study's construction (Figure 2) confirms the existing BPR theory.</p>	<p>Effectiveness – minor.</p>	<p>Effectiveness – minor: Development measures established regarding the form of the BPR concept.</p>	<p>Effectiveness – major: Development measures established regarding the form of the BPR concept.</p>	<p>Effectiveness – major: Creating models and the BPR concept, and supporting the current theory via deduction (Figure 3).</p>

Alasuutari (2002) considers how one should proceed from the research stage towards publication, while fulfilling the Ph.D. thesis requirement. Below is a modified version of Alasuutari's original model, in which interconnections are drawn, at a general level, between the central section and, respectively, the introduction and research design, and the three final paragraphs. The fundamental idea of Figure 5 is to visualize how important themes and issues recur through different paragraphs of the thesis. Figure 5 represents the fundamental principle of how the study is formulated for dissertation publication.

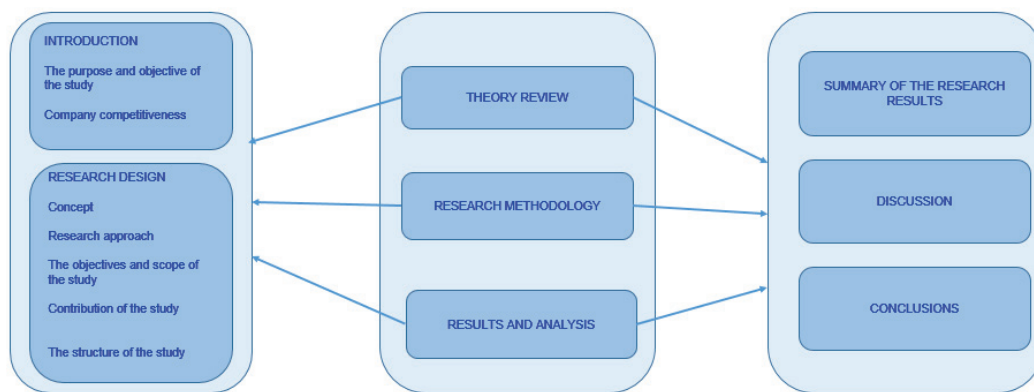


Figure 5. The construction of a dissertation publication (Alasuutari 2002).

3 THEORY REVIEW

3.1 Introduction to the business process reengineering (BPR) theoretical framework

Business processes and the BPR approach are important factors for a successfully operating company. This section focuses on the field of BPR theory at the general level. The theory is discussed in more detail in the following sections. The field of business process improvement contains many different terms and definitions. The difference between the concepts of BPR and BPM in general, and particularly in this study, is that BPR is considered to be a development approach, while BPM pertains to management.

The theoretical structure is presented in Figure 6.

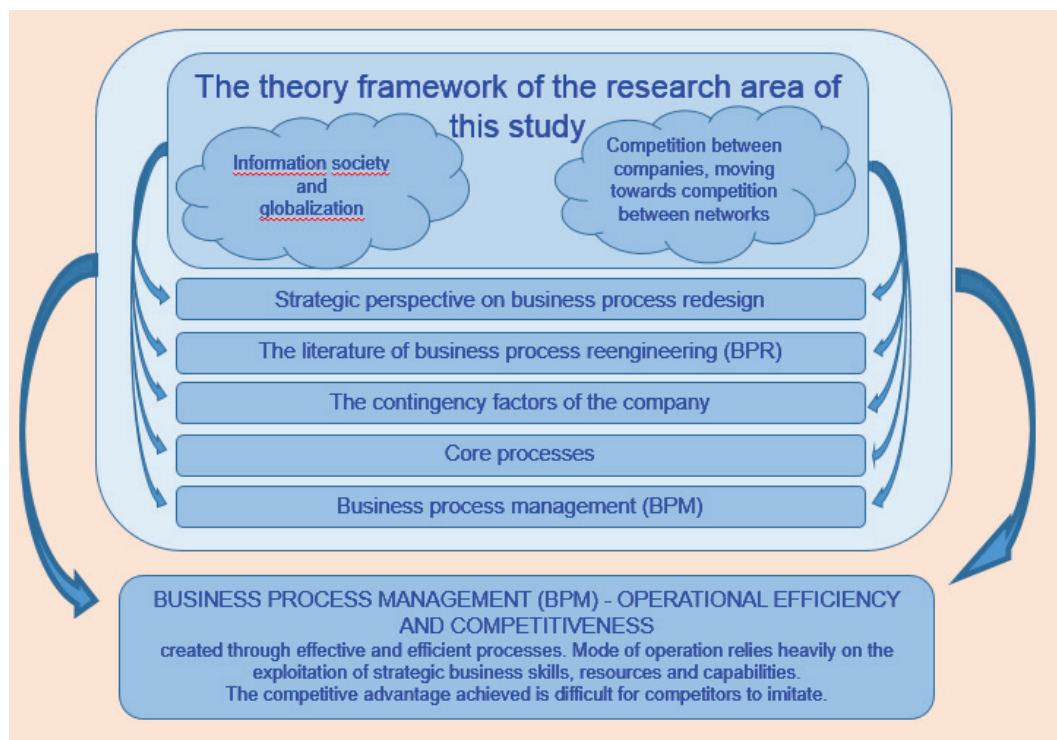


Figure 6. The theoretical framework.

Champy (2003) considers business processes and process management approaches in terms of productivity, enabling IT and X-engineering through transparency, standardization and harmonization and onward through offshoring.

In the early 2000s, it was observed that, although the economic situation had deteriorated, the company's productivity had improved. The above-described productivity phenomenon illustrates what economists have long known: the productivity of a company improves through enabling IT and its driving factors. The US was, at the beginning of that decade, in the sphere of influence of the "information age society", whereby the introduction of new information systems meant, in principle, improvements in the productivity of a company. Champy considers this industrial development to be dualistically divided: business grows and develops, thereby improving employment, yet, for companies within the information society, it has become more challenging to keep up with new developments and retain competitiveness. Harnessing new IT systems, such as enterprise resource planning (ERP), for the company's needs becomes more complicated and success is not a foregone conclusion. Yet there is no doubt that the successful application of IT developments helps a company to transform its business and become more competitive.

In 1993, Hammer and Champy introduced the concept of reengineering in their book "Reengineering the Corporation: A Manifesto for Business Revolution". The central message of the book was that companies must be reformed radically, and they must invest in customer value-generating core processes. Some companies use BPR in order to dramatically improve their operational processes, taking advantage of improved productivity. The next step of the development is X-engineering, which means that business processes take place beyond the organization's boundaries. For this new cross-border X-engineering approach, the important principles are transparency, standardization and harmonization.

Transparency - Interactive coupling and cooperation between different companies require transparency regarding their business practices. In the long-term, the company's sustainable competitive advantage is simply dependent on its ability to realize a profitable business. In a networked business, the company operates in deep interactive collaboration with both customers and suppliers - this requires transparency.

Standardization - The company can operate more efficiently in organizing processes and operating methods when standardized practices are applied. In other words, the processes that penetrate through various functional departments, as well as the boundaries of the company, should be standardized applications that can communicate with one another, as well as enterprise-wide and across the company's borders in the direction of both customers and suppliers.

Harmonization - The company must be consistent in defining its business processes. During the design and definition of its business processes, overall optimization must be applied such that the processes run smoothly across the enterprise and switch smoothly to both client and supplier processes.

In addition to reengineering and X-engineering, "offshoring" can be mentioned as a third important development trend. Offshoring is a practice by which a company can improve its competitiveness. By offshoring some of its processes, a company transfers part of its labor to low-cost countries. Work tasks to be offshored are, among others, providing customer service by phone or work associated with product or service design. One important point to consider in offshoring is that the company must carefully design and implement outsourced work related to the company's core competence. It is important to keep core competence-related know-how the company in order to maintain sustainable competitive advantage in the long-term. (Champy 2003)

The company's various levels of concern regarding business processes have different starting points. Companies with little or no experience of BPR address development measures in a more limited scope. Companies with more experience of BPR address broader, more systematic development measures, making bigger changes and taking greater risks.

These business concerns can be classified into three hierarchical levels:

- Enterprise level: addresses issues such as strategy, process architecture and performance management.
- Business process level: addresses issues such as process redesign, improvements and Lean Six Sigma projects.
- Project documentation implementation level: addresses the need to develop resources for these renewed processes.

According to Harmon (2007), during an economic downturn, companies invest in processes development primarily so as to improve efficiency with the aim of cutting costs. During an economic upturn, by contrast, the focus tends to be on improving the competitiveness of the company, aiming to apply new technologies, provide new services or develop a new business area.

Leading companies strongly believe that company-wide investment in process management provides a superior means of managing their business activities. The most interest in the process management approach seems to come from industrial fields that experience large, rapid changes. Companies need an agile

process-oriented approach to respond quickly and effectively to the ever-changing market. Leading companies focus on developing the entire enterprise-wide business process architecture, with the aim of harmonizing processes across the entire value chain (Harmon 2007).

3.2 Strategic perspective on business process redesign

According to Tinnilla (1995), many world-class companies have successfully improved their business competitiveness by developing their business processes. Development priorities appear to primarily concern operations and the aim is to improve throughput time by streamlining business processes. Another key objective is to reduce costs. One of the development challenges relates to the definition of processes, such that processes are discussed as functional compartments.

Business process development is challenging and frequently its results are less impressive than expected. It has been noted that one of the central causes of such underperformance is that business process development actions tend to be carried out from the operative rather than the strategic perspective. Considering development actions, three different perspectives can be identified. IT is of significant importance in increasing operational excellence and operative performance. Another aspect is the potential of the development of business processes, while the third aspect relates to addressing strategic issues. IT is frequently identified as an enabling factor. This in turn leads to an excessively narrow approach, with the consequence that competitive priorities are primarily sought from the operational effectiveness perspective. The disadvantage of this approach is that development actions are directed towards old, ineffective practices. This approach ignores a significant development potential. (Tinnilla 1995)

Davenport et al. (1990) mention two significant tools related to organization development, namely utilizing IT and process reengineering. In using these two tools in an appropriate manner, a company has the opportunity to effectively develop its operations and preserve its competitiveness. IT can be considered from the perspective of process analysis and modeling, on the one hand, and as an active aspect of the operational activities of the process itself, on the other. Process analysis and modeling relate to the process development stage with the aim of creating a modern interactive environment in which process descriptions are presented in an appropriate manner. Exploiting IT in operative processes,

increasing automation and manual work processes will be streamlined. IT and BPR have a recursive relationship, which is presented in Figure 7.

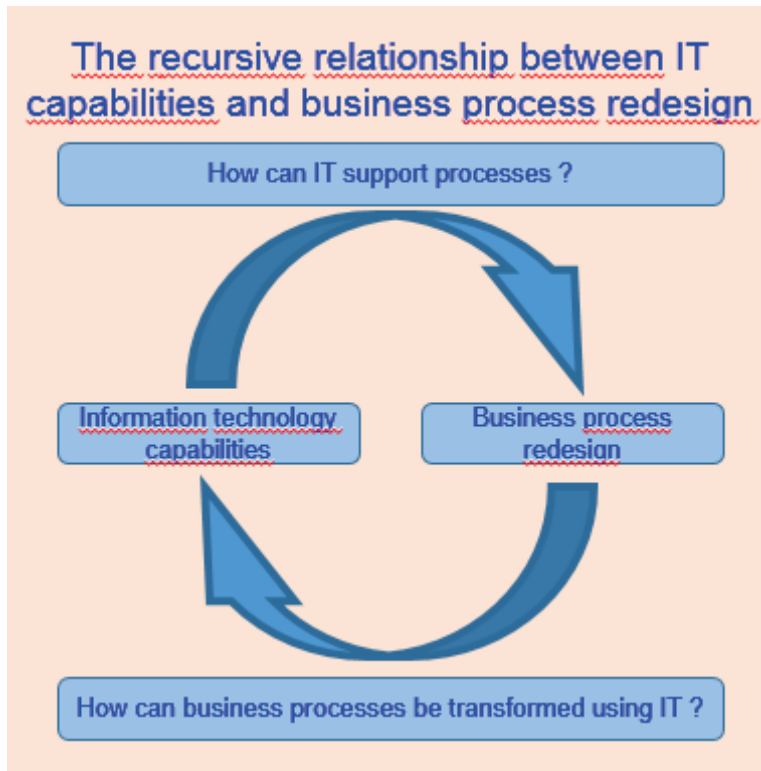


Figure 7. The recursive relationship between IT capabilities and business process redesign (Davenport et al. 1990).

Figure 7 includes IT, which is primarily tailored to the process requirements of a company, and only secondarily to its functions or other company entities. (Davenport et al. 1990)

Luftman et al. (2011) consider key IT and management in terms of IT management concerns, top applications and technology developments. The five most important priorities of IT management concerns are: (1) business productivity and cost reduction; (2) IT and business alignment; (3) business agility and speed to market; (4) BPR and reengineering; and (5) IT reliability. The five most important top applications and technology developments are: (1) business intelligence; (2) cloud computing; (3) ERP systems; (4) software as a service (SaaS) / platform as a service (PaaS); and (5) collaborative and workflow tools (Luftman et al. 2011).

Tinnila (1995) holds that business processes as organizational units mean that BPR initiatives must be considered in terms of total rather than partial optimization. In other words, the organization must be developed as an entity. All

processes, in a cross-functional manner, all organizations, human resources and IT must be reengineered together. The number of processes is not an intrinsic value, but their number must be considered from the specific perspective of the company. Four fundamental business processes can be identified: technical, innovative, enabling and social.

When the development action is performed from the business process and company-specific perspective, larger development leaps are enabled by streamlining business processes and transforming organizational structures towards horizontal structures. As the final result, a process- and resource-oriented organizational structure is achieved, which is, in turn, directed towards the information society model in which companies cooperate in a networked environment. Business processes as objects of the strategic planning approach consider business processes from both the company strategic and customer needs perspectives. This approach represents a perspective according to which business processes are even more important than products and markets. “These key processes have to be transformed into strategic capabilities providing superior value to customers”. (Tinnila 1995)

Stalk et al. (1992) present a conception of corporate strategy that they call “capabilities-based competition”. The American company Walmart is presented as an example of success in the interaction between business processes and strategy in order to achieve a sustainable competitive edge. A number of visible factors – such as an excellent service culture, friendly staff, entrepreneurial employees and a strategy of everyday low prices – are met by customers when doing business in the store. Considering the factors behind Walmart’s success, one must dig deeper into the company’s business principles and the important structural factors that enable its sustainable competitive edge. One such structural factor is shortening product life cycles, given that an important competitive edge consists in the ability to create new products at a rapid pace and bring them to market faster than competitors.

In Walmart’s case, the competitive advantage is achieved through its ability to predict future market movements and agilely react to changing market demands.

Walmart’s “capabilities-based competition” originates from organizational practices and business process capabilities that are better than those of its competitors:

“1. The building blocks of corporate strategy are not products and markets but processes.

2. *Competitive success depends on transforming a company's key processes into strategic capabilities that consistently provide superior value to the customer.*
3. *Companies create these capabilities by making strategic investments in a support infrastructure that links together and transcends traditional strategic business units (SBU) and functions.*
4. *Because capabilities necessarily cross functions, the champion of a capabilities-based strategy is the CEO.” (Stalk et al. 1992)*

Ives et al. (1993) write that IT is spearheaded during implementation and coordination of worldwide business actions. It can be argued that globalization is no longer a goal but a necessary course of action. By utilizing IT's potential, companies implement an approach whereby geographical barriers are blurred and become meaningless to successful business execution. Worldwide coordination and control are characteristic of such global business, enabling the best possible economic added value. This approach is known as the value chain concept. This type of environment enables the emergence of a new organizational infrastructure called “networked organization”. In worldwide business, IT controls and promotes the business. Worldwide communication, through networks of interconnected computers, will change the business environment. Companies seek to take advantage of new business environment opportunities by applying the latest available technologies. Companies that are able to successfully integrate worldwide information systems and strategies with one another become successful in the new networked business environment, which in turn lead to synergies and increased competitiveness in highly competitive worldwide markets (Ives et al. 1993).

3.3 The literature of business process reengineering (BPR)

Three BPR literature publications often referenced are:

Thomas H. Davenport (1993). *Process Innovation: Reengineering Work Through Information Technology*. Harvard Business School Press. Boston, Massachusetts, USA. ISBN 0-87584-366-2.

Michael Hammer and James Champy (2001). *Reengineering the Corporation: A Manifesto for Business Revolution*. Collins Publishers. New York, USA. ISBN-10: 0-06-055953-5. Originally published: 1993.

James H. Harrington (2012). Streamlined Process Improvement. The McGraw-Hill Companies Inc. USA. ISBN 978-0-07-176863-4.

Here's a brief overview of the ideas of these three main works.

Davenport combines the adoption of a process view of business with the application of innovation to key processes (Davenport 1993). His approach to the process of innovation is process-based, defined as: "simply a structured, measured set of activities designed to produce a specified output for a particular customer or market". The process approach focuses on "how work is done" as compared to the product approach, which focuses on "what is done".

The key point of Davenport's approach is to understand the concept of the business process and how it integrates with other process activities within the company. Particularly relevant is distinguishing the hierarchical structure of a company, which describes functional responsibilities, and the process structure, which describes how to create added value for the customer. Considering the issue of business development, the organization must be able to communicate to their customers how added value is created within the organization. Communication of production parameters, such as cost, time, product and service quality, are not sufficient to provide a quality experience to the customer at a higher level. In order to resolve the above-mentioned issues, the company must create a process structure where the way in which the company creates value for the customer is described in practical terms. Figure 8 presents the typical structure of a cross-functional process, which contains operations in several functions. In this example, the functional departments are R&D, marketing and manufacturing. (Davenport 1993)

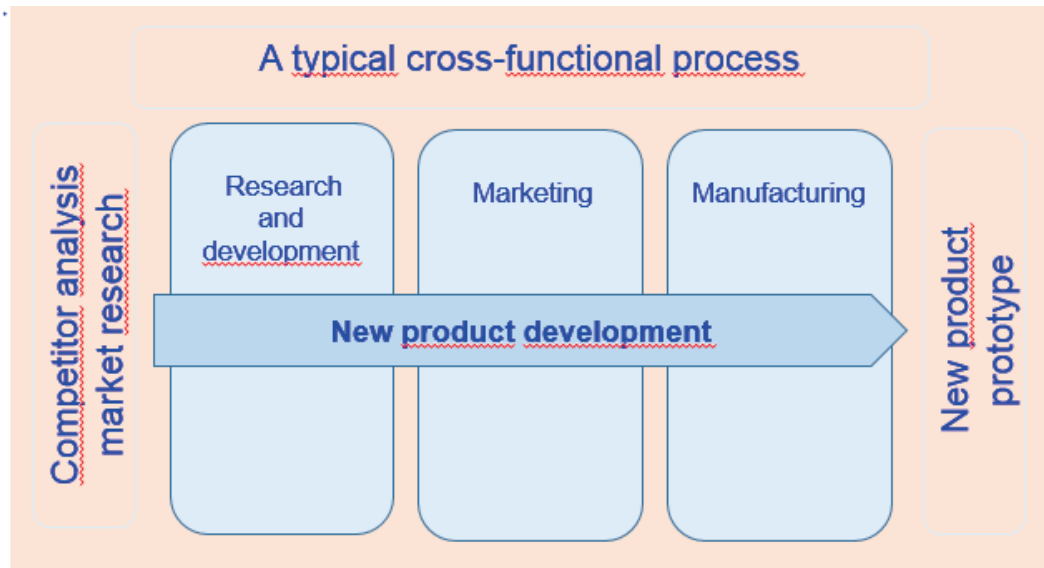


Figure 8. A typical cross-functional process (Davenport 1993).

Hammer and Champy (2001) write about companies that have used old practices, such as the command-and-control approach, which was applied to the US railways organization 150 years ago, and the splitting of work into small repeatable sub-assemblies, which was developed by Henry Ford and Alfred Sloan for the Ford car plant in the US in the 1920s.

A hierarchical and functional management culture emerged after the Second World War in the United States, and was widely adopted both in Europe and Japan. This type of functional management was appropriate for the operating environment of the 1950s and 1960s, where the market was constantly increasing and competition was very limited. From the 1980s, however, the balance between supply and demand changed in developed countries. Previously, the market acted on a mass production operating principle. In the new situation, customer awareness and the demand for customized products increased, and products manufacturers had to pay attention to consumer preferences and, thereby, changes in market trends.

The above-described fundamental change occurred for both the supply of products and consumer behavior. This, in turn, had a major influence on how companies had to organize their operations. Hammer and Champy consider the matter from the perspective of three Cs: customers, competition and change. Considering these companies from a business perspective, in a new competitive situation success cannot be achieved by relying on the old approach, which is based on continuous market growth, mass production and a stable market situation. In the new, competitive market condition, companies must be able to

respond quickly to changing customer preferences, market demand and competition.

According to Hammer and Champy, in order to survive this competition, the company must abandon the old, inefficient functional management model and adopt the new process management approach. They define the necessary change as the following: “Reengineering, properly, is the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, quality, service, and speed”. When the company adjusts its operations to meet reduced demand, it means that the company produces less at lower cost. The aim of Hammer and Champy's reengineering concept is to produce more at lower cost. These two perspectives have a significant difference which a company must identify when considering development measures. In addition, the company must consider the extent of the changes required for development through the following perspectives: does the company require fundamental changes in its existing practices? Is there a need to change existing practices radically? Would the necessary changes be dramatic? Are the planned development measures directed towards improving business processes? If the answer to each presented question is “yes”, then it is necessary to perform reengineering activities. Otherwise, the question will lead to the improvement of processes and practices with a lighter development project or, alternatively, the application of continuous improvement practices. (Hammer et al. 2001)

Harrington (2012) comments on the BPR concept with his own slogan: “Don't design for Six Sigma – design for maximum performance”. He justifies the argument by noting that, while Six Sigma does reduce process variations, it is inadequate for process improvement.

Lean practices in turn improve efficiency, but they cannot develop business processes alone. The development concept (method) presented in Harrington's book aims to develop and streamline business processes in order to improve variables such as costs, throughput time, satisfaction of both employees and customers, and the overall quality of the company's products and services. Figure 9 presents Harrington's Streamlined Process Improvement (SPI) approach.

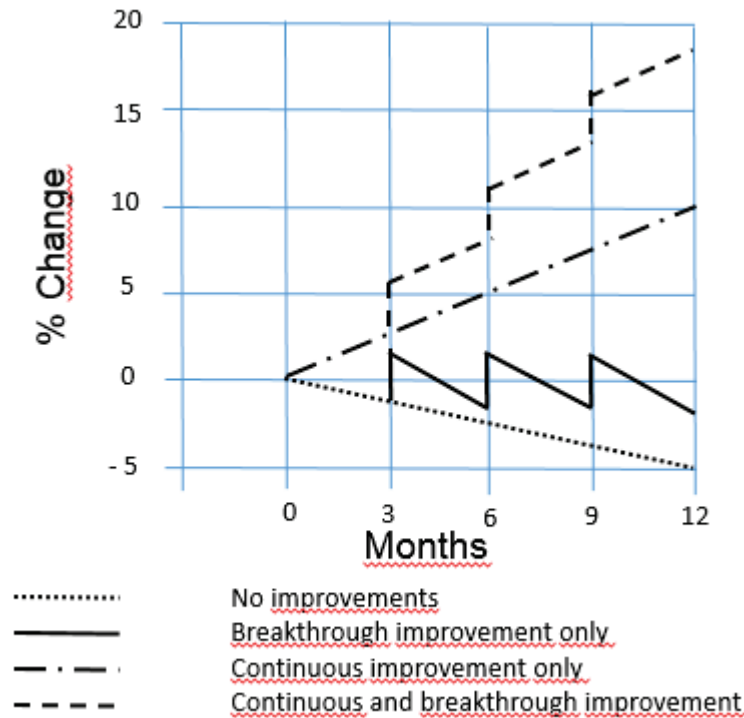


Figure 9. Comparative performance change with continuous and breakthrough improvement (Harrington 2012).

The downward curve 1 shows the situation in which any development measures are applied; curve 2 follows developments spurts (breakthrough improvement only); the situation in curve 3 shows only continuous improvement, while curve 4 is the sum of the curves 2 and 3. In other words, in Harrington's approach, the separate development tasks – developments spurts and continuous improvement – follow one another sequentially. (Harrington 2012)

Next, we will briefly discuss the applicable tools or models that are commonly used in the development of business processes. This subject has been discussed in depth in article 2. According to Davenport (1993), the process innovation business model of process development is performed in a separate development project in which processes are radically improved. Figure 10 presents the high-level approach to process innovation.

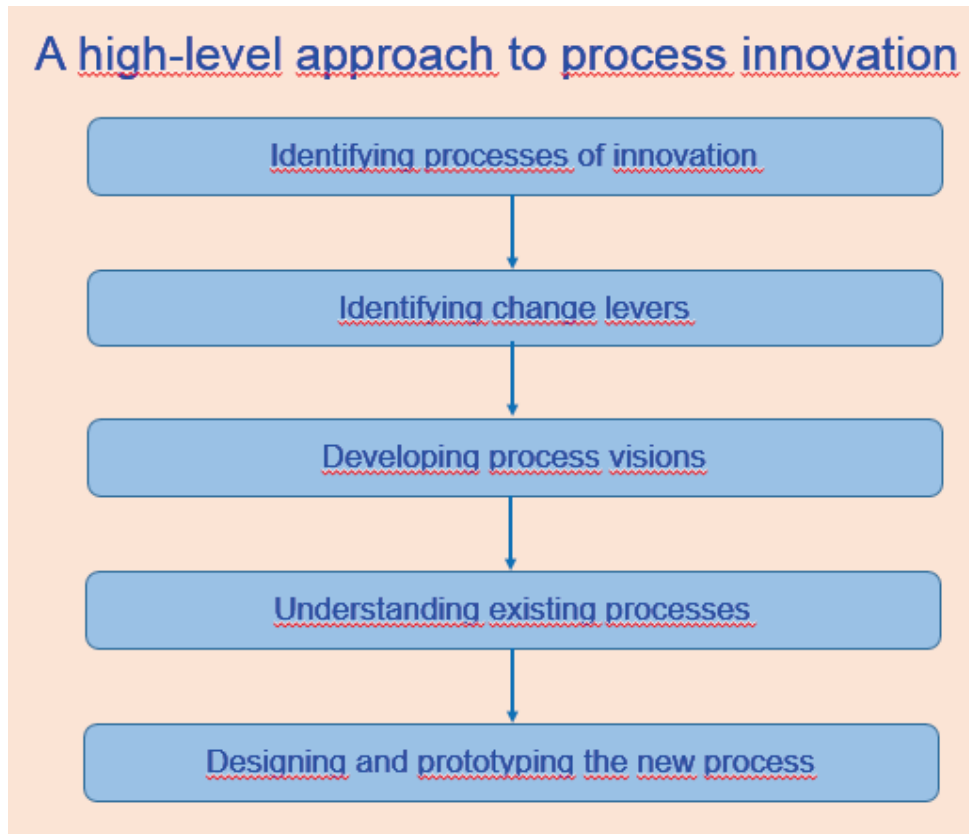


Figure 10. High-level approach to process innovation (Davenport 1993).

According to Davenport's (1993) model, it is particularly important that the continuous improvement operational model is implemented after the business processes development project. Unless these measures are performed in this order, there is a risk that the business processes operational model will return the use of old, inefficient practices, thereby losing the implemented development advantages. (Davenport 1993)

In response to the question of how to develop business processes, Harrington (2012) presents his five-stage planning, analyzing, streamlining, implementing and continuous improvement (PASIC) model, which is presented in Figure 11.

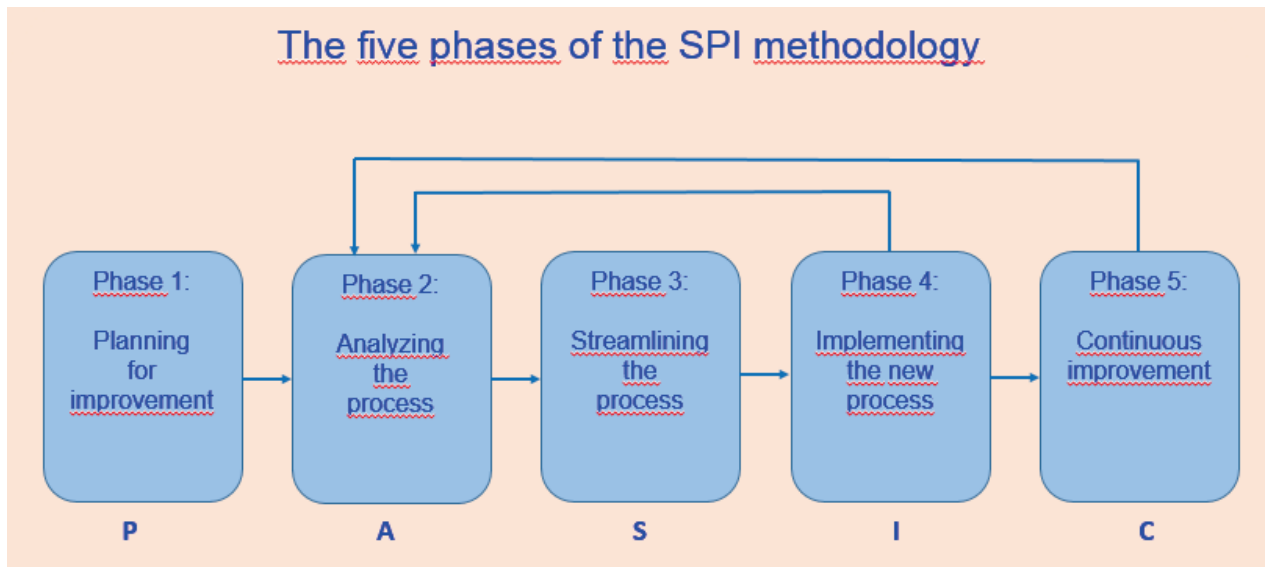


Figure 11. The PASIC model of SPI methodology (Harrington 2012).

The PASIC model consists of five steps, following one another sequentially according to Figure 11 (Harrington 2012).

3.4 Contingency factors of the company

Considering the company's development activities, it is vital to take into account the principles of situational leadership theory, as they have a significant impact on the organization's development planning. Each organization's design and development is unique and is dependent on the organizational structure, which in turn is the result of an organizational and interactive environment that will shape choices related to the organizational structure.

Since the organizational structure has a significant impact on the implementation of the objectives set, it is necessary to understand the impact of the organizational structure on the organization's development activities in order to determine the allocation of development resources and key organizational relationships. According to Galetic et al. (2002), various internal and external factors shape the organization's development activities individually, depending on, among other factors, the objectives of the organization, the technology used and the available resources. In addition, compatibility between the strategy and structure of the company predicts the success of the development and maintenance of competitiveness (Galetic et al. 2002).

The general perception is that the organization's integration (functional integration) is compelling. According to Turkulainen et al. (2011), the performance breakdown is important because the effect of functional integration with the performance is conditional: although the effects achieved by the integration of functions in several dimensions indicate positive performance, this impact varies between different performance dimensions.

A significant part of the unit cost of production is known to originate in the product development (PD) stage, rather than the actual product manufacturing stage. Marketing and sales have an important role in highlighting the market data it collects regarding customers' product requirements. Taking these into account at the design stage enables the avoidance of costly product and process re-design and installation. The conformity of the product's quality consists in the company's ability to coordinate all of its internal information flows and to implement the customers' design and delivery requirements. Flexibility comprises two dimensions: the design must be flexible and agile so as to implement product design changes (full life cycle), and the supply chain must be similarly flexible and agile, capable of responding to fluctuations in demand. Too often in new product introduction (NPI) operations, the R&D function is disproportionately seen as the bearer of this responsibility. When utilizing an organization's resources and expertise as widely as possible, the NPI operation achieves significant advantages, including enhanced product quality, better capabilities to introduce new products and new features, shorter design times, better information sharing in the R&D project with all partners and overall shorter time to market (TTM). (Turkulainen et al. 2011)

According to Porter (1980), the company must make a choice as to what the basis of its competitive advantage will be: cost leadership or product differentiation. Whichever basis is selected interacts strongly with the company's operations and aligns the company's culture, structure and strategic planning (Powell et al. 1994). By contrast to Porter and Powell et al., Tanwar (2013) lists three "competition factors": cost leadership, differentiation and focus (Tanwar 2013).

Company size is an important contingency factor. In large companies, the management system contains more formal procedures, and strategic planning is more formal. This increases administrative complexity, as coordination, standard practices and control ensure that the organization complies with established procedures. In general, the performance and success of development measures will vary between different fields and industries. One such issue – instability and uncertainty – is critical and important to the success of the operation. The life

cycle of the product can also be mentioned as a significant variable (Powell et al. 1994, Galetic et al. 2002).

Fine (1998), in his book "Clockspeed: Winning Industry Control in the Age of Temporary Advantage", considers product life cycle behavior by comparing it to that of fruit flies. The clockspeed concept considers the product life cycle in terms of how quickly the industry sector under review renews its product range (Fine 1998).

What technology a company uses has a significant enabling impact on its development. This point can be approached from two different perspectives: firstly, what technology the company uses and applies to practical business activities, and secondly, what technology is used in the products and services that the company produces and supplies. The ERP system is one of the cornerstones of profitable business. Hsu et al. (2004) name the key advantage of ERP as its integrated approach, whereby data are handled in a centralized, enterprise-wide manner, shared among the company's various activities. ERP's large-scale application helps companies to integrate and streamline their processes, including associated information and work processes. This in turns facilitates the connection of internal processes and external trading partners' processes, exploiting the opportunities brought about by the information system. In other words, companies are able to convey product- and service-related information regarding both supply and demand to one another on time, accurately and consistently (Hsu et al. 2004).

3.5 Core processes

Section 3.5 addresses the theme of company core processes by limiting the scope of analysis to customer value-adding processes.

3.5.1 Customer relationship management (CRM)

According to Kotler (2003), "It is no longer enough to satisfy customers. You must delight them". Today's companies must build customer satisfaction, value and retention on a sustainable competitive advantage basis in order to create a profitable business in the long-term (Kotler 2003).

Since the 1990s, the application of CRM has expanded and many companies have automated their sales, service and marketing processes. Companies that have applied this new approach have sought to rationalize the management of

customer relationships by centralizing customer information management, deepening customer knowledge, improving the quality of customer experience and moving towards a client-oriented approach. Despite large economic investments in the development of CRM, in many cases the results have not met expectations. Organizations directed themselves too much towards technological development, leaving fewer resources available for necessary business development measures.

When designing development measures, it is important to identify how the CRM mechanism improves competitiveness (competitive advantage) in parallel to the company's other strategic measures. Reliable and practical indicators must be applied to the evaluation of CRM development measures, such as turnover, customer satisfaction and business performance (profits). Despite criticism, CRM, when properly developed, offers much potential for improving competitiveness (competitive advantage). The main objective of CRM is to maintain and improve a profitable business, and many enterprises have chosen this effort as one of their important strategic directions.

Companies must recognize that the development of CRM will exploit the opportunities provided by new technology, not the other way around, and consideration must be given to how the selected technology can implement CRM activities. At best, a well-implemented, well-functioning CRM process improves the company's financial results and provides the company with a competitive advantage. The company must position its CRM operation in relation to its other activities. The key task of CRM is to contribute to the company's efforts towards improving sales, service and marketing activities. Considered from the perspective of CRM operations, the company's efforts can be classified into three groups: the operative philosophy, whose main activity is attracting customers by offering tailor-made products and services in a customer-oriented manner; applying best practices whereby sales, service and marketing are integrated into a holistic functional process; and utilizing best IT practices in order to automate business processes and manage customer information. (Bligh et al. 2004)

The marketing focus has increasingly shifted from product orientation to customer orientation. In practice, a product-specific marketing company strives to find customers to whom to offer products, while a customer-oriented company strives to maintain a product portfolio that meets customers' needs.

Customization means that the company offers individually differentiated products via an electronic service channel. Utilizing an electronic service channel, the supplier allows the customer to participate in the product design, and the customer's role changes as he participates as a self-producing customer. The

company's activities are to be defined in accordance with the concept of customization, combining both the customization of product operations and the customization of marketing operations. (Kotler 2003)

The possession of information from sources both internal and external to the organization is constantly expanding. Companies face challenges in maintaining IT systems and exploiting information and knowledge regarding business development, which is important from the perspective of both competitiveness and customer service. Electronic data interchange (EDI) is a standardized method of electronic communication that facilitates the electronic exchange of information between different information system applications over the internet. Utilizing EDI, two different companies, positioned either in the same country or different countries, may provide information to one another in the form of electronic documents, such as purchase orders, invoices, sales orders and shipping notifications, among many others. In order to function properly, EDI requires companies to have clear and workable business processes. A key operating principle of this system is based on business data applications that are capable of operating with one another so as to interact without the need for manual intervention. The system of information exchange should be seamless (Woodcock 2003, Copeland et al. 1997).

Figure 12 presents the supplier-customer relationship in the traditional structure and in the new economy structure respectively.

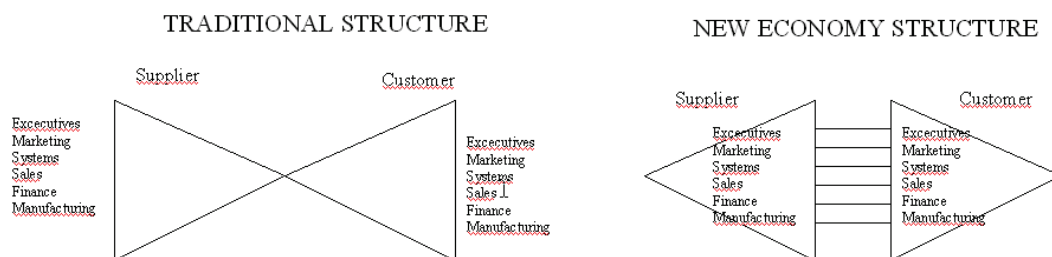


Figure 12. Supplier-customer structure (Kotler 2003).

In the structure of the new economy, the business processes between the supplier and the customer are seamlessly linked together via a communications network. By utilizing EDI and acting together through ERP systems, companies are enabled to operate a seamlessly networked environment in the new economy. In order to better understand the relationship between the companies, we must consider the concepts of value-added networks (VAN), value chains and value delivery networks (also called supply chains). Commercial VAN provide all

necessary communication services to companies that utilize EDI. Companies' business systems communicate with each other through standardized interfaces conveying business-related information. VAN systems provide electronic mailbox software that send, receive and save email messages independently, in accordance with current business needs.

Michael Porter, a professor at Harvard University, suggests that a value chain can be defined as "a tool for identifying ways to create more customer value". Creating value for the customer comprises activities such as design, manufacturing, marketing, delivery and product support. All the company core processes that create value for the customer together form the company value chain. The value delivery network, or supply chain as it is also known in many contexts, represent the operational environment in which the product and/or service is created. While the value chain comprises the internal functions of the company, the value delivery network is a broader concept and includes both suppliers and the company's own value chain, as well as distributors, channels and customers.

Companies must make significant investments in infrastructure in order to be able to operate in the networked environment. The ERP system, combined with EDI, plays a key role in the company's electronic transaction. In general, the customer is satisfied when delivery meets his or her expectations. When considering different satisfaction levels, a low level of customer satisfaction decreases the customer's commitment to a long-term relationship with the company. A customer who enjoys a high level of satisfaction, in turn, recommends the company to others. This has a significant effect on how the company maintains its customer satisfaction levels. If the company maintains its customer satisfaction by lowering prices or increasing services, it may cause a negative impact on earnings. Better results can be achieved by improving business processes and thereby efficiency. (Kotler 2003, Copeland et al. 1997)

The development of excellent products and services is not sufficient for companies to achieve a competitive advantage. In addition, the company must devote sufficient resources to fulfilling the customer's expectations, thereby sustaining competitive advantage (Mackay et al. 2008).

Customers make their product decisions on the basis of the benefits and costs of available offerings. When a buyer is planning to acquire new machinery, he considers which option offers the best total customer value in terms of perceived reliability, durability, performance, service, training, total price, restoration value, etc. Customer value creation characteristics and conditions include the ability to find new and maintain existing customers by satisfying their

expectations, ensuring delivery readiness in terms of all service providers in the entire value chain, ensuring necessary communications in the customer interface according to the customer promise and ensuring personnel are capable of fulfilling the eligible customer promises.

Research shows that a company failing to get to know the customers' expectations has an adverse effect on the creation of customer value. Regardless of the company's good performance, it is inevitable that some occasional deviations occur in the company's operations. The manner in which the company responds to such deviations plays an important role in customer satisfaction. The customer appreciates the fact that the supplier takes care of deviations promptly and in such a way that the customer experiences only a minor harm. In practice, effective deviations management requires the supplier's own special processes, taking charge of a comprehensive correction of all deviations from follow-up and registration through to operational execution.

IT is an extremely important aspect of customer service. The organization's possession of information from both internal and external sources is constantly expanding. Companies face challenges in maintaining IT systems and information, on the one hand, and exploiting the information and knowledge of business development, on the other, which is important from the perspective of both competitiveness and customer service.

Organizations must focus on strengthening and developing the process-based approach rather than developing separate functions. Organizations must consider the development of the process-based approach from both customer and organizational perspectives. The way in which organizations carry out their activities is reflected in the value of the customer's experience and, through that, customer satisfaction. In addition to the individual process performance measurement, the cost-effective implementation of the entire life cycle of the customer relationship must be considered. (Woodcock 2003)

3.5.2 Product management (PM)

Engineering work will soon be distributed around the clock in continuous work shifts. According to Eppinger (2011), demanding engineering work processes can be developed such that the work is distributed across multiple aspects in an appropriate manner, resulting in work processes taking place in different time zones in accordance with the 24/7 principle (Eppinger 2011).

Increasing competition and rapidly growing global markets are forcing companies to focus on maintaining sustainable competitive advantage. Continuous product innovation and development of products with a flexible approach has become necessary. Operational practices, such as quality function deployment (QFD), concurrent engineering (CE) and integrated product and process development (IPPD), are measures that take us in the right direction, but are not sufficient to ensure the company's sustainable competitiveness in the long-term. In addition, product and process reengineering is needed. Reengineering must be implemented in a holistic manner by considering both the customer and the organization's needs (Zhang et al. 2002).

Global product development (GPD): a new practice

Many manufacturers apply an approach by which R&D activities are performed on a decentralized basis in various countries around the world. Companies often face a challenge of taking full advantage of distributed R&D centers, ensuring that they effectively support growth and innovation. Globalization pressures have had a significant impact on the transition of development to the new practice. A new development paradigm has emerged whereby companies around the world take advantage of decentralized professional design teams who cooperatively design products. PD best practices are shifting from local units' cooperation to an approach by which design teams operate in worldwide networked environments. This decentralized design is a significant change to many companies' traditional practices.

Defining GPD

In the 2000s, it became widely accepted practice that efficient R&D functions in close, cross-border cooperation with sales and marketing, production and purchasing.

Co-located PD teams are capable of performing all functions in parallel, such as understanding market needs, satisfying customer expectations, conceptual and detailed design, testing, analyzing results, preparing prototypes, maintaining manufacturing technology, and related after-sales measures.

With CE practices, companies can achieve good performance, high-level product design, shorter TTM and low manufacturing costs. PD functions are generally placed in a company's PD and research centers, maintaining good interaction between the company's production facilities and sales offices around the world.

The emerging best practices in PD are based on distributed, networked development processes that take full advantage of digital planning systems. The GPD approach combines certain centralized functions with worldwide distributed design and closely related functions. This type of practice may join outsourced design services, but also offer subsidiary design services. The benefits of decentralized GPD are undeniable. Cost efficiency is achieved through the use of low-cost country resources and more efficient allocations of resources.

Since the 1980s and 1990s, many American, European and Japanese companies have become international and begun applying the global approach to their business operations. Companies apply their accumulated global business experience and expertise to implement GPD. Such companies build GPD with the following aims: to save costs; to develop and/or enhance the planning process; to expand their operations worldwide; to take advantage of the available technology.

The Essential Elements of GPD

It is possible for a company to apply different approaches in implementing GPD. Figure 13 shows the application of gradual outsourcing of R&D resources in various options in relation to the location and ownership of resources.

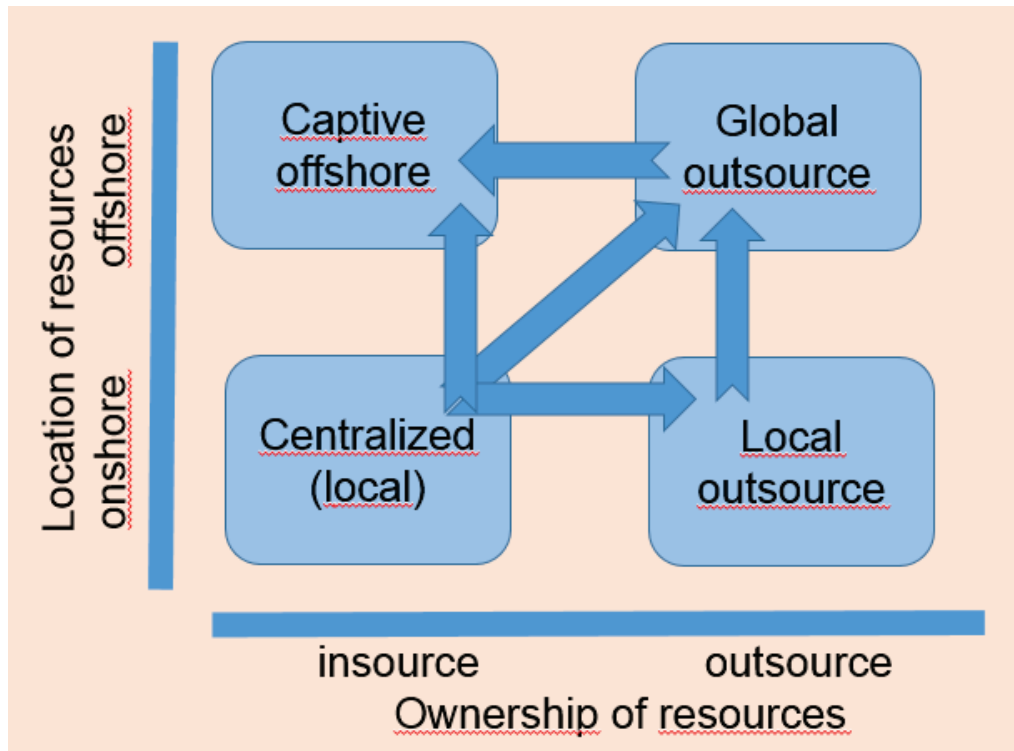


Figure 13. The various stages of PD processes outsourcing (Eppinger et al. 2006).

R&D resource outsourcing is a mode of operation in which the resources are owned by a third party, i.e., the service provider. Insourcing is a mode of operation in which the R&D work is carried out with the company's own resources in its own facilities.

In the centralized mode of operation, PD is carried out in-house through the company's own R&D processes. PD resources are typically located in the same country as the company headquarters – "the headquarter country". This mode of operation is particularly typical in high-cost countries.

Locally outsourced development exploitation of resources is a mode of operation in which the PD operation is carried out by a service provider's employees, who are often referred to consultants working in the company's own facilities. In this way, the company primarily aims at two strategic objectives: to gain access to technological know-how that is not appropriate for the company to maintain itself, and to adjust R&D resource capacity to the desired level.

Subsidiary company located R&D (captive offshoring) is a mode of operation in which the PD is carried out in the same group R&D center, often located in a low-

cost country. In this mode of operation, the company must make significant investments in resource allocation, such as premises, equipment and personnel.

Global outsourcing is a mode of operation in which the R&D service is acquired abroad, with the service provider often being located in a low-cost country. This mode of operation is often a stepping stone for the company before moving to the captive offshoring operating model. Outsourcing typically begins by engaging, on a small scale, external partners in initially simple task planning activities. Cooperation evolves on both sides as the partners' processes are integrated, and the relationship may evolve into strategic partnership.

An offshore center can develop into a strategic aspect of the company's operations for three main reasons: PD is related to product or process intellectual property, which in turn provides a valuable product differentiation; expertise and know-how are related to the company's core competence; and understanding the local market and the design of products that correspond to these market expectations provides value for the company. For the above-mentioned important strategic reasons, it is important for the company to maintain control of the offshore centers in order to lead the people, resources, capital, processes and systems. (Eppinger et al. 2006)

3.5.3 Product delivery management (PDM)

The importance of supply chain alignment is a widely discussed topic in the production management literature. Wong et al. (2012) identify six primary supply chain enablers: organizational structure, internal relational behavior, customer relational behavior, top management support, information sharing and business performance measurement systems. Through these identified six enablers, enterprises can maintain and develop their sustainable competitive advantage (Wong et al. 2012).

Ville Hallavo (2015) discusses how supply chain suitability affects a company's performance. Supply chain suitability in this context refers to a perspective that combines practical knowledge and the performance of the company, comprising a number of dimensions – leanness, agility, flexibility and efficiency – into one stream of research. According to Hallavo (2015), the direct mutual relationship between customer uncertainty and supply chain responsiveness has great importance for supply chain optimization. The research results show that a company's performance can be improved through better coordination between company uncertainties and functional ability. Further evidence suggests that efficiency is the precursor of operational responsiveness.

A company can achieve superior performance by optimizing its supply chain. In an environment of low uncertainty, this means focusing on operational efficiency and a lean manufacturing approach. In an environment of high uncertainty, it means focusing on operational responsiveness, agility and a flexible manufacturing approach. (Hallavo 2015)

Supply chain management (SCM) has a significant role to play in the development of corporate business. Companies have a strong vision of reform processes related to the supply chain providing significant profits. Yet publications in the field of industrial engineering and management, on the one hand, and industry experts, on the other, have differences of opinion regarding company business development.

Examples of business success stories can be found, yet examples can also be found of sluggish business development. Walmart stands out as one example of a company that has been able to develop its business by optimizing SCM.

Few companies have succeeded in optimizing SCM in this way, and therefore a significant developed action can be identified – in particular, cooperation between companies in the field of SCM. The differences between the winners and losers are significant: if a company belongs to the group of winners, success is predicted, yet if the company falls among the losers, it may mean business failure.

The results of supply chain optimization for successful companies are convincing. Continuous improvement practices combined with ambitious development projects directed towards the entire supply chain is the key to success. These measures, by improving the company's competitiveness, offer the possibility of satisfying customers and thereby improving profitability. Supply chain optimization is not easy to implement. Concerning the transition from in-house to networked development, the difficulty level increases. In order to successfully develop the network environment, cooperation efforts are required on the part of all companies operating in the network. As a result, an optimized value creation supply chain is achieved, which in turn satisfies customers' expectations.

Genuine network value chain operations, which have so far been established by companies such as Dell, Cisco, Walmart and Tesco, contain certain common features. The first feature is the underlying controlling role of one of the "core businesses". The core company's size is such that it is able to make decisions that affect the whole network and sufficiently commit to successfully controlling the entire network. Another important feature is common technology. The companies operating in the network must apply compatible technologies (EDI,

ERP), which allow information to be exchanged between companies operating in the network. (Poirier 2003)

Competitive priorities, such as quality, delivery, flexibility and cost, are commonly accepted approaches to considering operations strategy and SCM capability. Contingency theory applies to business management so as to identify the causal mechanisms underlying the measures taken in pursuit of results. According to contingency theory, the company must adapt its structure and processes in accordance with environmental requirements in order to optimize its performance. In developing the PDM and SCM activities, the clockspeed of industry sector products must be considered. Industry clockspeed indicates how rapidly given products are renewable in the relevant industrial sector. According to Fine (1998), the clockspeed concept can also be applied to indicate the change rate of processes and organizational structures. To be successful in the face of ever-increasing, fierce competition, companies must adapt their SCM capabilities and operational processes to operate at least at the same clockspeed as the relevant industrial sector. Changes in products represent the rate of release of new products, while changes in processes and production processes refer to changes in production technology. Finally, mergers and acquisitions indicate changes in organizational structures (Fine 1998, Chavez et al. 2012).

The chronological evolution of the competitive elements of SCM can be identified through a classified development path, starting in the 1980s with the "flow of material" action, proceeding to the "integrative philosophy" approach and further to the "assistance among members" and "mutuality and holistic" approaches, and finally arriving at today's approach which "links together partners". An alternative way of mapping this evolution is to consider the development path through the supply network approach, whereby SCM has developed through three distinct development phase: dyadic linkages, a chain of suppliers and a supply network.

The networked approach plays a key role in the company's strategy for developing supply chain performance. Companies operate as partners with their suppliers and cooperate closely. In this mode, information management has great importance due to technical complexity and increased worldwide competition. Companies must manage new digital IT tools necessary for the international business network. Knowledge dispersion and technological resources are forcing companies to operate in an increasingly networked environment. Companies thus strive to increase cooperation with external partners. This opens up opportunities to strengthen their own core competencies, but on the other hand,

under this approach companies are dependent on their partners' resources and capabilities. (Svahn et al. 2007, Braziotis et al. 2013)

Reichhart et al. (2007) consider supply chain responsiveness in term of product, volume, mix and delivery. In pursuit of a critical competitive advantage in relation to competitors, companies must take into account the increasing market range of products, their customization and precise OTD. Companies design and implement strategic measures in order to improve their competitiveness and take advantage of achievable competitive advantages. Flexibility and responsiveness are important and differentiating competitive factors, particularly in an uncertain and dynamic market environment. Order management can be considered as one of the critical business processes. The precise and exact, but if necessary flexible, OTD process will bring certainty and predictability to the order delivery process, thereby meeting the expectations of the customer (Park et al. 2010, Reichhart et al. 2007).

Companies must pay attention to the alignment of competitive priorities. Innovative companies must align to the strategic priorities of new products with a flexible approach to operations, while customer-oriented companies must align to the strategic focus areas of sourcing, production and delivery flexibility. According to the military supply chain flexibility measures, the ability to adapt operations in terms of the level of moved materials and lead times is an important dimension of SCM performance (Fantazy et al. 2009, Sokri 2014).

The competitive environment has shifted in the direction of networks competing with one another. The company's practice of continuous improvement in this new competitive environment is at least as important as in the traditional environment of competition between enterprises. Development measures must be considered at the entire network level. In other words, development must not be confined to each company's own business delivery network. Development activities maintain a strategic dimension and this is essential for companies to operate successfully in the worldwide competitive market.

The worldwide competitive and dynamic market is characterized by customers requiring short lead-time, low-cost, high-quality, diversified products. Products are increasingly fragmented, and companies are adapting their operations by utilizing a networked approach in order to achieve competitive advantage. Communication channels and connections between services are an important development area, as companies seek to manage geographically dispersed supply networks seamlessly and in a timely and cost-effective manner. (Chang et al. 2011)

Maintaining product support services has become important in at least two important respects. First, maintenance operations are significant business opportunities that companies should take advantage of. There are several companies on the market whose sales are over 50% maintenance activities. Second, the customer is concerned about product life cycle costs in terms of reliability and failure frequency, downtime duration during service operation and the total costs of maintenance and repair activities (Kotler 2003).

3.6 Business process management (BPM)

Fierce, worldwide competition is forcing companies to continuously find ways to maintain and develop sustainable competitive advantage. BPM is a widely known concept that considering business development activities and the methods used to improve competitiveness (Nadarajah et al. 2014, Sikdar et al. 2014).

Total Quality Management (TQM) and BPR evolution towards BPM

TQM is a widely known and recognized quality management concept. Its roots are in the 1920s and it has evolved into a model nowadays known through concepts at several development stages, such as quality control (QC), quality assurance (QA) and total quality control (TQC). These concepts have been contributed by scholars such as Deming, Juran, Crosby and Feigenbaum. Awareness of these concepts has increased due to a number of quality awards, of which the best known are the US Malcolm Baldrige National Quality Award, the European Quality Award and the Deming Prize in Japan.

The TQM concept and key development areas aim at ensuring the customer's perception of quality via continual improvement practices, while also ensuring profitability by sustaining competitive advantage. The concept of BPR is to move towards a process-based management approach. The first important task is to define the current process status and analyze development areas. Before development action can take place, it must be carefully considered in terms of IT enabling possibilities, the risk level and the desired scale of change. In other words, the question is how radical a development action is feasible.

An important aspect of the BPR concept is appropriate process descriptions, which in turn provide assessment of processes, developing and measuring their performance. BPM and BPR significantly differ as BPR aims to effect the dramatic improvements, while TQM emphasizes continuous, incremental improvement. A common feature can be seen in the tendency to improve overall performance. Figure 14 show the evolution of BPM.

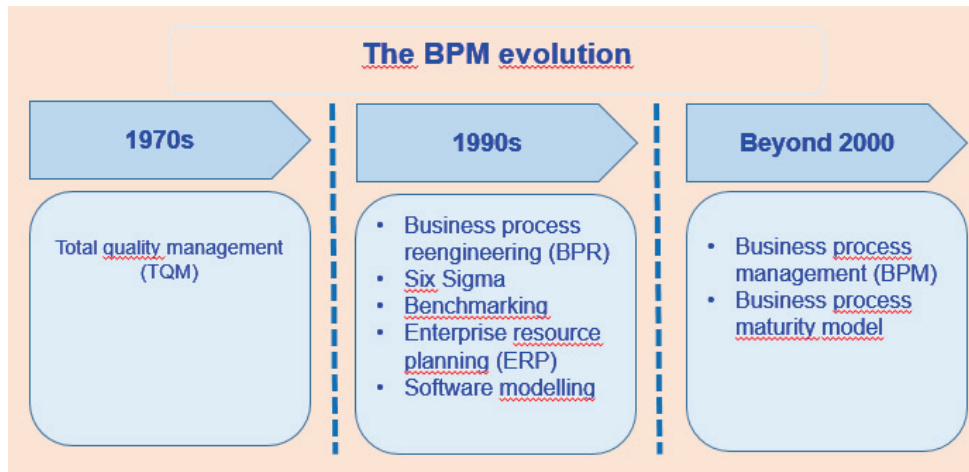


Figure 14. The BPM evolution (Nadarajah et al. 2014).

According to the evolutionary approach, the BPM concept emerged from early scientific management theory through TQM towards BPR and finally to BPM. The BPM concept is a holistic perspective and its important key points focus strategic perspectives on the customer's perception of quality and on the process management approach, rather than the functional management approach. In summary, it can be said that the BPM concept's key areas are capable and efficient organizations that are customer-oriented and continuously improve. (Nadarajah et al. 2014, Sikdar et al. 2014, Ghobadian et al. 2001, Zairi 1997, Hanafizadeh et al. 2009)

In applying BPM's key policies, a company must be able to systemically develop all the activities of its people, processes and systems, and cooperate with partner companies in the networked environment. The central idea of BPM is to optimize the entire supply chain such that it becomes a seamless entity, from the raw material supplier to the end user. Applying this approach requires the continuous application of new technologies that integrate key information and business partners throughout the business and across geographical borders. At best, the application of this approach helps the company to automate routine work and release resources for improving and tailoring processes across business borders in accordance with the customer's expectations (Poirier 2003).

4 RESEARCH METHODOLOGY

This study follows the general framework of the action research methodology, characterized by dialogue between theory and practice in the actual operating environment.

Action research is often based on a practical real-life situation that calls for improvement due to changes in the environment. The role of the researcher in action research differs from that in traditional methods – the researcher holds an active role in the research process, acting as an equal member of the group (Ojasalo et al. 2009, Hannu Linturi 2000).

This is the starting point of this study, and the intention is to find proactive improvements for the case company's competitiveness through the BPR concept, presented in Figure 15.

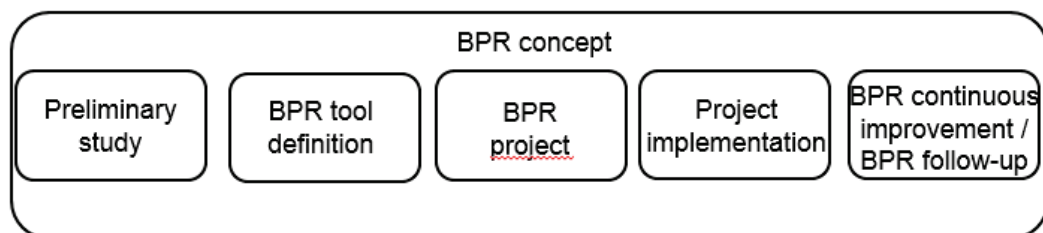


Figure 15. General framework of the study.

Preliminary study: The study began with a survey of the company's economic and technical competitiveness at the baseline, and preliminary targets for R&D were considered.

BPR tool definition: In the next stage, the current state of the company's business processes were studied and a theoretical framework of the business processes was created.

BPR project: This phase included defining BPR and the project plan.

Project implementation: This stage of the business processes was organized (a new process structure) in order to achieve the target of improving sustainable competitive advantage.

BPR continuous improvement / BPR follow-up: This stage occurs subsequent to the development project. The processes are constantly measured, evaluated and improved according to the continuous improvement approach.

The present case study is constructive in the sense that company competitiveness is investigated. The research problem is the company's competitiveness and the research object is the processes of an electrical equipment manufacturing company.

According to Kari Lukka, the constructive research approach is applicable to an empirical case study and the methodology is used particularly in business economic research. This study is a close dialogue between practice and theory, where the construction is the BPR concept established in this study. It contains the key elements of Lukka's constructive research approach: practical importance of the problem to be solved, solution functionality in practice, theoretical contribution of the study and connection to existing theory (Lukka 2001). The key elements of the constructive research approach are described in Figure 16.

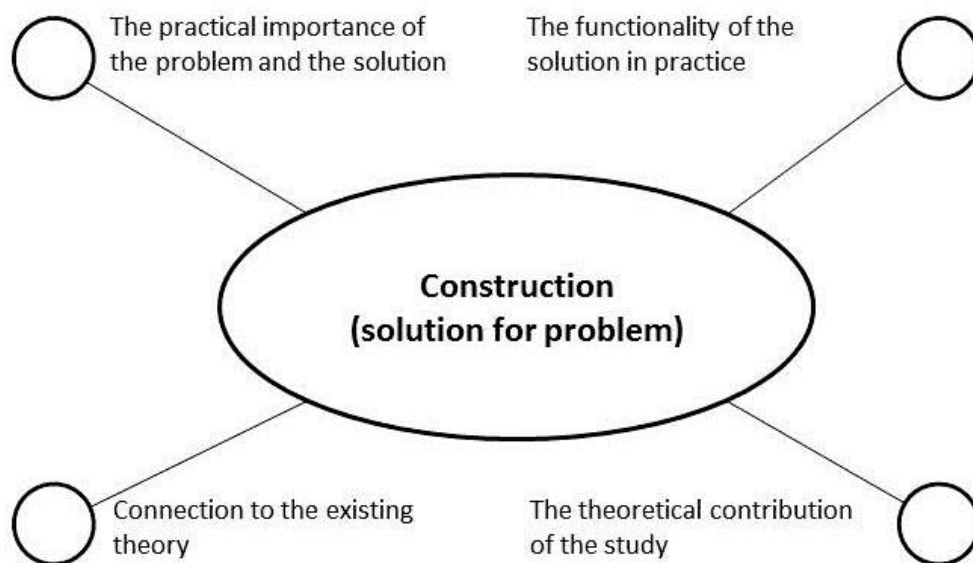


Figure 16. The key elements of the constructive research approach (Lukka 2001).

The BPR concept, as presented in Figure 15, consists of five independent phases, of which the most notable are the second (BPR theory), third (BPR project implementation) and fourth stages (establishing process management). These contain the features of constructive research as presented by Lukka (2001).

The researcher works full-time in the case company and is therefore an active participant in the development. The role of an active participant in the case company provides a good basis for a dialogue between theory and practice (Lukka 2001).

The study also includes the features of the weak and semi-strong market tests. The weak market test is designed to determine whether some company is ready to apply the construction to their own processes. The semi-strong market test is designed to determine whether business results have improved after the construction has been applied to the company. If the construction passes both tests, it can be considered that its performance is good enough to apply for similar considerations in other companies (Kasanen et al. 1991, Multamäki 2003).

The methodological approach of the study can be considered as a process by which the theory of science and research methodologies are combined (Arbnor & Bjerke 1997).

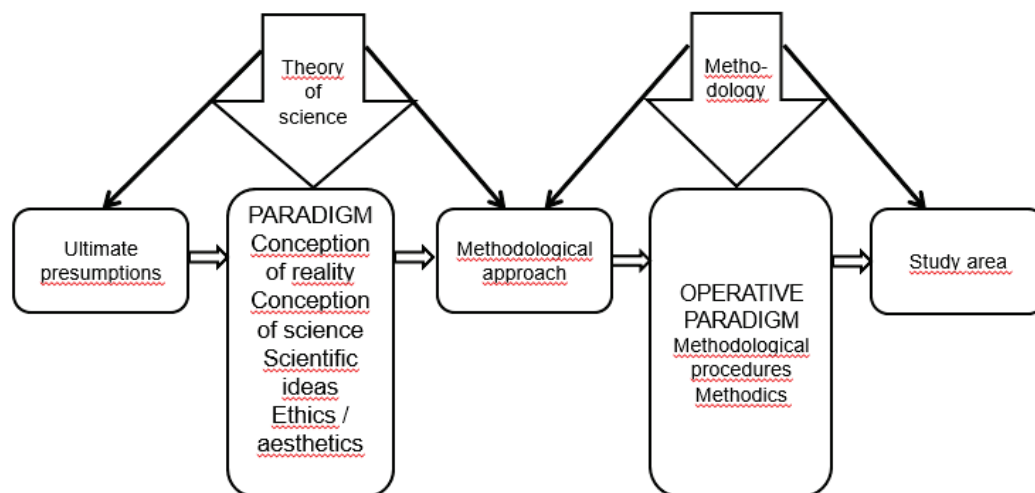


Figure 17. Constructive methodological approach (Arbnor & Bjerke 1997).

This study follows the basic methodological approach of Arbnor and Bjerke (1997). The research propositions rely on the ultimate presumptions. The paradigm used in the study is the BPR project. The methodological approach is presented according to Lukka (2001), Kasanen (1991, 306), Multamäki (2003) and Linturi (2000). The operative paradigm is the applied BPR methodology, and the study area is the BPR project.

Characteristics of the action research approach have significantly contributed to the collection of research data and their exploitation. A key feature or target of action research is the solving of a practical problem. The action research approach is characterized by its interest in how things should be, not just how things are.

Figure 18 presents the spiral progress of the action research. A single phase comprises four steps: plan, do, observe and evaluate/reflect. The entity is formed by iterations of these cyclic steps.

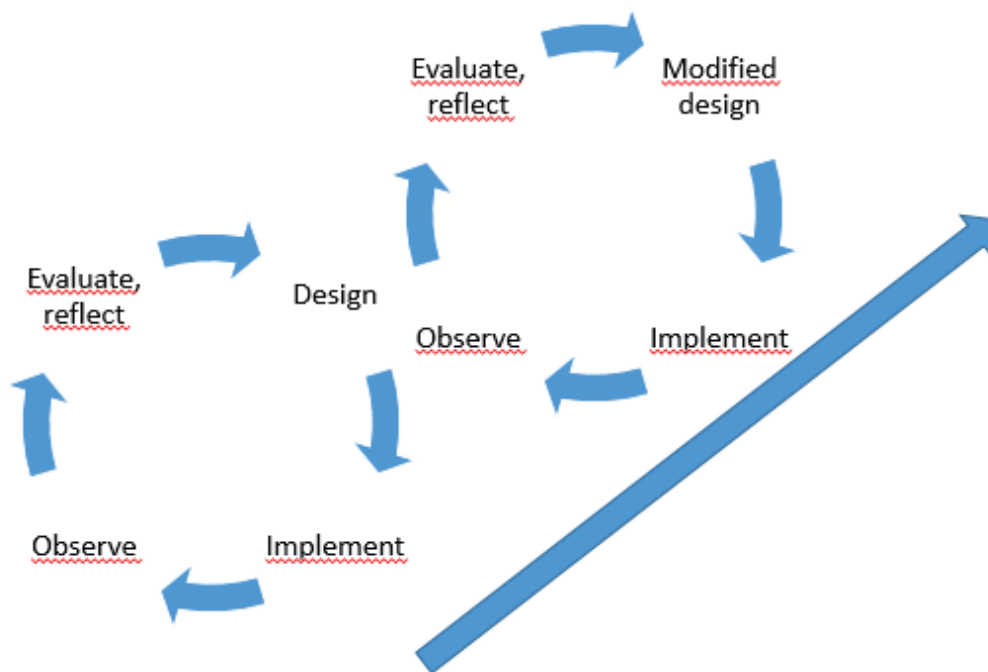


Figure 18. Action research process (Ojasalo et al. 2009).

As a general remark on the action research process, the development team is the subject as well as the object of the research. The collection and use of data take place at the same time as the development measures.

The collected data – such as the project documentation and observation notes – emerge during the research work, which the author of the study has exploited in the four scientific articles.

5 RESULTS AND ANALYSIS

This chapter summarizes and analyzes the achieved results of the dissertation. Section 5.1 addresses the identified answers to the presented research propositions: P1, P2, P3 and P4. Section 5.2 considers the achieved results through weak and semi-strong market tests.

The most notable results of the BPR concept created in the study and its important dimensions are: the six-stage BPR project, pilot projects and BPR continuous improvement / BPR follow-up. The second notable result is the development actions achieved as a result of development implementation in three core processes.

5.1 Answers to research propositions

This section presents the answers to the research propositions.

P1: The resolution of the main identified relevant BPM issues improves the operational competitiveness of the electronics manufacturing company in the 2010s in a challenging and dynamic global business environment. This proposition is answered in Section 5.1.1 – “Main relevant issues in the BPM” – illuminating the accomplishments of the research work.

P2: The improvement of a sustainable competitive advantage can be achieved through BPR implementation in practice. This proposition is answered in Section 5.1.2 – “Business processes reengineering implementation in practice” – presenting briefly how BPR actions are performed in practice.

P3: The development of business processes significantly improves the company's competitiveness. Section 5.1.3 – “The development of business processes in order to significantly improve the company's performance” – briefly presents how the improvement of the BPR increases the company's performance and sustainable competitive advantage.

P4: The study's construction (Figure 2) confirms the existing BPR theory. Section 5.1.4 – “Construction created in the study to confirm the existing theory” considers how the created BPR concept confirms the existing BPR theory.

5.1.1 Main relevant issues in business process management (BPM) (P1)

The first research proposition (P1) is confirmed.

P1: The resolution of the main identified relevant BPM issues improves the operational competitiveness of the electronics manufacturing company in the 2010s in a challenging and dynamic global business environment.

Figure 19 presents the framework of the answer to P1.

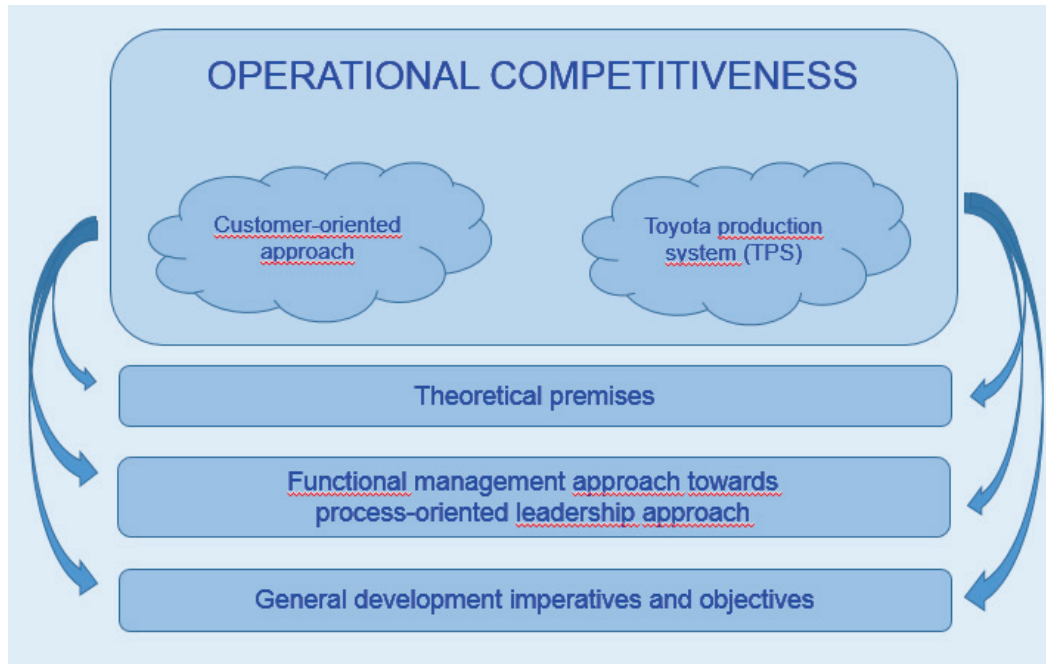


Figure 19. The framework of P1.

The company's business must be profitable in the long-term in order to maintain its vitality. In the worldwide competitive environment, a company must be able to challenge its rivals on issues such as product quality, customer orientation, product features, price and ability to deliver on some of the major issues mentioned.

We can consider operations in terms of product-oriented and customer-oriented marketing. Marketing focus has generally increasingly shifted towards a customer orientation and the customer-oriented company strives to maintain a product portfolio that meets the needs of its customers (Kotler 2003).

There may be good reason to consider how these features can be kept at a sufficiently high level in relation to competitors. Consider, for example, product quality – it can be approached from a least two perspectives, those of product

quality and of functional quality. During the 2000s, the issue of the customer's perception of quality has become increasingly important, which, in turn, has led companies' operations towards customer-oriented approaches.

The Toyota production system (TPS) is a management system created by the Toyota Motor Corporation. The process development approach known as lean manufacturing is the heart of TPS, whose main objective is to remove waste from the entire business process. The central idea of this process development system is to maintain a continuous learning culture by challenging employees from the plant floor level up to the company's management to grow through continuous work to resolve problems. The secret of Toyota's success is a genuine learning culture (Liker 2014). TPS can be considered as quite close to the resource-based approach through continuous personal development.

In the development of a business, it is inevitable that the company must change existing ineffective practices. Through change management, the company must make trade-offs between how major a shift the organization is seeking and the level of risk the company is willing to take.

Organizations must consider how dramatic the necessary change is. In such considerations, there are three important aspects to take into account: IT-based need; the risk level that organization can accommodate; and the degree of change that the organization expects. Each of these aspects must be considered individually and carefully. Aside from these aspects, organizations must also consider how dramatic the results they expect to achieve will be, what the timescale of improvement and change will be, and how much executive involvement must be ensured (Hanafizadeh et al. 2009).

The primary issue is how radical a change must be for it to make sense as a target. Organizational change must take into account the actual issues in the organization's operations that require attention. It has been said that radical change is often unavoidable in a BPR situation, with one scholar noting, "Business Process Reengineering means not only change -- but dramatic change" (Balasubramanian 2006). According the gurus in the field of BPR, while there are alternatives that companies can take in terms of small and continuous steps (Harrington 1992), radical change is defined as a new business model (Hammer & Champy 1993) or something between small and continuous steps and radical change (Davenport 1993, Childe 1995).

Quality management began to develop after the Second World War as a result of the work of quality gurus, W. Edwards Deming and J. M. Juran. The statistical process control approach was established even earlier, based on the doctrines of

Walter A. Shewhart. As a result of the work of Deming, quality management developed in the direction of connecting quality and systems theory. The Deming quality circle – plan-do-study-act –included feedback as an essential and important part of the systems theory approach. Professor Peter M. Senge, a developer of systems thinking in the 1990s, brought a complete mindset change to system theory. His amendment constituted a transition from an organization-oriented management style towards a process-oriented leadership style, which formed the basis for the TQM approach, now well known in quality management culture (Karjalainen et al. 2000).

The following stages of quality management development are BPR and BPM (Nadarajah et al. 2014).

The following general development imperatives and objectives were identified for the BPR project in the case company:

- o Growth: It was noted that the company faced a challenge in gaining enough production capacity to maintain OTD at a reasonable level.
- o Quality: Customers' perceptions of quality were identified as needing improvement.
- o Global responsibilities must be identified in portfolio management and the product and service creation (PSC) processes. This is a challenge for product and service development, and product maintenance activities.
- o The total productivity management (TPM) actions must be intensified. In the case company, the purpose of TPM is to improve operational excellence.
- o Sales must be expanded to cover solutions and services and move ahead in the value chain.
- o The capabilities of the processes must be identified in order to differentiate the company's products and services from its competitors.
- o These identified capabilities must be intensified to gain competitive advantage.
- o Processes must be based on customers' requirements – the company's main task is to create added value for the customer.
- o Information sharing must be executed in an effective and appropriate manner.
- o The processes' capabilities must be measured and maintained through regular procedures (Uusitalo 2013).

Considering the identified development objectives in article 3 of this study, as well as the above-mentioned literature sources regarding learning organizations, TPS, the customer-oriented marketing approach and the development of the quality approach towards today's BPM approach, it can be stated as a conclusion that very large-scale development action is needed where all processes of the case company are directed towards development actions. In other words, the approach is to optimize all processes of the entire case company. This is considered to be an answer to P1.

5.1.2 Business processes reengineering (BPR) implementation in practice (P2)

The second proposition (P2) is confirmed. The implementation of BPR in practice is an appropriate procedure for achieving the target of improving case company competitiveness.

The answer to P2 is addressed in this section by illuminating the study through the lens of achieved research results.

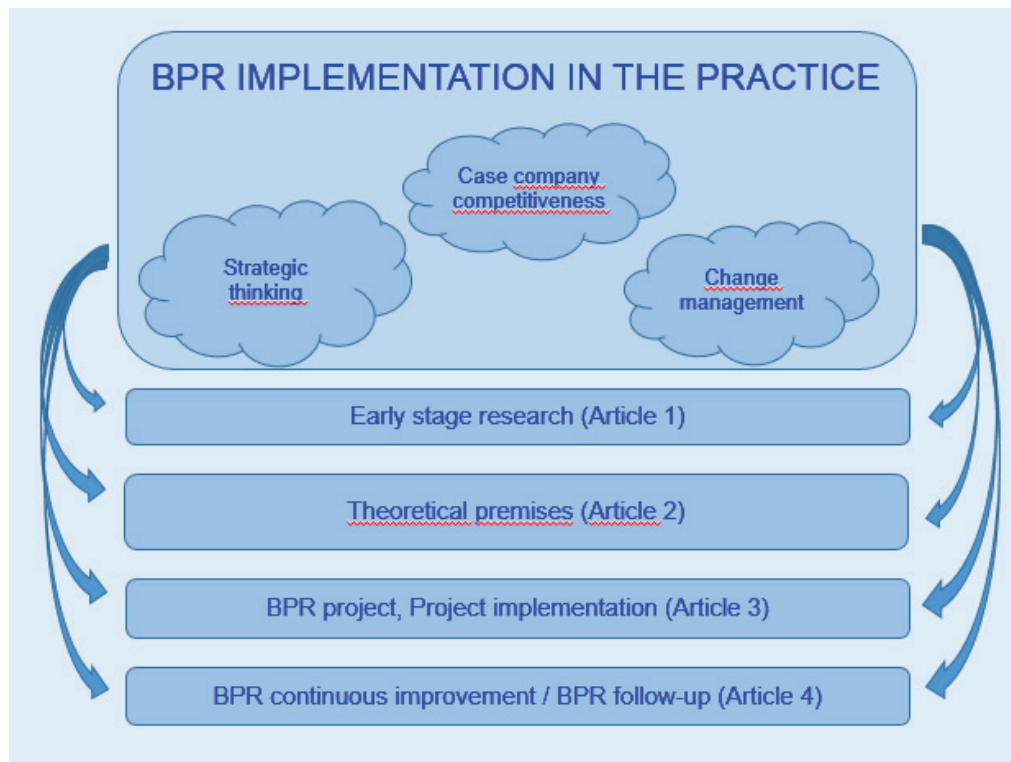


Figure 20. The P2 framework.

The first article identified the most critical areas of the case company for improvement, which in turn were utilized in workshops in order to define the

development areas and prepare for identification of the objectivities of development actions.

The most important development areas can be nominated according to the indication of the CFI product group for one item, Prod#3, and the KPI group for four items: KPI#2, KPI#3, KPI#4 and KPI#5. The direction of the experience development index has only two values, and while the index indicates deterioration for two factors (Process #8 and Personnel #3), all other indicate remaining at the same level or improving. The importance index indicates that Prod#3, with a value of 0.99, and KPI#2, with a value of 0.97, are more important than the others.

It is extremely important to identify and direct the development actions to the most critical development areas from the very early stages of consideration of development actions. This point is not much discussed in the literature, with most practitioners focusing more on the later stages of the development action, such as the process-oriented approach, how IT is positioned relative to planned initiatives or a tool or methodology that is planned to be implemented during the development project.

Thomas Grünberg (2004) is a rare exception in this regard, drawing attention to the early stages of research by presenting two questions: where should developments begin? How should development work be carried out? The first question refers to the fact that the initial phase aims to identify the most critical areas of quality development needing improvement, while the latter refers to the question of what kind of tool or development methodology should be pursued (Grünberg 2004).

Article 2 considers the importance of a strategic approach in the context of different BPR models through a review of the BPR literature and by presenting three different core processes used in the case company.

The indication and consideration of important drivers turns out to be important as an intermediate stage when identifying the neediest areas for development within the organization, for making preparations for launching development measures, and for establishing appropriate development tools and development methodology.

A strategic standpoint is one of the most important drivers for designing and implementing BPR activities. Identifying strategically important major issues is vital in the early stages of investigation and preparation of development actions. Important strategic factors, such as strong executive direction and support for

the change and a clear vision of breakthrough business goals, help to set the preconditions for successful development work. Another important factor at the early stage is analysis of the current business process status in order to identify those parts of the business processes that work well and those that do not (Muthu et al. 1999, Balasubramanian 2006).

Article 2 presents a holistic framework for the BPR methodology and the case company's requirements for the BPR. Some important points here are literature recommendations regarding methodology and the combination of these recommendations with company-specific issues, which are used in creating the BPR project plan and methodology, and determining the appropriateness of BPR information.

The focus of the theoretical viewpoint is on factors that support practical BPR implementation in the case company, rather than creating a completely new theory in the BPR realm. The intention is to apply BPR theory from the company standpoint, and ultimately, in the discussion section, to consider to what degree a new theory has been discovered.

It is important to clearly define the objectivities towards which an organization strives in order to successfully execute a BPR project. The difference between function- and process-based organizations has been defined. The limitations of function-based actions, like narrow targets and excessive focus on expense, thereby reducing resources for action, limit a corporation's chances for success. Meanwhile, process-based actions offer great potential for achieving financial and other measurable objectivities, as well as the capability to create added value for the customer and increase the customer's perception of quality.

The three core process models – CRM, PM and PDM – have been defined from the case company's perspective and a short description is also presented of each of the main activities of the core processes. The BPR framework is presented from the perspectives of several authors and the case company's main drivers. It is important to consider the BPR framework in a holistic manner. The presented models and case company's main drivers are the starting point for further case company-specific BPR methodology and BPR project definitions.

Article 3, and particularly section 3 of that article – "BPR FRAMEWORK" – first reviews the key issues of the preliminary study of the company's capabilities, discussed in the context of identifying organizational development actions and further identified through the process development objectives. Ultimately, at the end of the third section, BPR methodology development is considered. This is

followed by section 4 – “PROJECT IMPLEMENTATION” – in which WBS, pilot projects and an IT development project are introduced.

An important aspect of article 3 is its recapitulation of the research performed thus far and, from there, its identification of the practical implementation of BPR through methodology, pilot projects and IT development project.

In terms of time frame, the longest stage was the sixth phase: “work breakdown structure”. This stage can be considered to be the “development core” of the project. This stage began with the identification of existing processes, a review of the current operation, a detailed identification of current subprocesses, subprocess restructuring into a seamless entity, transition to a three core process model to replace the previous five core process model, identification and prioritization of development areas, and identification of the vision: "The road to the future".

As a result of these BPR activities, a process portal (based on the Microsoft SharePoint software), consisting of a process description section and an operational section, was designed and implemented. The processes are presented in a hierarchical manner, allowing users to drill down from the core process level into each subprocess. The operational section of the process portal provides all necessary functionality to run subprocesses in an operative manner.

Article 4 presents the practical implementation of the continuous improvement and follow-up measures. In accordance with the model set out in articles 2 and 3, a situation-specific BPR concept was created and, from there, the BPR project and continuous improvement practice were implemented. The strong customer orientation of this research is notable, with the context of the BPR concept being a key underlying factor (Uusitalo 2012, Uusitalo 2013, Uusitalo 2014).

The BPR concept consists of the following five sequential stages: preliminary study (article 1), BPR tool definition (article 2), BPR project definition and project implementation (article 3) and BPR continuous improvement / follow-up (article 4). The business development entity was implemented on the basis of the BPR concept, created in this study (Uusitalo 2013, Uusitalo 2014).

The concept formed for the development of BPR on the basis of this implemented project supplement the gap between BPR theory and empirical facts through a detailed description of the case study.

The framework of the study forms the BPR concept, developed, applied and tested in the case company development project. The business development BPR

concept was developed in a dynamic information age business environment in order to improve the company's competitiveness. This BPR concept complements the literature in this respect, and points to the development perspective according to which the starting point is the analysis of the unique situation of the case company and the development of a customer-oriented approach.

The BPR concept is examined in detail in article 4. Based on the study carried out, the simplified model of the BPR concept is shown in Figure 21.

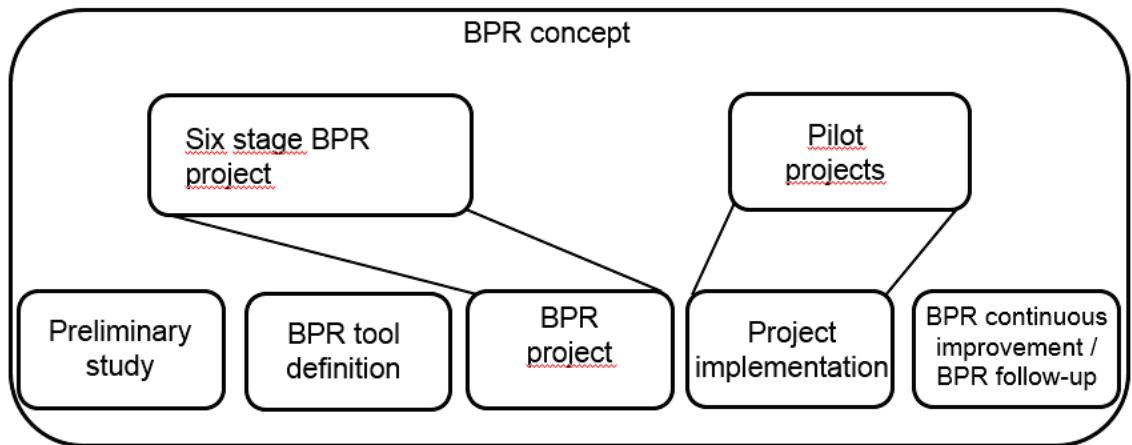


Figure 21. BPR concept.

5.1.3 The development of business processes in order to significantly improve the company's performance (P3)

The third research proposition (P3) is confirmed.

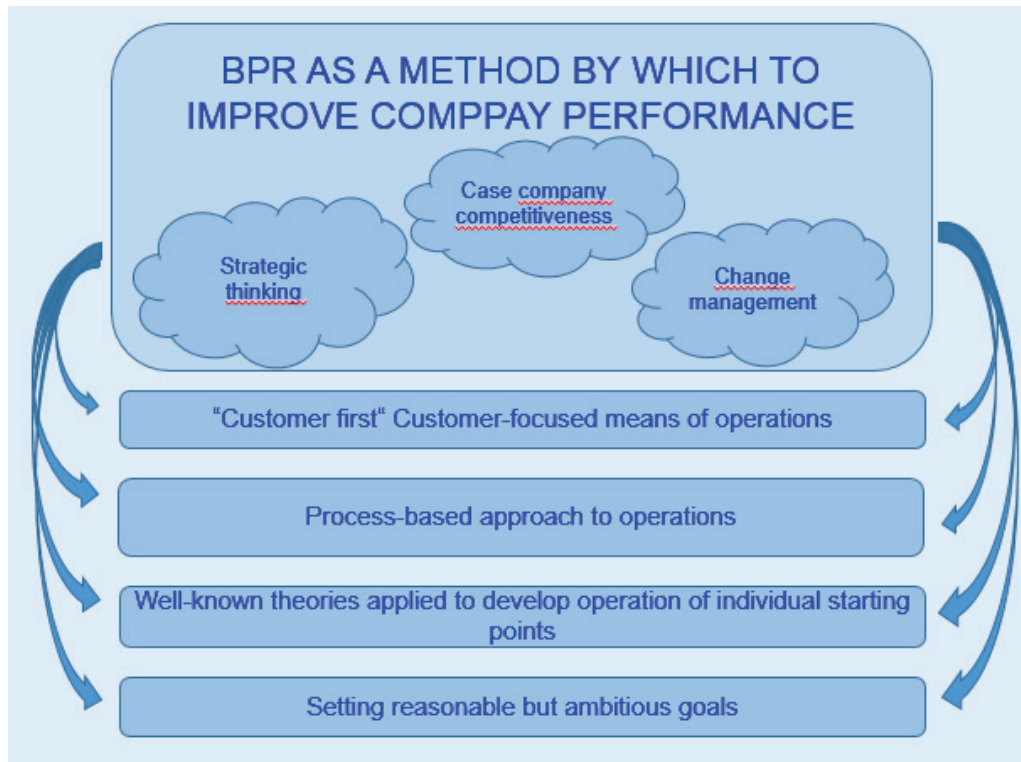


Figure 22. BPR as a method by which to improve company performance.

The choice to implement BPR turns out to be beneficial in terms of improving the case company's competitive advantage. The identified important areas – a process-directed rather than a function-based operation, a customer-first approach both regarding products and operations, and streamlined, seamless operating processes – are all necessary in order to improve the sustainable competitive advantage of the company.

Implemented development projects, based on the research results, achieved substantial progress in the development of the core processes and thereby improved the case company in terms of its competitiveness. It should be noted that the case company made a conscious decision to adopt the development measures with (minimal) reasonable risk, with proportionate achieved results.

According to business reengineering theory, the greater the risk the company is willing to accept in the implementation of development measures, the greater the major developmental leaps the company can achieve (Harrington 1992, Hammer & Champy 1993, Davenport 1993, Childe 1995, Balasubramanian 2006).

What are the expectations for the BPR project results? BPR has great potential for improving company capabilities through BPR activities in areas such as productivity, quality and customer satisfaction. This requires successful BPR

project planning and the capability of implementing fundamental changes. According to Al-Mashari and Zairi (1999), a survey revealed that many BPR projects fail despite the existing potential for successful BPR implementation.

5.1.4 Construction created in the study to confirm the existing theory (P4)

The fourth research proposition (P4) is confirmed.

The construction created in the study confirms the existing business reengineering theory, at least from the following perspectives: the systematic step-by-step approach based on the practitioners' literature, exploitation of IT opportunities and the process-oriented approach, the latter of which is, in turn, the basic prerequisite for sustainable competitive advantage in the information age business environment.

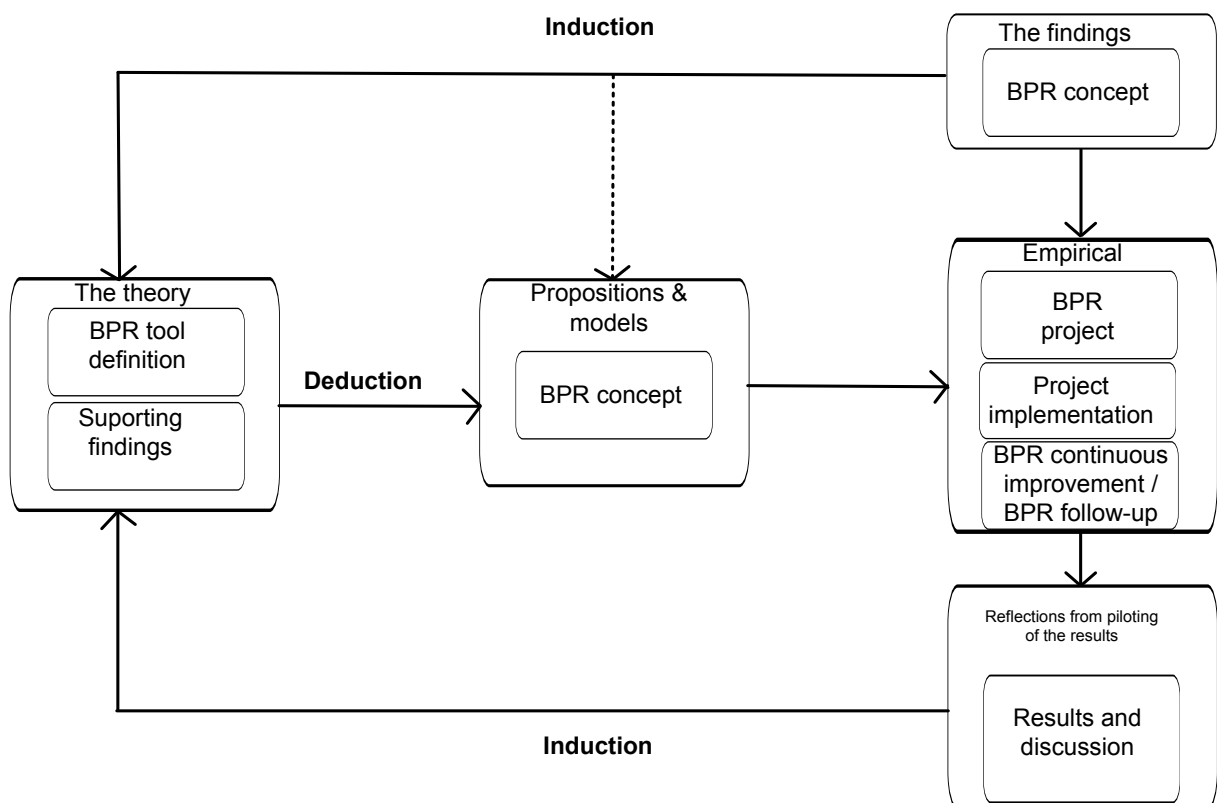


Figure 23. Modified model (Salmi & Jarvenpaa 2000).

Based on the study carried out by Salmi and Jarvenpaa (2000), resulting in the modified model shown in Figure 23, this study followed a systematic, step-by-

step approach, representing the dialogue between theory and practice from the perspectives of both induction and deduction. Al-Mashari et al. (1999) represent BPR in a holistic framework (Al-Mashari et al. 2001), followed by Kiiskinen et al. (2002), who divide BPR into five phases, Martola and Santala (1997) who add a sixth step – “readiness for change” – to their approach (Martola et al. 1997) and, finally, Balasubramanian (2006) presents the commonly used seven-step approach to BPR.

According to Hammer, Davenport and Short (1990), Hammer and Champy (1993) and Alter (1994), a successful BPR implementation program has great potential to improve the capability and profitability of a company. Since a BPR implementation is a risky endeavor and is prone to failure, it is important to draw up a proper project plan and be proactive in risk assessment (Al-Mashari and Zairi 1999).

Exploiting IT opportunities, Tinnila (1995) considers three important BPR perspectives concerning the operational BPR project approach: IT as an enabler, the potential of BPR redesign, and the role of business process as a unit of strategic planning. According to Davenport et al. (1990), IT can be considered from the perspective of analyzing and modeling process, on one hand, and as an active aspect of the operational activities of the process itself on the other (Tinnila 1995, Davenport et al. 1990).

The issue of process organization is considered in this study as a business process employed company-wide as a way to direct actions. The process in this case is defined as follows: an activity process is a set of interrelated activities and recourses by which operational results are achieved (Laamanen 2001). Companies must continually develop their activities in a constantly changing, intense and competitive business environment. Very often, operations are run with a too narrow target, setting the focus mostly on production and service functions. Often the time period for considering the results and setting targets is too short. Regardless, one fact holds true: in the long run, company success cannot be secured by reducing expenses alone. Companies must take corrective action in the long run by focusing on issues like customers' perceptions of value, real customer needs and the development of sustainable customer relationships that are based on competitive and customer-oriented products and services. Organizations in which operations are function-oriented rather than process-oriented suffer from weak communications between departments. In these organizations, operations work in the manner of silos, causing operational stagnation in the long run (Laamanen 2001).

Lean management is a mechanism whereby an organization boosts added value actions for the customer, diminishing non-value added actions (Hannus 1994). Al-Mashari classifies business processes into four groups: core processes related to business operations, support processes that ensure operational preconditions for core processes and functions, management processes related to organizing and controlling, and business network processes that take care of organizational boundaries (Al-Mashari & Zairi 2000). Customer-oriented, high capability processes, based on those processes that receive positive input from the customer, refine products and services in the customer's interest in a demand-driven manner (Laamanen 2001). Company core processes must be defined through value creation for the customer. Some common classifications for company core processes are PSC, CRM and SCM (Hannus 1994, Al-Mashari & Zairi 2000, Laamanen 2001).

5.2 Weak market test and semi-strong market test

The case company management identified that its customers sometimes encounter unwanted quality issues and variations in OTD. As a result of an identified shortfall between customers' perceptions of the company's expected and experienced capabilities, the case company management made a decision to prioritize the allocation of resources for a survey to analyze the case company's current status.

Based on the findings of that survey, the case company senior management defined preliminary expectations of how daily business should be executed. The following steps were to be considered concrete BPR actions in order to improve customer closeness, customers' perceptions of quality, and product quality.

The process reengineering project carried out in the case company consisted of two main steps: the BPR framework and the BPR project implementation.

The BPR framework consists of the following steps: preliminary study of the company's capabilities, identification of organization development actions, process development objectives, BPR development method and project objectives (article 1: preliminary study, article 2: BPR tool definition, article 3: BPR project).

The BPR project implementation consists of the following steps: WBS, pilot projects and IT development and further BPR continuous improvement / BPR Follow-up (article 3: BPR project, article 3: project implementation, article 4: BPR continuous improvement / BPR follow-up).

The first stage, BPR framework, represents the weak market test, while the BPR project represents the semi-strong market test (Kasanen et al. 1993).

6 SUMMARY OF THE RESEARCH RESULTS

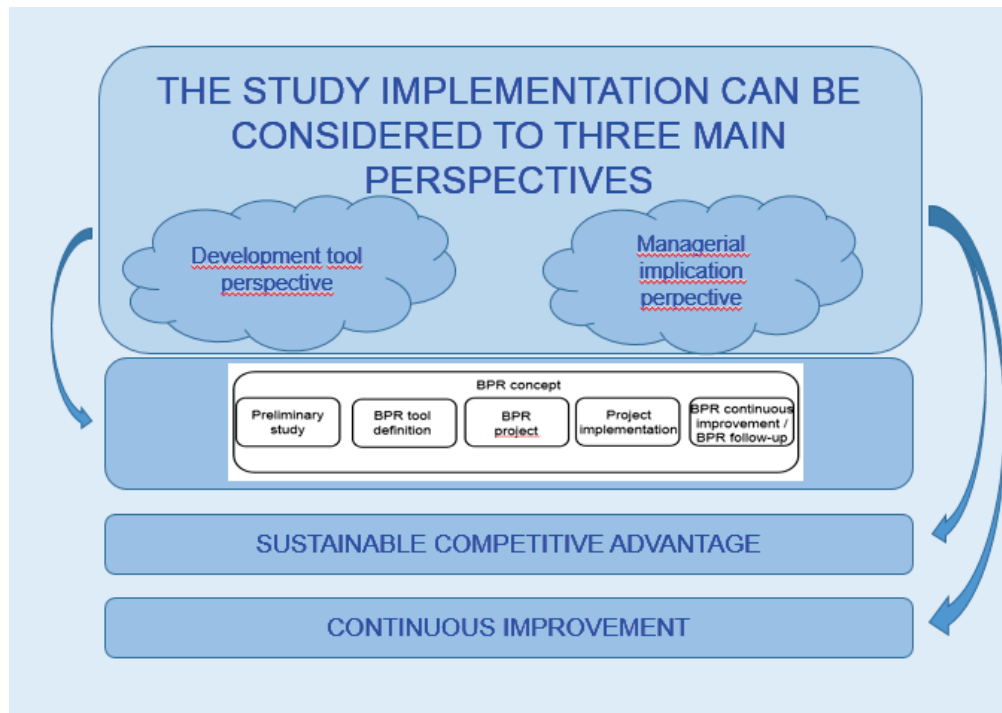


Figure 24. The three main perspectives of the study.

The constructive investigation seeks to establish a very pragmatic solution by creating a new construct. Based on the executed study, a combination of scientific research perspectives and a practical approach to development activities, namely the business development "BPR concept", was created.

Another dimension of the study is identified by considering the issue from another point of view, as part of the BPR concept – the construct of the business processes of the case company, which form in connection with reform of the processes.

Considering the study from a third perspective, the IT point of view, the interactive Microsoft SharePoint technology-based process portal was created as part of the BPR concept, which provided all necessary services for the execution of processes operatives.

A key objective of the study was to improve the company's competitiveness. The above-outlined constructions are basic prerequisites and enablers of business development. They are carried out as a result of strategic thinking, assessment

based on the case company-specific situation, the careful planning of project measures and successful change management.

The case company had already deployed a strong continuous improvement approach. In this study, the practice of continuous improvement of established processes and its effectiveness was directed by implementation of process management practices for the development of value-added processes. Significant added value for the development was achieved through systematic measurement of processes, evaluation, prioritization of development measures and the assurance of their compliance with the systematic development model.

7 DISCUSSION AND CONCLUSIONS

This chapter summarizes the contribution of the study, followed by discussions of its managerial implications, limitations of the study and, finally, suggestions for future research.

Competitive advantage in the competitive and networked environment of the 2010s is an extremely important issue for every company's survival. What follows are some thoughts about sustainable competitive advantage and the ideas regarding competition in the age of temporary advantage put forward by Fine (1998). An issue to consider is the fundamental phenomenon of competitive advantage in the age of the information society. Does sustainable competitive advantage emerge through steps taken to achieve temporary competitive advantage? If so, it means the company must strive to incorporate, step by step, elements of competitive advantage into its continuous improvement activities in the long run. The core of Fine's (1998) idea is that of product renewing cycle time, which in turn has significant influence on competitive advantage. At the larger scale, there is a question concerning differences between industry sectors in terms of the renewable speed rate of its products, process and organization (Fine 1998).

Considering the theoretical review and the results of this study, the company development framework can be presented according to Figure 25, where the x-axis represents the risk taken in implementing the development action and the y-axis represents the opportunity for business improvement.

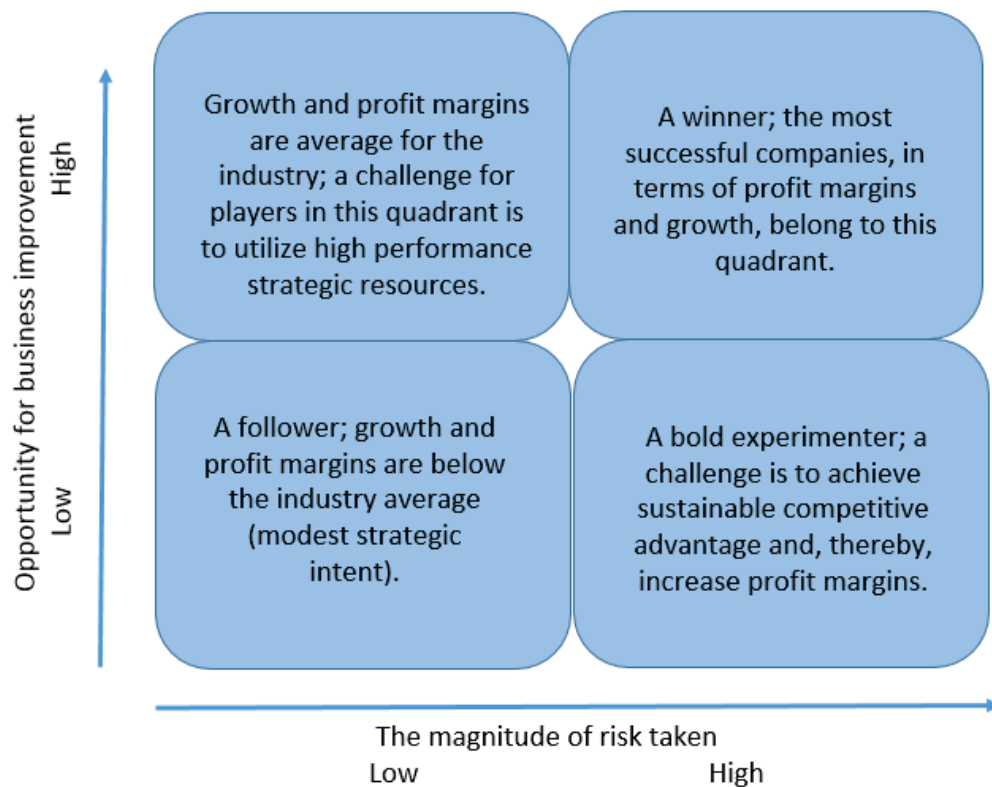


Figure 25. Opportunity for business improvement vs. risk taken.

This is a practical approach to the business development framework, offering a general understanding of the choice in terms of risks and opportunities that must be undertaken considering the company's development action.

In section 7.1, the contribution of the research to both the scientific field and the case company is discussed. Section 7.2 considers managerial implications through the perspectives of competitive advantage and the BPR concept. Section 7.3 presents the limitations of the study, considering sensitive information, the strategic intent and the definition of key development areas, while the final section, 7.4, presents suggestions for future research – how does the case company gain competitive advantage and how can profitable business growth be achieved?

7.1 Contribution

The contribution of this study is considered in terms of the importance of the research for science and for the case company.

Despite wide interest in the literature concerning customer closeness and customer orientation in general, this study complements the research of its field and literature, particularly through its detailed description and its comprehensive optimization of the entire scope of the company's operations.

7.1.1 Theoretical contribution

The theoretical contribution of this research is considered through the lens of specific important themes, such as business processes, company competitiveness, quality, BPR and strategic thinking.

When considering implementing BPR to increase company competitiveness, BPR must be directed towards a strategic position. According to Si et al. (2008), quality, customer focus and know-how are the three most important competitive priorities of manufacturing strategies (Si et al. 2008). According to the authors, there are four fundamental processes: technical, innovation, enabling and social. These are the processes on which the company must focus during BPR or redesign (Tinnilla 1995, Uusitalo 2012).

In the 1990s, attention was paid to strategy management, the efficiency of internal processes and organizational governance. At that time, there was a discussion regarding value creation and capture, as well as resource management concepts. Strategic management developed in two main directions. First, in the direction of structural analysis of industries and companies' positioning in the competitive field according to that analysis. Porter had a strong influence on this trend. Second, in the direction of the resource-based view or resource-based perspective. This affected the evolution of strategic thinking, especially in the 1990s (Wernerfelt 1984, Johnson et al. 1997, Powell 1995, Teece et al. 1997, Santalainen 2010, Uusitalo 2014).

Strategic management is seen as a way by which to obtain an important competitive edge over rivals in terms of positioning and customer-oriented operations. Strategic management comprises the following factors: a diverse and inspiring vision; the creation of the necessary set of core competencies; resource activation in the direction of the vision; and maintenance and strengthening of the company's competitive position by updating and developing resources. In-depth multidimensional change is called transformation. In his book, Santalainen (2010) writes that strategic management that resembles a radical transformation includes elements such as the following: business management, organizational structures and processes, culture, and people and processes (Santalainen 2010, Uusitalo 2014).

Teece et al. (1997) identify three existing strategic management paradigms:

- 1) The competitive forces approach, created by Porter (1980), which emphasizes creating defensive positions against competitive forces.
- 2) The strategic conflict approach, which pursues competitive advantage through strategic investments, pricing strategies, signaling and the control of information.
- 3) A resource-based perspective, which emphasizes efficiency and effectiveness.

Teece et al. (1997) consider the following question within the field of strategic management: what methods can a company apply in order to achieve and sustain competitive advantage? They answer this question through the dynamic capabilities approach, which emphasizes the development of management capabilities in the form of functional and technological skills in areas such as the management of R&D, product and process development, technology transfer, intellectual property, manufacturing, human resources and organizational learning. (Teece et al. 1997, Uusitalo 2014)

The initial study (article 1) surveyed the situation in the case company, identifying the most critical areas of quality development needing improvement. Quality, in this study, is considered to be a company-wide examination, covering all main processes and functions. The case organization had recognized a need for an investigation into its processes, reengineering with reference to customer closeness and cost of poor quality (COPQ) issues. Another matter that the organization had considered was the role of functions in relation to key processes, as well as how well the current key processes correspond to the current mode of action (Uusitalo 2011).

The concept of customers' perceptions of value refers to the benefits that are available to the customer through the business relationship. Kotler (2003) defines the customer's perception of value through total customer value, which is the monetary value of the perceived alternatives and the total customer cost. Kotler defines marketing, stating, "It is no longer enough to satisfy customers. You must delight them". A company must be able to build and maintain customer satisfaction, creating value in order to retain its customer and create new customer relationships by constantly improving and exceeding customer expectations (Kotler 2003). Lillrank and Holopainen (1998) define customers' perceptions of value as the result of improved quality and features, such as easy transactions (Uusitalo 2012).

David J. Teece (2010) considers the essence of a business model as aiming at achieving sustainable competitive advantage. He emphasizes the importance of addressing customer needs and capturing value from new products and services. In order to produce sustainable competitive advantage, the requirements of a competent business model are to be differentiated and difficult for competitors to replicate.

The business model describes key policies that are attuned to the customer value propositions. A good and well-functioning business model allows the company to gain competitive advantage. Competitors will start to apply the same business model elements fairly quickly - within a time period of up to one year. Imitation can be made more difficult by combining strategy analysis with business model analysis and from there differentiating the various market segments with segment-specific value proposition (Teece 2010).

7.1.2 Practical contribution

This study contributes to case company competitiveness through the following important aspects:

- o A strategic approach is an important dimension of designing and implementing competitiveness measures.
- o Customers' perceptions of quality are identified as an important key area in terms of improving overall added value creation for the customer.
- o Through a tendency towards a customer-oriented approach, the traditional functional management culture is directed towards a process management approach.
- o The concept of customers' perceptions of value is an important dimension of considering overall competitiveness development.
- o The methodology of the study follows the guidelines of the existing BPR theory, and its implementation is highly practical and situation-directed.
- o BPR development measures are applied in order to achieve competitive advantage in the competitive and networked environment of the 2010s.
- o The BPR concept represents an entity approach aimed at improving the competitive advantage (sustainable or/and temporally) of the case company.

o The results achieved in the study are verified with the weak market test (BPR project plan) and semi-strong market test (BPR project implementation).

The second research proposition in the results section highlighted the importance of early-stage research in terms of where and how to initiate the improvement actions. The initial phase also offers contributions to another dimension, namely identification of the importance of undertaking development actions. The company's management makes a decision, based on the initial mapping of the case company's competitive situation, either to proceed in undertaking development measures or that development measures are not needed.

Overall optimization is a key issue in the development of business processes. This fact has been central in this study (Uusitalo & Takala 2011, Uusitalo 2012, Uusitalo 2013).

Added value creation for the customer, in addition to a high-quality approach, is one of the most important premises for this study. The aim of the business development is to maintain the customer's perception of quality and sustain competitive advantage. Customer satisfaction is monitored through the net promoter score (NPS), which in turn indicates favorable development (Uusitalo 2014).

Through this study and the literature presented herein, it can be stated that added value creation is an important aspect of this field of science, and it is obvious that it is equally important from the case company's perspective. Added value creation is the goal of development measures, which in turn are fulfilled through long-term development work and by applying the appropriate development methods.

The study has been utilized in the BPR theory framework which has itself been widely discussed in the first and particularly in the second article (Uusitalo 2011, Uusitalo 2012). The theoretical premise is the BPR holistic framework put forth by Al-Masharin et al. (1999), as well as Hanafizadeh's BPR scale of the change approach and the BPR systematic approaches of Kiiskinen et al. (2002) and Balasubramanian (2006). The present study was combined with the above-mentioned theoretical literature in application to a case study, with a strong emphasis on situational factors, overall optimization of added value for the customer, and improved quality perceived by the customer.

Business development and improving the company's competitiveness by utilizing tools and methods suitable for the company's current situation represent the

visible part of the development measures. The implementation of the measures is accomplished through the work of the people. Furthermore, the chain of influence can be extended to these people's skills and abilities, which in turn compose the pool of the company's resources, which can be viewed through the resource-based management approach. The resource-based management approach of the company is maintained through strategic thinking (Wernerfelt 1984).

The competitive and networked environment of the 2010s, in which the company operates, dictates the required development measures at which the company should aim. As mentioned earlier in this study, the issue concerns the competitive situation between networks, rather than that between individual enterprises. This, in turn, directs the consideration of development actions at a wider scope. In considering development actions, a company must account for its value-added chain and, from there, focus on entity optimization rather than partial optimization.

The above idea, in turn, leads to another important point for observation, namely the individual circumstances of the company in the network and the network itself. The need for a contingency approach is strengthened through this study and reinforces the view that there are no universal common methods for gaining competitive advantage in the competitive networked environment of the 2010s.

The BPR concept has been applied by taking into account these company situation factors. This reinforces the view that contextual factors are an important dimension in the development of business processes. An antecedent of the created BPR concept is the indicated case company's key drivers for the BPR methodology (Uusitalo 2012) and the presented BPR literature of this study (Uusitalo 2012, Uusitalo 2013). According to contingency theory, there is no single universal concept of management for managing processes. It even potentially dangerous and harmful to directly copy the concept that another organization has successfully applied (Trkman 2010).

The results achieved in this study are verified with the weak market test (BPR project plan) and the semi-strong market test (BPR project implementation), presented in more detail in section 5.2.

With the help of this study, the case company has improved its competitiveness as measured by KPIs. The observed improvements that these KPIs indicate comprise all implemented corrective actions throughout the entire company.

To what extent improvement is attributable to this case study is difficult to estimate, such that measurement has not even been attempted. In any case, the development actions of this study, as presented in the results and discussion sections, are estimated to affect the long-term performance of the company, and it is thought that they will be indicated by KPIs within two to three years.

Within two years, operations have significantly improved in the following areas: profitability in terms of earnings before interest and taxes (EBIT) and productivity; customers' perceptions of quality as measured via the NPS indicator; product portfolio, which has been expanded with new products according to customer requirements; product and service delivery, which has been improved in terms of OTD percentage; and first pass yield (FPY), which is measured in terms of FPY percentage.

7.2 Managerial implications

The development of the company's business will inevitably encounter two basic questions: what is to be developed and how are development actions to be taken. The first question was investigated in the case company by carrying out a survey questionnaire, which offered an overview of the quality development requiring improvement. Based on this study, it was shown that the detail-specific focus of the development areas required intensive study, and an analysis of the organization's mode of action was initiated, with plenty of reflection on the various workshops.

The study provides a holistic approach to company operational competitiveness development actions for an electronics manufacturing company in a challenging and dynamic global business environment of the 2010s. Implications of the development actions taken can be considered from both the BPM and BPR perspectives.

The following considers the managerial implications of development actions taken in the three core processes: CRM, PDM and PM.

The most significant development measures in the CRM core process were carried out in the business enabling and business capture subprocesses.

The most important developments in the business enabling subprocess concerned aspects such as the categorization of services provided by the process renewal, improvement of KPI setting, illustration follow-up and agility in

reactions, cross-process communication improvement, and ownership clarification regarding roles and links to other processes.

The most important development area in the business capture subprocess can be said to be the systematization of processes into a unified functional entity, in which increasing revenue and customer satisfaction are two important areas of development.

The most significant development measures in the PDM core process were performed in the order and delivery subprocess and the ensuring testing capability subprocess. The most important development area in the order delivery subprocess is the improvement of OTD, while the most important development area in the ensuring testing capability subprocess is test yield improvement regarding final testing.

The development results achieved in the PM core process are considered via the product portfolio management, product ramp-up and product ramp-down subprocesses. The development of the product portfolio management process has intensified and systematized portfolio management. In terms of product sales and deliveries, two important aspects can be highlighted: the capacity to release new products, as well as the relocation of end-of-life products to post-manufacturing production.

The maturity of the current process is evaluated using a ten-step scale: 1) process ownership is defined; 2) process description is defined; 3) objectives are defined; 4) measurements are implemented; 5) continuous improvements are implemented; 6) cooperation within the organization is achieved; 7) global cooperation is realized; 8) trend analysis is implemented; 9) benchmarking by others is implemented; 10) success is achieved. The results indicated that the maturity of the processes before the implementation of the development project were between levels 3 and 5. Following the implementation, the results indicate some progress in terms of maturity, progressing from levels 3 and 5 to levels 4 and 6. In other words, it can be concluded that most of the measures are implemented in the processes in question (level 4) and, accordingly, many processes are successfully cooperating with other processes (level 6).

The BPR concept tool designed and implemented in this study has enabled a successful BPR project implementation. The BPR concept can be exploited within the case company in later process development actions, and also be applied more broadly to other companies. The BPR concept applies the counsel of the existing BPR literature, in particular through its detailed description, taking the company's contingency factors into account, and strongly focusing on customers

in order to realize added value for the customer and increase customers' perceptions of quality.

7.3 Limitations of the study

The case company's customer added value processes are the main object of the present study. Support processes and global business processes are excluded from the study. Process interfaces are taken into account to an appropriate extent for possible further development of processes.

The study is limited to the case company's business process development. A strategic management approach is adopted so as to develop BPM. Strategic management issues, such as product-related development issues, product market positioning and product features positioning according to customer preferences, are excluded from this study.

The study faced some limitations regarding classified, strategically sensitive managerial capability and other related information, as well as confidential financial information. It is clear that this will continue to be a challenge in the future for similar company-specific case studies.

It is open to consideration as to whether the strategic objectives of the case company were discussed in a sufficiently profound manner. There is a risk that the treatment of objectives such as improving cost efficiency, improving customer satisfaction, establishing market position and developing quality is too superficial.

The content of the strategic development objectives should be discussed in a sufficiently deep and detailed manner in order to get an understanding of what is meant by the identified development action (Laamanen 2005).

One limitation to finishing the research was that the case company underwent YT (yt-laki, Act on Co-operation within Undertakings) negotiations and, as a result, the researcher was dismissed.

7.4 Future research

Two particularly interesting questions for future research were identified: how can the company gain competitive advantage, and how can the company pursue profitable business growth by exploiting the achieved competitive advantage based on the present study?

An interesting research topic in the information age is the interaction between resource-based views and Porter's competitive strategies. In particular, an interesting aspect is how the resource-based management approach can efficiently improve competitiveness in the dimension of product and service strategies.

An underlying factor is the company's strategic thinking. One of the fundamental questions is whether the products and services competitive strategy definition should be implemented first (cost focus or differentiation, Porter 1985), or rather consideration of where to acquire the necessary capabilities and resources for the implementation of the strategy objectives. The resource-based approach is the idea that the company should maintain and develop its strategic competence and capability resources, which in turn are utilized in directing business strategy for new product and service areas (Santalainen 1990).

Further growth by taking advantage of the achieved competitive advantage is not the only relevant factor, of course. Growth in the electronics industry was very strong in the 1980s. Within a relatively short period of time, larger companies operating in the market gained significant differences in the growth rate. The strong US brands operating in the field lost their market share in relation to the faster growing Japanese companies (Prahalad 1993).

The case company of this study operates in a very competitive electric and electronic worldwide market, in which maintaining one's current market share is in itself a good performance, not to mention increasing market share. Regarding this company specifically, an interesting future research topic would be how the achieved improvements in competitiveness through developing business processes can be directed to profitable business growth.

7.5 Conclusions

Products, services, processes and organizations within companies are in a constant state of change, and necessarily so. People, know-how, capabilities and resources are the glue that holds the organization together amidst constantly changing circumstances, and maintains the companies' competitive factors, which are invisible and difficult for competitors to imitate.

Based on the present study, different types of organizations apply the theoretical framework of the BPR literature to the electric and electronics industry by expanding the model to cover internal customers, quality perspectives and the perspective of upstream (the flow of materials into the organization) and

downstream (the flow of materials from the organization to customers) value chains. This hopefully offers more alternative approaches and perspectives for future research in quality management and the field of BPR.

References

- Arbnor, I. & Bjerke, B. (1997). *Methodology for Creating Business Knowledge*. Sage Publications, London, UK.
- Al-Mashari M. and Zairi I. (1999). BPR implementation process: an analysis of key success and failure factors, *Business Process Management Journal*, Vol. 5 No. 1, pp. 87-112, MCB University Press, 1463-7154.
- Al-Mashari, M. & Zairi, M. (2000). Revisiting BPR: a holistic review of practice and development. *Business Process Management Journal*, Vol. 6, No. 1, pp. 10-42. MCB University Press, 1463-7154.
- Al-Mashari M., Zahir I. and Zairi M. (2001). Business process reengineering: A survey of international experience, *Business Process Management Journal*, Vol. 7 no. 5, pp. 437-455, MCB University Press, 1463-7154.
- Alasuutari, P. (2002). Tutkimuksesta kirjaksi. Teoksessa Merja Kinnunen & Olli Löytty: Tieteellinen kirjoittaminen. Tampere: Vastapaino, pp. 149-161.
- Alter, A. (1994). Re-engineering tops list again, *Computerworld*, Vol. 28 No. 5, January 31, p. 8.
- Balasubramanian, S. (2006). <http://hosteddocs.ittoolbox.com/SB41806.pdf>. Successful BPR Implementation Strategy 4/19/2006 by Dr. S. Balasubramanian for IT Toolbox Project Management.
- Beck, U. (1997). *What is Globalization?* Polity Press, Cambridge, UK. ISBN 0-7456-2125-2.
- Bligh, P. & Turk, D. (2004). *CRM Unplugged: Releasing CRM's Strategic Value*. John Wiley & Sons, Hoboken, New Jersey, US. ProQuest ebrary. Web. September 25, 2016. ISBN 9780471663836.
- Braziotis, C., Bourlakis, M., Rogers, H. & Tannock, J. (2013). Supply chains and supply networks: distinctions and overlaps. *Supply Chain Management: An International Journal*, Vol. 18, Iss. 6, pp. 644-652.
- Childe, S. J., Smart, P. A. & Weaver, A. M. (1995). *The use of generic process models for process transformation*. University of Plymouth, Plymouth, PL4 8AA, UK.
- Childe, S. J., Weaver, A. M., Maull, R. S., Smart, P. A. & Bennett, J. (1997). *The application of generic process models in business process re-*

engineering. University of Plymouth, Drake Circus, Plymouth, PL4 8AA, UK.

Castells, M. (1996). *The Information Age: Economy, Society and Culture*. John Wiley & Sons, West Sussex, UK.

Champy, J. A. (2003). Is technology delivering on its productivity promise? *Financial Executive* 19.7 (Oct 2003): pp. 34-39.

Chavez, R., Fynes, B., Gimenez, C. & Wiengarten, F. (2012). Assessing the effect of industry clockspeed on the supply chain management practice-performance relationship. *Supply Chain Management: An International Journal*, Vol. 17, Iss. 3, pp. 235-248.

Copeland, K. W. & Hwang, C. J. (1997). *Electronic Data Interchange: Concepts and Effects*. Accessed in February 2014: https://www.isoc.org/inet97/proceedings/C5/C5_1.HTM.

Crawford, S. (1980). *The Origin and Development of a Concept: The Information Society*. Bull. Med. Libr. Assoc, USA, Washington.

Davenport, T. H. & Short, J. E. (1990). The new industrial engineering: information technology and business process redesign. *Sloan Management Review*, Vol. 31, No. 4.

Davenport, T. H., Ernst & Young (1993). *Process Innovation: Reengineering Work Through Information Technology*. Harvard Business School Press Boston, Massachusetts.

Eppinger, S. (2011). *Technology Innovation and Industrial Management, TIIM2011 Oulu*. Keynote Speaker Prof. Steven Eppinger – “a world expert in product design and development”.

Eppinger, S. D. & Chitkara, A. R. (2006). The new practice of global product development. *MIT Sloan Management Review*. Vol. 47, No. 4.

Ghobadian, A. & Gallea, D. (2001). TQM implementation: an empirical examination and proposed generic model. *Omega, International Journal of Management Science*, Vol. 29, No. 4, pp. 343-359.

Fantazy, K. A., Kumar, V. & Kumar, U. (2009). An empirical study of the relationships among strategy, flexibility, and performance in the supply chain context. *Supply Chain Management: An International Journal*, Vol. 14, Iss. 3, pp. 177-188

Fine, C. (1999). *Clockspeed: Winning Industry Control in the Age of Temporary Advantage*. Cambridge, MA: Perseus Books Group.

Galetic, L., Maric, I. & Aleksic, A. (2002). HOW CONTINGENCY FACTORS DETERMINE ORGANIZATION: RE - EXAMINIG THEIR

INFLUENCE IN BUILDING ORGANIZATIONAL STRUCTURE. Enterprise Odyssey. International Conference Proceedings;2012, p125.

Grünberg, T. (2004). Performance improvement. *International Journal of Productivity and Performance Management*, Vol. 53, Iss. 1, pp. 52-71.

Hallavo, V. (2015). Superior performance through supply chain fit: a synthesis. *Supply Chain Management: An International Journal*, Vol. 20, Iss. 1, pp. 71-82.

Hammer, M. & Champy, J. (2001). *Reengineering the Corporation: A Manifesto for Business Revolution*. Collins Publishers, New York, USA. ISBN-10: 0-06-055953-5. Originally published: 1993.

Hanafizadeh, P., Moosakhani, M. & Bakhshi, J. (2009). Selecting the best strategic practices for business process redesign. *Business Process Management Journal*, Vol. 15, Iss. 4, pp. 609-62.

Hannus, J. (1994). *Prosessi johtaminen, ydinprosessien uudistaminen ja suorituskäytännöt*, Gummerus Kirjapaino Oy, Jyväskylä, ISBN 951-96708-0-7.

Hannus, J., Lidroos, J. & Seppänen, T. (1999). *Strateginen uudistuminen*. HM&V Research Oy, Helsinki. ISBN 951-98059-1-5.

Harmon, P. (2007). *Business Process Change: A Guide for Business Managers and BPM and Six Sigma Professionals (2nd Edition)*. Burlington, MA, USA: Morgan Kaufmann. ProQuest ebrary. Web. January 12, 2015. Copyright © 2007.

Harrington, J. H. (2012). *Streamlined Process Improvement*. The McGraw-Hill Companies Inc. USA. ISBN 978-0-07-176863-4.

Held, D., McGrew, A., Goldblatt, D. & Perraton, J. (1999). *Contents and Introduction in Global Transformations: Politics, Economics and Culture*. Stanford: Stanford University Press, pp. 1-31.

Hsu, L. & Chen, M. (2004). Impacts of ERP systems on the integrated-interaction performance of manufacturing and marketing. *Industrial Management & Data Systems*, Vol. 104, Iss. 1, pp. 42-55.

Ip, W. H., Chan, S. L. & Lam, C. Y. (2011). Modeling supply chain performance and stability. *Industrial Management & Data Systems*, Vol. 111, Iss. 8, pp. 1332-1354.

Ives, B., Jarvenpaa, S. L. & Mason, R. O. (1993). Global business drivers: aligning information technology to global business strategy. *IBM Systems Journal*, Vol. 32, No. 1, pp. 143-61.

Johanson G., Scholes K. (1997). *Exploring Corporate Strategy*. Prentice Hall Europe, Hemel Hempstead. ISBN 0-13-525635-6.

- Karjalainen, T. E. & Karjalainen, E. E. (2000). Laatujohtamisoppien (TQM) soveltamien PK-yritykseen. Quality Knowhow Karjalainen Oy. Salpausselän Kirjapaino Oy, Hollola.
- Kasanen, E., Lukka, K. & Siitonen, A. (1991). Constructive research approach in business science. *Liiketaloudellinen Aikakauskirja*, Vol. 40, Iss. 3, pp. 301-327.
- Kasanen, E., Lukka, K. & Siitonen, A. (1993). The constructive approach in management accounting research. *Journal of Management Accounting Research*, Vol. 5, pp. 241-264.
- Kiiskinen, S., Linkoaho, A. & Santala, R. (2002). Prosessien johtaminen ja ulkoistaminen, WSOY Helsinki, ISBN 951-0-27418-6.
- Kotler, P. (2003). *Marketing Management*. Pearson Education, New Jersey, USA. ISBN 0-13-049715-0.
- Laamanen, K. (2001). *Johda liiketoimintaa prosessien verkkona*. ISBN 952-5136-16-7.
- Laamanen, K. (2005). *Johda suorituskkyä tiedon avulla – ilmiöstä tulkintaan*. Suomen Laatuokeskus Oy. Tampere: Tammer-Paino Oy. ISBN 952-5136-27-2.
- Liker, J. K. (2014). *Toyotan tapaan*. Readme.fi. ISBN: 9789522202260.
- Lillrank, P. & Holopainen, S. (1998). Innovative organizational structures and performance: a case study of structural transformation to “groovy community centers”. *Journal of Organizational Change Management*, Vol. 11, No. 3, pp. 246-259. © MCB University Press, 0953-4814.
- Linturi, H. (2000). *Toimintatutkimus. NexusDelfix 2004*. Accessed in September 2014 from:
http://nexusdelfix.internetix.fi/fi/sisalto/materiaalit/2_metodit/5_actix?C:D=61566&C:selres=61566.
- Luftman, J. & Zadeh, H. S. (2011). Key information technology and management issues 2010–11: an international study. *Journal of Information Technology* Vol. 26, pp. 193-204 & *JIT Palgrave Macmillan*. All rights reserved 0268-3962/11.
- Lukka, K. (2001). *Konstruktiiivinen tukimusote*. Accessed in September 2014 from:
http://www.metodix.com/fi/sisallys/01_menetelmat/02_metodiartikkelit/lukka_const_research_app/kooste.
- Mackay, D., Bititci, U., Maguire, C. & Ates, A. (2008). Delivering sustained performance through a structured business process approach to management. *Measuring Business Excellence*, Vol. 12, Iss. 4, pp.22-37.

Martola, U. & Santala, R. (1997). *Liiketoimintaprosessit – BPR muutoksen johtaminen*, WSOY – Kirjanpainoyksikkö Porvoo, ISBN 951-0-21673-9.

Ministry of Finance Finland (2013). *Economic Bulletin*, 1/2013. Accessed in October 2015 from: <http://vm.fi/dms-portlet/document/0/381939>

Multimäki, M. (2003). *Standardin ISO 9001 soveltamismenetelmä*. ACTA WASAENSIA No 120. Accessed in September 2014 from: http://www.uva.fi/materiaali/pdf/isbn_952-476-029-0.pdf.

Muthu, S., Whitman, L. & Cheraghi, S. H. (1999). *Business Process Reengineering: A Consolidated Methodology*. Dept. of Industrial and Manufacturing Engineering. Wichita State University Wichita, KS-67260 0035, USA.

Nadarajah, D., Latifah, S. & Kadir, S. A. (2014). A review of the importance of business process management in achieving sustainable competitive advantage. *The TQM Journal*, Vol. 26, Iss. 5, pp. 522-531

Ojasalo K., Moilanen, T. & Ritalahti, J. (2009). *Kehittämistyön menetelmät. Uudenlaista osaamista liiketoimintaan*. WSOYpro Oy, Helsinki. ISBN 978-951-0-32671-8.

Park, M., Lee, D., Shin, K. & Park, J. (2010). Business integration model with due-date re-negotiations. *Industrial Management & Data Systems*, Vol. 110, Iss. 3, pp. 415-432.

Poirier, C. (2003). *Networked Supply Chain: Applying Breakthrough Business Process Management Technology to Meet Relentless Customer Demands*. Boca Raton, FL, USA: J. Ross Publishing. ProQuest ebrary. Web. January 21, 2015. Copyright © 2003.

Porter, M., E., (1980). *COMPETITIVE STRATEGY. Techniques for Analyzing Industries and Competitors With a new Introduction*. THE FREE PRESS A Division of Simon & Schuster Inc. 1230 Avenue of the Americas New York, NY 10020.

Powell, T. C. (1994). Untangling the Relationship Between Strategic Planning and Performance: The Role of Contingency Factors. *Canadian Journal of Administrative Sciences / Revue Canadienne des Sciences de l'Administration*, 11: 124–138. doi:10.1111/j.1936-4490.1994.tb00042.x.

Prahalad, C. K. (1993). The role of core competences in the corporation. *Research Technology Management*, Vol. 36, Iss. 6, ABI/INFORM Global.

Reichhart, A. & Holweg, M. (2007). Creating the customer-responsive supply chain: a reconciliation of concepts. *International Journal of Operations & Production Management*, Vol. 27, Iss. 11, pp. 1144-1172.

- Salmi, T. & Järvenpää, M. (2000). Laskentatoimen case-tutkimus ja nomoteettinen tutkimusajattelu sulassa sovussa. *Liikataloudellinen aikakauskirja* 2, pp. 263-275.
- Santalainen, T. (2010). *Strateginen ajattelu*. Tallentum, Helsinki. ISBN 978-952-14-1122-9.
- Santalainen, T. (1990). *Resurssijohtaminen, visiosta muutokseen ja tulokseen*. Wellin+Gröös, Gummerus Kirjapaino Oy, Jyväskylä.
- Si S., Takala J. and Yang L., (2008). Competitiveness of Chinese high-tech manufacturing companies in global context, *Industrial Management & Data Systems*, Vol. 109 No. 3, 2009 pp. 404-424, © Emerald Group Publishing Limited 0263-5577 DOI 10.1108/02635570910939416.
- Sikdar, A. & Payyazhi, J. (2014). A process model of managing organizational change during business process redesign. *Business Process Management Journal*, Vol. 20, Iss. 6, pp. 971-998.
- Sklair, L. (2002). Democracy and the transnational capitalist class. *International Political Science Review*, Vol. 23, Iss. 2, pp. 159-174.
- Sklair, L. (2000). The transnational capitalist class and the discourse of globalisation. Department of Sociology, London School of Economics and Political Science, pp. 67-85, London UK.
- Sokri, A. (2014). Military supply chain flexibility measures. *Journal of Modelling in Management*, Vol. 9, Iss. 1, pp. 78-86.
- Stalk, G., Evans, P. & Shulman, L. E. (1992). Competing on capabilities: the new rules of corporate strategy. *Harvard Business Review*, Vol. 70, March-April 1992, pp. 57-69.
- Svahn, S. & Westerlund, M. (2007). The modes of supply net management: a capability view. *Supply Chain Management: An International Journal*, Vol. 12, Iss. 5, pp. 369-376.
- Tanwar, R., (2013). Porter's Generic Competitive Strategies. *IOSR Journal of Business and Management (IOSR-JBM)* e-ISSN: 2278-487X, p-ISSN: 2319-7668. Volume 15, Issue 1 (Nov. - Dec. 2013), PP 11-17.
- Teece, D. J., Pisano, G. & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, Vol. 18, Iss. 7.
- Teece, D. J. (2010). *Business Models, Business Strategy and Innovation*. *Long Range Planning* 43 (2010) pp. 172-194. Published by Elsevier Ltd.
- Tinnilä, M. (1995). Strategic perspective to business process redesign. *Business Process Reengineering & Management Journal*, Helsinki, Finland, Vol. 1, Iss. 1, pp. 44-59.

Turkulainen, V. & Mikko Ketokivi, M., (2012). Cross functional integration and performance: what are the real benefits?". *International Journal of Operations & Production Management*, Vol. 32 Iss 4 pp. 447 - 467.

TYT (2008). Accessed in October 2014 from: <http://www.uta.fi/avoinyliopisto/arkisto/sosiologia/index.html>

Tofler, A. (1980). *The Third Wave*. Bantam Books, New York, USA. ISBN 0-553-24698-4.

Trkman, P. (2010). The critical success factors of business process management. *International Journal of Information Management* Vol. 30, pp. 125-134.

Wernerfelt, B., (1984). A Resource-Based View of the Firm. *Strategic Management Journal*, Vol. 5, No. 2. (Apr. - Jun., 1984), pp. 171-180.

Wong, C., Skipworth, H., Godsell, J. & Achimugu, N. (2012). Towards a theory of supply chain alignment enablers: a systematic literature review. *Supply Chain Management: An International Journal*, Vol. 17, Iss. 4, pp. 419-437.

Woodcock, N., Stone, M. & Foss, B. F. (2003). *Customer Management Scorecard: Managing CRM for Profit*. London, UK: Kogan Page. ProQuest ebrary. Web. September 25, 2016. ISBN 0 7494 3895 9.

Zairi, M. (1997). Business process management: a boundary less approach to modern competitiveness. *Business Process Management Journal*, Vol. 3, No. 1, p. 64.

Zhang, Q. & Cao, M. (2002). Business process reengineering for flexibility and innovation in manufacturing. *Industrial Management & Data Systems*, Vol. 102, Iss. 3, pp. 146-152.

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**A COMPETITIVE OPERATIVE MANAGEMENT SYSTEM IN THE
ELECTRONIC MANUFACTURING BUSINESS**

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ABSTRACT

The purpose of this case study is to create a competitive operative management system to enable efficiency and quality performance in a mid-sized electronic manufacturing company, and the product and service creation process for the globally competitive electrical markets.

Sense and Respond, a multi-criteria decision making method is used as a tool in this study, in order to define the most critical development areas in the business process redesign and quality, especially COPQ (Cost of Poor Quality) point of view.

A qualitative research method with multi-criteria decision making process has been created and utilized in order to collect data through in-depth expert interviews. The performance measurement and improvement system developed has been implemented into practice in the case company.

Keywords: performance management, multi-criteria decision making, competitiveness, quality, electronics manufacturing industry, production, product and service creation.

INTRODUCTION

The purpose of this study is to find the most critical areas of the quality development needing improvement. Quality in this study is considered as a companywide examination, all main processes and main functions are covered.

The Case organization had recognized a need for an investigation of the process re-engineering concerning customer closeness and COPQ (Cost of Poor Quality) issues. Another matter that organization had considered was the role of the functions in relation to the key processes and also how well the current key processes correspond to the current way of action.

The research theory is based on the method introduced by Takala and Rautiainen and later Ranta and Takala, providing a tool to measure and indicate the most critical development areas. The method measures responder's expectations and experiences of quality and process related issues. Difference between expectations and experiences together with the deviation of the answers determines the so called critical factors index. The critical factor index calculation is utilized by the methods presented later in this study. The critical factor index indicates the most critical areas that need further development and respectively indicates also areas that have enough actions. A questionnaire has also a part where the direction of the development is measured and this information is taken into account in a statistical

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calculation. Also the direction of the development of individual aspects is taken into account (Rautiainen, Takala, 2003; Ranta, Takala, 2007).

The data regarding the current situation of quality and process was collected through interviews with the case-company's employees. People of the organization that took part in the questionnaire, have been chosen on the principle that they represent either management function or expert function. The case-company, ABB Oy, Distribution Automation Finland (ABB/DA/FI), is a company which provides numerical protection relays for international markets worldwide.

The results of the research identify critical development areas of the organization. The results are not unambiguous and require interpretation. The results of the study have been considered through the experience of responders, the view points between different groups of responders and also the answers between different groups.

CUSTOMER SATISFACTION AND QUALITY STRATEGIES FOR THE ELECTRONIC MANUFACTURING BUSINESS

Numerical Protection Relay are considered as Intelligent Electronic Device (IED), which consists of electronics parts, such as analog and digital input and output device, large scale of different communication modules and intelligent software. An IED is placed in an operational usage part of a larger electrical distribution network or power systems in order to measure and control operations in a way that all abnormal situations are controlled according to pre-programmed parameters and intelligent software control (ABB, 2011).

ABB's Relion[®] product family consists of several product series, which cover a wide range of protection, control, measurement and supervision of power systems (ABB, 2011).

Quality is one of the key stones in the Electronic Manufacturing Business. The competitive advantage of a company depends on the quality of the manufactured IEDs, design of electronics and software of the IED, and the interface between other parts of the electric power network or power system devices (ABB, 2011). The Certified Quality Handbook categorized quality in Management and Leadership, The Quality System, Product and Process Design, Product and Process Control, Continuous Improvements and Quantitative Methods and Tools (Kubiak and Benbow, 2008). Quality is a diverged concept in a general point of view. Sometimes a simple question of "what is quality" is presented. Nowadays customer satisfaction is one of the paradigms that drive company actions. The research results indicate that quality conformance has a significant impact on the customer satisfaction (Maiga, 2004). Based on this, quality would be defined as follows: Quality is defined through customer's satisfaction. Kumar (S C Chen) & al represent in their article that a better customer satisfaction and business profit can be achieved by the high level product design, effective manufacturing and high level of service quality (Kumar et al 2009, 3). Gordon writes in his article as follow: "*Product delivery is the culmination of all of the business processes, and output is a measure of system capability*" (Gordon, 2008, 2). This has to be taken into account during optimizing of all processes instead of falling for sub-optimization.

Quality Tools serve many kinds of purposes. The case company has recently focused on the 4Q and 5S quality tools. 4Q is a problem solution tool, which brings a systematic way of actions in quality improvement. 4Q is an ABB internal quality tool which is quite close to the

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Deming PDCA –circle. The 4Q method consists of a four step circle: Measure, Analyze, Improve and Sustain (Praveen 2006). 5S is a systematic quality tool that consists of five stages following each other: 1. Sorting 2. Simplifying 3. Self-discipline 4. Sweeping and 5. Standardizing. The case company has a whole organization wide systematic implementation of the 5 S tool (Becker, 2001).

Total Quality Management is considered here as a company wide way of actions in all level of organizational actions. Definition for the Quality management according to the Enterprise Performance Management (2009): *“A management system that seeks the efficient achievement of the stakeholder expectations by focusing the efforts of every member of the organization on customer satisfaction and by using quality techniques in each of the sub - systems of the organization”* (EPM, 377).

Total Quality Management has two functional levels, a strategic and an operational level, and a third tactical level between. Based on “A Grounded Theory Research Study of Strategic Dynamics of Total Quality Management” (Leonard and McAdam, 2002; Leonard and McAdam, 2003), it can be founded on the above mentioned strategic drivers model for Total Quality Management, which is presented in Figure 1.

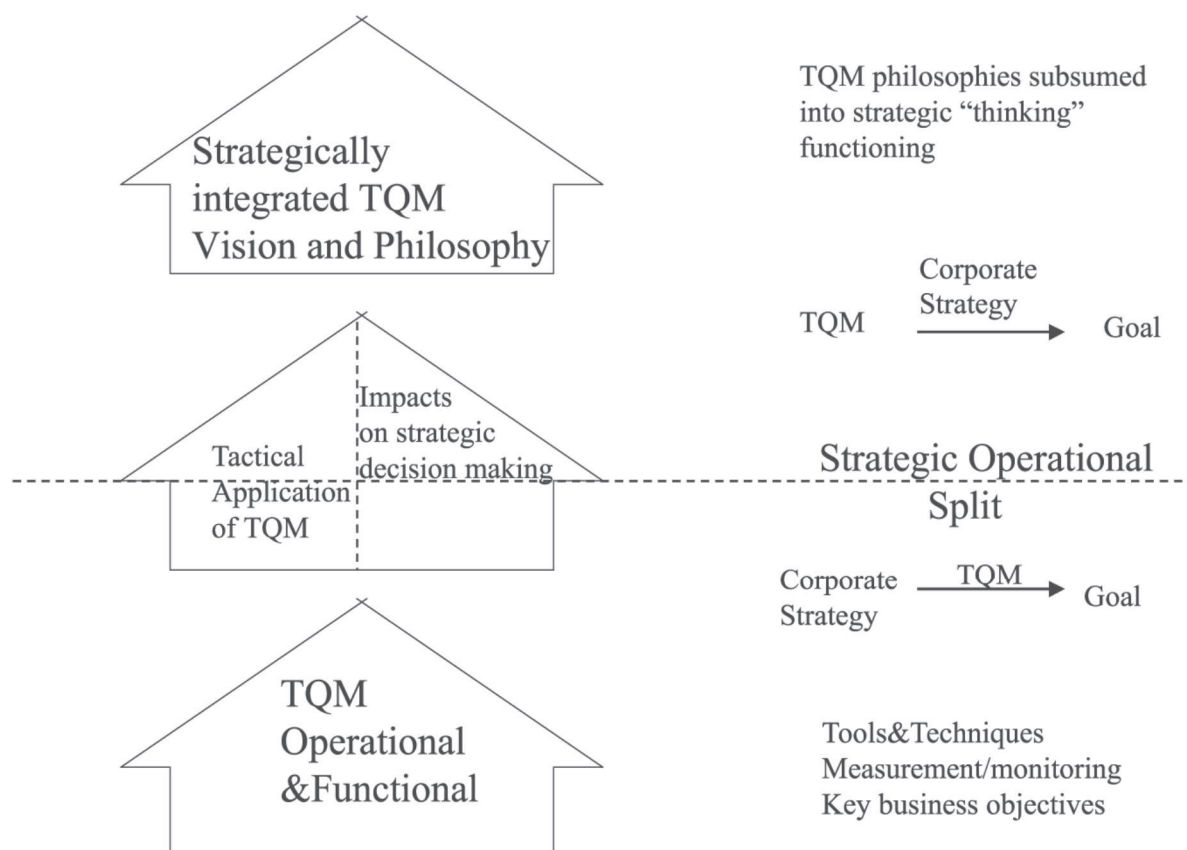


Figure 1: Strategic driver model for Total Quality Management (Leonard, McAdam, 2003).

Total Quality Management is basically a wholeness of how organization has organized its operations at the strategic level, for example a guideline of a matrix organization, where all the core actions of the company management are defined. Leonard and McAdam have defined a term “An Evaluative framework for TQM dynamics”, where the effect and dynamics of TQM in the organization are analyzed (Leonard and McAdam, 2003). Quality Management practices have a positive influence on the customer satisfaction, removing

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barriers between the individuals and departments, ensuring the company to achieve better productivity and business performance (Terziovski, 2006, 9). Markku Tinnila considers in his article the difference between Quality Management and Business Process Redesign. He argues that they both tend to improve efficiency and quality. Quality management improves through the TQM activities that company has, while Business Process Redesign covers also the definition of new ways of actions that have not been taken into account before (Tinnilla 1995, 4).

Business Process Redesign (BPR) is performed in order to achieve considerable improvements in the performance (Kallio et al 2002, 1). BPR has to be performed in an integrative and holistic way. Important aspects are processes, technology, organization structure, relationship and culture. The BPR definition is not unambiguous. There are different aspects of BPR. Some authors prefer more the customer aspect focusing on activities to provide adding value for the customer, while others prefer more process and measures of the activities varying according to the business area and the specific situation of a company. (Al-Mashari et al 2001, 1-3; Hustic 2009, 1-2). Tinnila emphasizes the importance of Information Technology (IT) as an enabler of the strategic planning and observation of the potential of BPR. The notion of functional departments and processes similarities is seen as an obstacle in the BPR performing (Tinnila 1995, 1).

When considering BPR activities, the company has to define, which particular part of the business process needs renewal and further more, what method should be used. It is quite common that the company has to resort to some external consultation (facilitator) during the BPR activities. The methods used during the consultation are based on experience or wisdom of best practices of the consultation partner (Mansar et al 2007). According to the article of Tom Dolan, benchmarking is the most common tool in the process improvement. Among other popular methods are cause and effect, analyze, change management, control charts and decision making. Besides the suitable methods, the company has to identify the main problem and how it effects matters such as customer satisfaction, employee involvement and financial returns. More significant issues in BPR are a visible top management support, effective and working cross functional team with enough wide representation of different parts of the organization and effective communication in all levels of the organization (Dolan et al 2003, 1-4).

When considering BPR in order to increase the company competitiveness, BPR has to be directed towards the strategic position. According to Si *et al.* (2008), quality, customer focus and know-how are the three most important factors of the competitive priorities of manufacturing strategy. (Si et al 2008, 4). According to the authors, there are four fundamental processes: technical, innovation, enabling and social, on which the company has to focus during business process re-engineering or redesign (Tinnilla 1995, 2).

Process organization is considered in this study as a business process, a companywide way of actions. The process in this case is defined as follows: Activity process is a group of logical operations and recourses to perform these actions in order to create results of the activities (Laamanen 2001).

Customer closeness is considered as well one of the key success factors during improving quality. Especially this has to be taken into account when a new expedient has to be found in order to find a way of action to improve ability to create added value for the customer. When considering the similarity between TQM, Six Sigma and Lean, one common

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denominator is customer satisfaction. All of these viewpoints tend to increase customer satisfaction by minimizing waste and resources (Andersson et al, 2006, 2-4).

BUILDING THE METHOD

The research method is mostly a case study in order to focus in one case company, but it also has the features of empirical, weak market test and constructive methods. Empirical material based on the questionnaire performed in the case company. The weak market test features represented by the question of how the implemented research methods suit to define the efficiency and quality performance for a company in a mid- sized electronic manufacturing business. A constructive method in this study represents the performed research method “Sense and Respond multi-criteria decision making”. The method used is performed in the same format as in earlier study in the literature, and this study does not contain any new application of the above mentioned research method.

The research theory is based on a method introduced by Rautiainen and Takala, which is a tool to measure the quality of service. Based on the calculated percentage values compared with competitors and direction of development, it measures expectations and experiences of the organization performance. The gap between the expectations and experiences, the direction of development and importance are calculated. Importance index measures the importance and pressure to improve (Rautiainen, Takala, 2003; Ranta, Takala, 2007).

The tools contain several indexes calculated from the results of the questionnaire. These tools are used to gain a more overall interpretation of the results. The research method includes averages and standard deviations calculation for all the measured attributes of the expectations and experiences. Standard deviations help to evaluate the validity and reliability of the results. Percentual figures are calculated from direction of the development and compared with competitors. Ranta and Takala have developed the Critical Factor Index (CFI). This index takes also the standard deviation of the expectations into account. The factors in the devisor are Importance index, which are the average of importance divided by ten, Gap index which measures the gap between the expectations and experiences and the Direction of development index (Rautiainen, Takala, 2003; Ranta, Takala, 2007).

$$\text{CFI} = \frac{\text{standard deviation of expectation} * \text{standard deviation of experience}}{\text{Importance index} * \text{Gap index} * \text{Direction of development index}}$$

Figure 2: CFI, Critical Factor Index (Rautiainen, Takala, 2003).

The first step of the used research method was to create a questionnaire that gathers the responder’s opinions. Each attribute was evaluated in four different ways: expectation, experience, compared with competitors and direction of development compared with time scale of 1 year and 2 years ago. To ensure that the reliability and validity was high, the questionnaire was short, clear and easy to answer. The more comfortable the questionnaire is to answer, the more reliable and valid the answer is. Rautiainen & Takala used a simple numerical estimation scale ranging from 1 to 10. The wide scale ranging from 1...10 makes it easy to find differences between the attributes. Figure 3 introduces how the information was gathered (Rautiainen, Takala, 2003).

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	Expectation Experiences		Compared with competitors			Direction of development		
	(1-10)	(1-10)	Worse	Same	Better	Worse	Same	Better
ATTRIBUTE 1			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ATTRIBUTE 2			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Figure 3: Questionnaire (Rautiainen, Takala, 2003).

The Attributes were categorized under four main categories: Process Capability with nine attributes, Product Capability with six attributes, Personnel Capability with five attributes, and Measures KPI's current status with nine attributes, all together 29 attributes. The four main categories mentioned represent the research area of the study. The questionnaire was executed via email by using an Excel form especially created for this purpose.

RESULTS

The questionnaire was directed to the experts and management for the following functions: Management, Operations, R&D department, Product and Portfolio Management, Sales & Marketing, Customer Support and Other Management. The questionnaire was delivered to 48 persons and 24 answers were received. The questionnaire was delivered by email. Answers' reliability would be increased by a personnel interview instead by sending it by email and this has to be considered in future for similar questionnaire. The answers are divided in to subgroup as follows (answers got / answers sent): Management 4/7, Operations 4 / 7, R&D 5 / 11, Product Portfolio Management 3 / 6, Sales&Marketing 2 / 8, Customer Support 4 / 8 and Other Management 2 / 8. Due to the partly low scope of the answers, Sales&Marketing and Other Management departments are left out of the department specific study. The scope of the rest department is also low, so only an indicative conclusion can be done whereas group all (24 / 48) has enough scope and statistical conclusions to be reliable.

95 % confidential level has calculated from all results according Table 1.

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Proc#1	Experiences	5,86	< P(n) <	7,32	Expectations	8,59	< P(n) <	9,41
Proc#2	Experiences	6,73	< P(n) <	7,71	Expectations	8,86	< P(n) <	9,48
Proc#3	Experiences	6,29	< P(n) <	7,35	Expectations	8,59	< P(n) <	9,41
Proc#4	Experiences	5,14	< P(n) <	6,94	Expectations	7,53	< P(n) <	8,73
Proc#5	Experiences	5,74	< P(n) <	7,22	Expectations	7,81	< P(n) <	8,80
Proc#6	Experiences	6,53	< P(n) <	7,73	Expectations	8,34	< P(n) <	9,14
Proc#7	Experiences	6,32	< P(n) <	7,78	Expectations	8,15	< P(n) <	9,22
Proc#8	Experiences	4,57	< P(n) <	6,21	Expectations	7,76	< P(n) <	8,76
Proc#9	Experiences	5,96	< P(n) <	7,49	Expectations	7,70	< P(n) <	8,67
Prod#1	Experiences	6,40	< P(n) <	7,78	Expectations	8,99	< P(n) <	9,71
Prod#2	Experiences	7,00	< P(n) <	8,04	Expectations	8,91	< P(n) <	9,61
Prod#3	Experiences	7,28	< P(n) <	8,20	Expectations	9,72	< P(n) <	10,02
Prod#4	Experiences	7,16	< P(n) <	8,65	Expectations	8,44	< P(n) <	9,27
Prod#5	Experiences	5,91	< P(n) <	7,22	Expectations	7,81	< P(n) <	8,88
Prod#6	Experiences	6,14	< P(n) <	7,69	Expectations	8,01	< P(n) <	8,95
Pers#1	Experiences	6,17	< P(n) <	7,57	Expectations	8,07	< P(n) <	8,89
Pers#2	Experiences	5,95	< P(n) <	7,35	Expectations	8,74	< P(n) <	9,43
Pers#3	Experiences	5,69	< P(n) <	7,44	Expectations	8,95	< P(n) <	9,66
Pers#4	Experiences	6,11	< P(n) <	7,37	Expectations	8,60	< P(n) <	9,23
Pers#5	Experiences	6,03	< P(n) <	7,45	Expectations	7,96	< P(n) <	9,00
KPI#1	Experiences	6,84	< P(n) <	8,03	Expectations	8,67	< P(n) <	9,59
KPI#2	Experiences	8,57	< P(n) <	9,26	Expectations	9,32	< P(n) <	9,99
KPI#3	Experiences	6,51	< P(n) <	7,58	Expectations	8,96	< P(n) <	9,58
KPI#4	Experiences	6,82	< P(n) <	7,71	Expectations	8,51	< P(n) <	9,28
KPI#5	Experiences	6,70	< P(n) <	7,74	Expectations	8,59	< P(n) <	9,00
KPI#6	Experiences	6,22	< P(n) <	7,48	Expectations	8,47	< P(n) <	9,23
KPI#7	Experiences	7,88	< P(n) <	8,66	Expectations	8,16	< P(n) <	9,38
KPI#8	Experiences	7,29	< P(n) <	8,27	Expectations	7,37	< P(n) <	8,63
KPI#9	Experiences	7,40	< P(n) <	8,42	Expectations	6,47	< P(n) <	8,34

Table 1: 95 % confidential level for all the answers.

Experiences variation min value is 1,80 and max value is 1,87 while Expectation variation min value is 0,30 and max value is 1,87 which are calculated according to Student's t-distribution.

All together the questionnaire consists of 29 questions categorized in four groups: Nine questions about the process, six questions about the product, five questions about the personnel, and nine questions about Key performance Indicators (KPI). The period of the question direction of the development and compared with competitor was considered in a time scale of two years; one year and two years ago. Time scale defining was based on the quite rapidly changing situations and the turbulent electronics manufacturing business.

Compared with competitors section, only our own personnel were asked, and therefore, it represents only an estimation of the customers' way of thinking. Due this limitation, the study sets more value on other parameters.

Table 2 shows the preliminary results analyzed by the methods introduced in this study.

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	Avarage of the Expectations (1-10)	Standard deviation of the Expectations	Avarage of the Experiences (1-10)	Standard deviation of the Experiences	(2)Direction of development index
Proc#1	9,00	0,93	6,59	1,65	0,82
Proc#2	9,17	0,72	7,22	1,13	0,48
Proc#3	9,00	0,95	6,82	1,22	0,61
Proc#4	8,13	1,39	6,04	2,08	0,87
Proc#5	8,30	1,15	6,48	1,70	0,87
Proc#6	8,74	0,92	7,13	1,39	0,78
Proc#7	8,68	1,21	7,05	1,65	0,50
Proc#8	8,26	1,05	5,39	1,72	1,11
Proc#9	8,18	1,10	6,73	1,72	0,95
Prod#1	9,35	0,83	7,09	1,59	0,70
Prod#2	9,26	0,81	7,52	1,20	0,65
Prod#3	9,87	0,34	7,74	1,05	0,96
Prod#4	8,86	0,91	7,90	1,64	0,62
Prod#5	8,35	1,23	6,57	1,50	0,87
Prod#6	8,48	1,08	6,91	1,78	0,65
Pers#1	8,48	0,95	6,87	1,60	1,00
Pers#2	9,09	0,79	6,65	1,61	0,83
Pers#3	9,30	0,82	6,57	2,02	1,13
Pers#4	8,91	0,73	6,74	1,45	0,87
Pers#5	8,48	1,20	6,74	1,63	0,91
KPI#1	9,13	1,06	7,43	1,38	0,96
KPI#2	9,65	0,78	8,91	0,79	0,61
KPI#3	9,27	0,70	7,05	1,21	0,91
KPI#4	8,89	0,81	7,26	0,93	0,95
KPI#5	9,00	0,84	7,22	1,06	0,89
KPI#6	8,85	0,81	6,85	1,35	0,70
KPI#7	8,77	1,38	8,27	0,88	0,68
KPI#8	8,00	1,28	7,78	1,00	0,94
KPI#9	7,41	2,11	7,91	1,15	0,50

Table 2: Experience figures.

The following represents some findings about above preliminary analysis. Critical values of the experiences indicated in red color hit on the following groups: Process two, Product one and one in Personnel group. Respectively the experiences on a good level are indicated in yellow: two in Product and the rest four yellow signs are in the KPI group. The conclusion of this is that the experience of KPI is seen to be on a good level. The process group needs some improvements and the group Product needs to be considered with further analysis because it has both red and yellow sign values.

Some more consideration are done according to the results in Table 3, where the left part of the Table 3 represents an Average of the Experience and the right side represents the result of Critical Factor Index (CFI). The results are represented from sub-groups Management, Operations, R&D, Product Portfolio Management, Customer Support and group All.

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	Average of the Experiences							Critical Factor Index CFI					
	Management	Operations	R/D	ProdPortFoMng	CusSupp	All		Management	Operations	R/D	ProdPortFoMng	CusSupp	All
Proc#1	6,50	6,00	7,20	6,67	6,00	6,59	Proc#1	1,41	1,72	0,53	0,89	#DIV/0!	1,67
Proc#2	6,50	7,75	7,60	7,67	7,33	7,22	Proc#2	0,52	3,92	#DIV/0!	0,00	1,02	1,54
Proc#3	6,25	6,75	6,60	7,33	7,33	6,82	Proc#3	1,59	1,25	2,13	1,65	1,45	1,74
Proc#4	5,00	6,00	6,00	6,33	6,67	6,04	Proc#4	8,76	1,62	1,50	2,23	0,64	3,38
Proc#5	5,25	6,00	7,00	7,67	6,33	6,48	Proc#5	2,63	2,32	1,19	0,70	0,84	2,28
Proc#6	7,50	7,00	7,00	7,00	7,33	7,13	Proc#6	1,92	1,07	0,67	0,43	0,00	1,60
Proc#7	7,00	7,00	7,20	8,00	7,00	7,05	Proc#7	3,49	2,02	1,49	9,92	1,02	3,95
Proc#8	4,00	5,00	5,00	6,50	6,50	5,39	Proc#8	1,19	1,40	1,49	0,00	1,21	1,53
Proc#9	6,25	6,50	6,60	7,67	7,50	6,73	Proc#9	3,96	1,55	3,44	0,69	0,00	2,11
Prod#1	6,75	7,50	7,00	6,67	6,67	7,09	Prod#1	#DIV/0!	1,75	1,03	2,37	0,56	1,66
Prod#2	8,00	8,25	7,20	7,67	7,00	7,52	Prod#2	1,49	2,82	0,56	1,85	0,00	1,37
Prod#3	7,50	7,50	7,80	8,00	7,67	7,74	Prod#3	0,00	0,00	0,21	0,38	0,43	0,32
Prod#4	8,75	8,00	8,40	8,50	8,00	7,90	Prod#4	2,10	1,11	1,01	3,17	0,00	2,49
Prod#5	5,25	6,75	6,60	7,33	7,00	6,57	Prod#5	3,47	1,15	1,64	2,28	0,57	2,16
Prod#6	6,25	7,00	7,00	8,00	6,67	6,91	Prod#6	7,49	2,52	1,76	5,32	0,76	3,01
Pers#1	7,00	7,75	6,60	5,33	7,33	6,87	Pers#1	2,68	3,05	0,40	0,98	0,68	1,54
Pers#2	6,25	6,50	6,60	6,33	7,67	6,65	Pers#2	2,13	1,01	0,83	0,70	1,05	1,37
Pers#3	6,00	6,50	6,40	7,00	7,00	6,57	Pers#3	1,07	0,00	0,86	2,41	0,00	1,24
Pers#4	6,75	7,75	6,40	5,67	7,00	6,74	Pers#4	2,70	0,45	0,70	0,52	0,61	1,13
Pers#5	5,75	7,50	7,00	7,33	7,00	6,74	Pers#5	3,31	1,87	0,83	2,43	1,98	2,15
KPI#1	7,50	7,00	7,60	6,67	7,33	7,43	KPI#1	0,00	0,71	1,08	3,54	0,25	1,42
KPI#2	9,00	9,25	8,80	8,67	9,33	8,91	KPI#2	0,00	0,00	1,10	0,24	1,07	0,97
KPI#3	6,50	7,00	7,40	7,33	7,00	7,05	KPI#3	0,77	0,00	0,00	1,98	0,43	0,83
KPI#4	7,25	7,25	7,00	7,33	9,00	7,26	KPI#4	1,65	1,49	0,25	0,22	#DIV/0!	0,77
KPI#5	6,50	7,25	7,00	7,33	9,00	7,22	KPI#5	0,94	1,73	0,00	0,54	#DIV/0!	0,95
KPI#6	6,25	7,00	6,60	7,67	7,00	6,85	KPI#6	4,01	2,31	1,60	0,70	#DIV/0!	1,47
KPI#7	8,25	9,00	8,20	7,67	8,50	8,27	KPI#7	0,94	2,57	0,22	3,48	1,32	1,94
KPI#8	8,75	7,25	7,60	6,50	8,00	7,78	KPI#8	1,49	2,43	0,53	1,82	#DIV/0!	1,67
KPI#9	9,25	8,25	7,40	8,33	7,50	7,91	KPI#9	#DIV/0!	3,83	1,38	3,77	#DIV/0!	6,89

Table 3: Average of experience and the Critical Factor Index.

The left part of the Table 3 represents the results of an Average of the Experience. Most of the red areas are on the process group with four red sign items and the personnel group with three red sign items. According to this finding, a conclusion can be made that Process and Personnel groups need corrective actions. The yellow sign of the groups Product and KPI indicates that respondents' experiments are on a good level.

The CFI values in the right side of the Table 3 are more disassembled. Dissection results of the lowest part of the Table 3 (KPI-values), it can be done at least to findings. First, the CFI results at the right and lower part of the Table 3 are quite opposite to the experiences at the left and lower part of the Table 3 where experiences results were in a good level meanwhile the CFI values include a lot of red values. Secondly, the upper part of CFI indicates also some red attributes, but also some yellow signs which represents a good result. The results have to be analyzed more analytically.

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+	STATUS	
Proc#1		NOK
Proc#2	OK	
Proc#3	OK	
Proc#4		CONFLICTING
Proc#5		NOK
Proc#6	OK	
Proc#7	OK	
Proc#8		NOK
Proc#9	OK	
Prod#1	OK	
Prod#2	OK	
Prod#3		NOK
Prod#4	OK	
Prod#5	OK	
Prod#6		CONFLICTING
Pers#1		NOK
Pers#2		CONFLICTING
Pers#3		CONFLICTING
Pers#4		NOK
Pers#5	OK	
KPI#1		NOK
KPI#2		CONFLICTING
KPI#3		NOK
KPI#4		NOK
KPI#5		CONFLICTING
KPI#6	OK	
KPI#7	OK	
KPI#8		CONFLICTING
KPI#9	OK	

Table 4: Summary of Table 3.

According to Table 4, represented summary is based on the results of Table 3, all attributes marked with yellow represent mostly good, attributes marked with red indicate improvement areas, and a new sign marked “CONFLICTING” with blue color indicate that these attributes have both red and yellow colors and based on this, the final improvements areas have to be defined according to the results of Table 5.

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	(2)Direction of development index	(3) Importance index	Critical factor index
Proc#1	0,82	0,90	1,67
Proc#2	0,48	0,92	1,54
Proc#3	0,61	0,90	1,74
Proc#4	0,87	0,81	3,38
Proc#5	0,87	0,83	2,28
Proc#6	0,78	0,87	1,60
Proc#7	0,50	0,87	3,95
Proc#8	1,11	0,83	1,53
Proc#9	0,95	0,82	2,11
Prod#1	0,70	0,93	1,66
Prod#2	0,65	0,93	1,37
Prod#3	0,96	0,99	0,32
Prod#4	0,62	0,89	2,49
Prod#5	0,87	0,83	2,16
Prod#6	0,65	0,85	3,01
Pers#1	1,00	0,85	1,54
Pers#2	0,83	0,91	1,37
Pers#3	1,13	0,93	1,24
Pers#4	0,87	0,89	1,13
Pers#5	0,91	0,85	2,15
KPI#1	0,96	0,91	1,42
KPI#2	0,61	0,97	0,97
KPI#3	0,91	0,93	0,83
KPI#4	0,95	0,89	0,77
KPI#5	0,89	0,90	0,95
KPI#6	0,70	0,89	1,47
KPI#7	0,68	0,88	1,94
KPI#8	0,94	0,80	1,67
KPI#9	0,50	0,74	6,89

Table 5: Direction of development index, Importance Index and Critical Factors Index (CFI).

The direction of the experience development index has only two values where the index indicates the worse development direction (Process #8 and Personnel #3), all other indicate to remain on the same level or to improve. The Importance Index indicates that Prod #3 with value 0,99 and KPI#2 with value 0,97 has more importance than other.

Finally the most potential development areas can be nominated according to the indication by CFI: Product group on one, item Prod#3 and KPI group four items: KPI#2, KPI#3, KPI#4, KPI#5.

The nominated most critical items are represented also on Figure 4 with red color and the respectively items in good situation are with yellow –color.

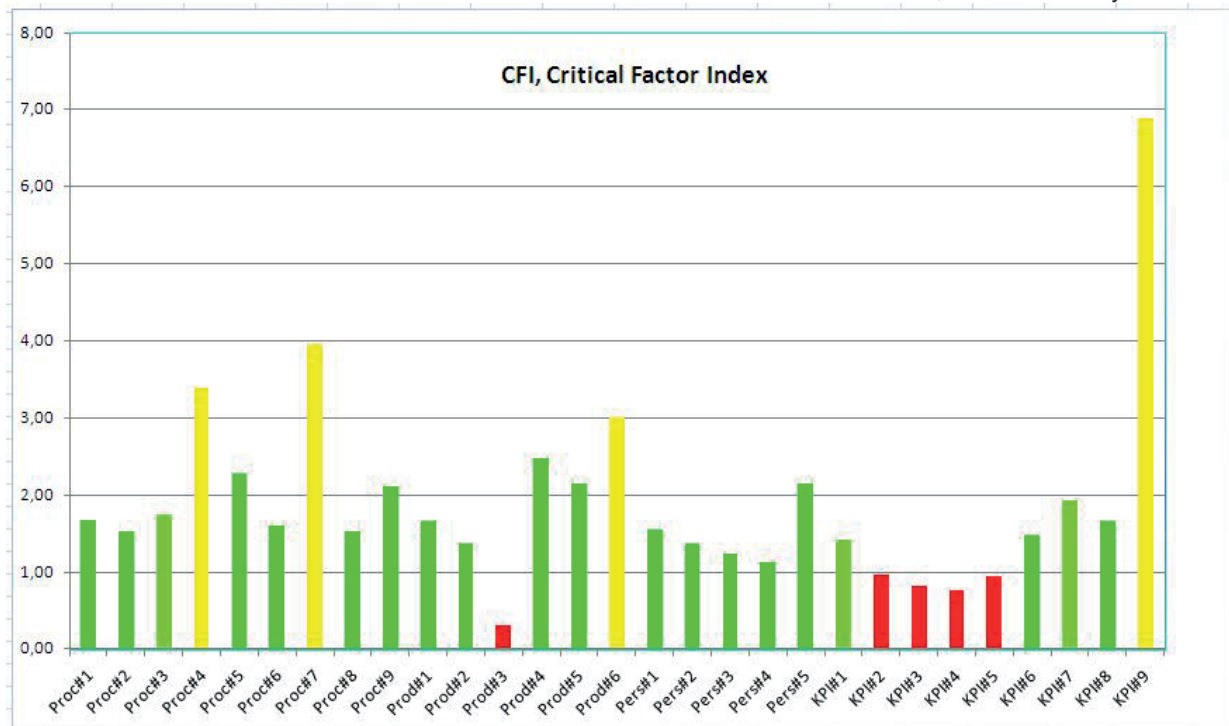


Figure 4: Results of Critical Factors Index.

UTILIZATION AND EVALUATION OF THE RESULTS

The evaluation of the weak market test question is how the method describes the development areas as expected. As mentioned, the study has some limitation on how much value can be set on the customers' way of thinking. Due to this limitation, more value has been set on the average of the experience, the direction of the development index and finally, in the CFI index.

The empirical material has partly low scope, especially with Sales & Marketing (two of eight responders) and Other Management (two of eight responders). Due to this limitation, only the results from Management, Operations, R&D, Product Portfolio Management and Customer Support departments are used in the analysis.

The Sense and Respond method has been basically used as in earlier studies. This study contains more comparison between the questionnaire groups and also between the departments. Also the answers received from the questionnaire have been tested by Student's t-distribution and 95 % confidential level has been calculated.

The differences between the different groups of organization on average of the experience and Critical Factor Index were large. One reason for the gap might be that different functions of the company are working independently. Actually the results from the business process re-engineering workshops performed in the company support thinking of this kind of way (the workshops are not presented in this study).

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The used Sense and Response research method identified the most important attributes which indicated low CFI values. Concerning the CFI and average of experience as most important result of the study, the study indicates the most critical development areas as written above based on information of Table 5 and Figure 4.

The major managerial implication of the study has been to specify the guidelines of the process redesign activities in the case company. Also the implemented study provided important information about essential themes, such as quality and customer closeness.

CONCLUSIONS

The focus of the questionnaire was very large and it gave a general view of the organization's status regarding its capability in general. The case organization had recognized a need for to investigate quality improvement actions. A fundamental way to perform the actions was an idea to improve performance by doing process redesign activities. The theoretical review at the beginning of the study gave fundamental information about Quality, Quality Tools, Total Quality Management, Business Process Redesign, Process Organization and Customer Closeness. Together, the empirical part of the study is based on the research on the Sense and Respond method. The theoretical review on the necessary areas gives a source of information for the case organization to go further with the business process redesign activities. The practical importance of the study delivers important information for Process Redesign in order to streamline the processes. Secondly the company has also set a target to increase registration and follow up of the COPQ expenses.

A further study is to investigate and perform Business Process Redesign activities based on these study and separately performed process workshops. After the Business Process Redesign activities have been taken into effect, it is recommendable to perform a Sense and Respond follow-up study. During the follow-up study it would be possible to take the improvements presented in this study into account.

REFERENCES

1. ABB (2011), <http://www.abb.fi>
2. Al-Mashari Majed, Zahir Irani, Zairi Mohamed (2001). Business process reengineering: A survey of international experience. *Business Process Management Journal* Vol. 7 no. 5, 2001, pp. 437-455. MCB University Press, 1463-7154
3. Andersson Roy, Eriksson Henrik and Torstensson Hakan (2006). Similarities and differences between TQM, six sigma and lean. *School of Engineering, University College of Boras, Boras, Sweden*. Vol. 18 No. 3, 2006 pp. 282-296 © Emerald Group Publishing Limited 0954-478X DOI 10.1108/09544780610660004
4. Becker E John (2001). Implementing 5S: To promote safety & housekeeping. *Professional Safety*; Aug 2001; 46, 8; ABI/INFORM Global pg. 29
5. Dolan Tom (2003). Best practices in process improvement. *Quality Progress*; Aug 2003; 36, 8; ABI/INFORM Global pg. 23
6. EPM (2009). *Management Accounting – Enterprise Performance Management*. The Institute of Cost and Works Accountants of India 12, SUDDER STREET, KOLKATA – 700 016
7. Gordon K Dale (2008). Product vs. System Quality. January 2008, *Quality Progress*; pp. 83-85. Jan 2008; 41, 1; ABI/INFORM Global pg. 83

TIIM2011 Conference Proceedings**31th March, 2011**

HKV, DIEM University of Oulu

8. Husic Igor, Gospodarstvo Nase (2009). A NEW MODEL FOR RENEWAL OF BUSINESS PROCESSES IN INNOVATIVE ENTERPRISES/Nov m.: NG; 2009; 55, 5/6; ABI/INFORM Global pg. 20
9. Kallio Jukka, Tinnila Markku and Anne Tseng Anne (2008) An international comparison of operator-driven business models. Helsinki School of Economics, Electronic Commerce Institute, Helsinki, Finland. Journal Vol. 12 No. 3, 2006 pp. 281-298 © Emerald Group Publishing Limited 1463-7154 DOI 10.1108/14637150610667962
10. Kubiak T.M and Benbow W Donald (2008). The Certified Quality Engineer Handbook, third edition. ISBN: 978-0-87389-745-7
11. Kumar Vinod, Choisine Franck, Grosbois de Danuta, Kumar Uma (2009). Impact of TQM on company's performance. International Journal of Quality & Reliability Management Vol. 26 No. 1, 2009 pp. 23-37© Emerald Group Publishing Limited 0265-671X DOI 10.1108/02656710910924152
12. Laamanen Kari (2001). Johda liiketoimintaa prosessien verkkona. ISBN 952-5136-16-7
13. Leonard Denis, McAdam Rodney (2002). The strategic dynamics of total quality management: A grounded theory research. Quality Management Journal; 2002; 9, 1; ABI/INFORM Global pg. 50
14. Leonard Denis, McAdam Rodney, Reid Renee (2002). A grounded multi-model framework for TQM dynamics. The International Journal of Quality & Reliability Management; 2002; 19, 6/7; ABI/INFORM Global pg. 710
15. Maiga S Adam, Jamar J, (2004). Effects of Management Control Systems on Manufacturing Performance: A Path Analytical Model. JAMAR Vol. 2 Number 1 2004
16. Mansar S Limam, Reijers H. A (2007). Best practices in business process redesign: use and impact. Business Process Management Journal Vol. 13 No. 2, 2007 pp. 193-213 © Emerald Group Publishing Limited 1463-7154 DOI 10.1108/14637150710740455
17. Praveen Gupta (2006). Beyond PDCA-A New Process Management Model. Quality Progress; Jul 2006; 39, 7; ABI/INFORM Global pg. 45
18. Ranta J-M. Takala J (2007). A Holistic method for finding out critical features of industry maintenance services. IGSS Journal Paper.
19. Rautiainen, M, Takala, J. (2003). Measuring Customer Satisfaction and Increasing It by Choosing the Right Development Subjects. International Journal of Business Performance Measurement
20. Si Subin, Takala Josu and Liu Yang (2008). Competitiveness of Chinese high-tech manufacturing companies in global context Shubin Si Department of Industrial Engineering, Northwestern Polytechnical University, Xi'an, People's Republic of China, and Josu Takala and Yang Liu. Industrial Management & Data Systems Vol. 109 No. 3, 2009 pp. 404-424 © Emerald Group Publishing Limited 0263-5577 DOI 10.1108/02635570910939416
21. Terziovski Mile' (2006). Quality management practices and their relationship with customer satisfaction and productivity improvement. Management Research News Vol. 29 No. 7, 2006 pp. 414-424 © Emerald Group Publishing Limited DOI 0.1108/01409170610690871
22. Tinnilä Markku (1995). Strategic perspective to business process redesign. Helsinki School of Economics, Finland. Business Process Re-engineering & Management Journal, Vol. 1 No. 1, 1995, pp. 44-59. © MCB University Press, 1355-2503. Management Decision; 1995; 33, 3; ABI/INFORM Global pg. 25

BUSINESS PROCESS REENGINEERING IN THE ELECTRONIC MANUFACTURING BUSINESS

Terho Uusitalo¹

Abstract

The purpose of this case study is to create a competitive operative management system to enable efficiency and quality performance in a mid-sized electronic manufacturing company and the product and service creation process for the globally competitive electrical markets.

The action research method is used in this study to define the most critical development areas in the business process of redesign, increasing customer closeness and customer perceived quality.

A qualitative research method with interviews and workshops was created and utilized to collect data through in-depth expert interviews. The Process Reengineering and Methodology developed has been implemented into practice in the case company.

Keywords: Business Process Reengineering, Business Process Management, Change Management

1. Introduction

The purpose of this study is to identify the most critical areas of the workflows and processes needing improvement and to create an appropriate methodology to implement a business process reengineering (BPR) project. Customer perceived quality in this study is considered as a company-wide examination, and all main processes and main functions are covered.

The case organization had recognized the need for an investigation of process reengineering, specifically as it concerned customer closeness and customer perceived quality. Another matter that the organization had considered was the role of the functions in relation to the key processes and also how well the current key processes correspond to current operations.

The author has worked as a project manager in a process reengineering project, and this study is a report on process reengineering in the case company. strategic approach was taken into account in the case company's project, as well as in this report.

The research's purpose is to define the BPR initiatives taken to increase the economic value of the company by streamlining its processes toward more customer-focused actions. The research method is mostly an action research method based on the concepts of process reengineering and change management. In this research, we note that case is a weak feature of constructive research method due to its process development methods.

In the first section there is a literature review of interesting and important aspects of BPR from the case company point of view. The literature review attempts to identify a theory that appropriately defines the framework of BPR definitions in the case company. The end of the first section considers a three-core processes model as it reflects on the needs of the case company.

The second section presents a holistic framework of the BPR methodology and the case company requirements for the BPR. Important viewpoints herein are to consider literature recommendations for methodology and to combine those recommendations with company specific issues used in creating the BPR project plan and methodology and determining the appropriateness of BPR information.

The case company made a managerial decision to implement Total Productivity Management (TPM) as a management tool to boost its operative and strategic excellence. In the third section, there is a literature review focused on TPM, while the later sections consist of the research results, an examination of those results, and a discussion on the potential for further research.

The following research questions for the study were presented:

1. What is the appropriate BPR methodology for process activation in the case company?
2. What are the most common pitfalls that have to be avoided and what are the possible success factors to be boosted during BPR activities?

2. General BPR basis

The intention of this literature review is to find important aspects from the BRP area in order to support BPR activities planned to be performed in the case company. The focus of the theoretical viewpoint is on issues that support practical BPR implementation in the case company rather than to create a totally new theory of the BPR area. The intention is to apply BPR theory from the company standpoint, and finally in the discussion section to consider to what degree a new theory has been discovered.

Important viewpoints that might be utilized in the methodology include: customer perceived value; customer closeness; change management; how radical is the expected

change; who are the stakeholders to be taken in the account; what are the expectations for the BPR project and for the personnel; whether to eliminate non-value added work; whether to remove functional silos; how to strengthen processes to work in more cross functional manner; what are the strategic initiatives and objectivities; what are the BPR success factors and respectively pitfalls; and what is the timescale for the BPR activities.

Business Process Redesign. BPR is performed in order to achieve considerable improvements in business performance (Kallio et al., 2002). BPR has to be performed in an integrative and holistic way. Important aspects are processes, technology, organization structure, relationship, and culture. The BPR definition is not unambiguous, as there are different aspects of BPR. Some authors prefer the customer aspect, focusing on activities to provide added value for the customer; others prefer to focus on process and measures of the activities, varying according to the business area and the specific situation of a company (Al-Mashari et al., 2001; Husic, 2009). Tinnila (1995) emphasizes the importance of information technology (IT) as an enabler of the strategic planning and observation of the potential of BPR. The notion of functional departments and similarity of processes is seen as an obstacle to BPR performance.

When considering BPR activities, the company has to define which particular part of the business process needs renewal; furthermore, it needs to define what method should be used to achieve that renewal (Mansar and Reijers, 2007). It is quite common that the company has to resort to external consultation (facilitator) during the BPR activities. The methods used during the consultation are based on the experience or wisdom of best practices of the consultation partner. According to Tom Dolan (2003), benchmarking is the most common tool in process improvement. Among other popular methods are cause and effect analysis, change management, control charts, and decision-making support tools. Besides the appropriate methods, the company has to identify the main problem and its effects in matters such as customer satisfaction, employee involvement, and financial returns. More significant issues in BPR are the visible support of top management, an effective and cross-functional team across the organization, and effective communication at all levels of the organization (Dolan, 2003).

When considering implementing BPR to increase company competitiveness, BPR has to be directed towards a strategic position. According to Si *et al.* (2008), quality, customer focus, and know-how are the three most important factors of the competitive priorities of manufacturing strategy (Si et al., 2008). According to the authors, there are four fundamental processes: technical, innovation, enabling, and social. These are the processes on which the company has to focus during business process reengineering or redesign (Tinnilla, 1995).

Process organization. The issue of process organization is considered in this study as a business process employed companywide as a way to direct actions. The process in this case is defined as follows: Activity process is a set of interrelated activities and recourses to achieve operational results (Laamanen, 2001).

Companies must continually develop their activities in a constantly changing, intense, and competitive business environment. Very often the operations are run with a too

narrow a target, setting the focus mostly on production and services functions. Often the time period for considering the results and the target setting is too short. Regardless, one fact holds true: In the long run company success can't be secured only by reducing expenses. Companies must take corrective action in the long run by focusing on issues like customer perceived value, real customer needs, and the development of sustainable customer relationships that are based on competitive and customer-oriented products and services. Organizations in which operations are of a more functional manner instead of a process-oriented operation suffer from weak communication between departments. In these organizations, operations work in the manner of silos, which causes operational slowness in the long run (Laamanen, 2001).

The scope of the change project:

- a) Strategic projects – changing the business
- b) or operational projects – changing the business processes

Depending on the project scope, project initiatives, triggers, and the expected project outcomes have to be considered in the project definition (Kallio et al., 2002).

Three perspectives to business processes. Tinnila (1995) mentions three important BPR perspectives concerning the operational BPR project approach: IT as an enabler, the potential of BPR redesign, and the role of business process as a unit of strategic planning.

Methodology. For BRP activities to be considered from the company-specific starting point, there exist plenty of different models and methodologies in the literature. The maturity and construction of the company processes is a mandatory factor when considering a methodology for BPR activities in the company (Childe et al., 1995)

Organizational change. This issue asks how radical must the change be for it to make sense for a target. Organizational change has to take into account what are the actual issues in the organization's operations that must change. It has been said that radical change is often unavoidable in a BPR situation, with one scholar noting, "Business Process Reengineering means not only *change* -- but *dramatic change*" (Balasubramanian, 2006). According the gurus in the field of BPR, while there are alternatives that companies can take in terms of small and continuous steps (Harrington, 1992), radical change is defined as a new business model (Hammer & Champy, 1993) or something between small and continuous steps and when radical change is involved (Davenport, 1993; Childe, 1995). The dominant culture in the organization is an important factor that affects management's ability to implement organizational change (Al-Mashari and Zairi, 1999).

What are the expectations for BPR project results? BPR has great potential for improving company capability through BPR activities in areas such as productivity, quality, and customer satisfaction. This requires successful BPR project planning and the capability of putting forward fundamental changes. According to Al-Mashari and Zairi (1999), a survey revealed that many BPR projects fail despite the existing potential of successful BPR implementation.

Personnel empowerment. The issue of personal empowerment is an important factor to successful BPR implementation, and it requires a committed and strong leadership by the top management (Al-Mashari and Zairi, 1999).

BPR success factors and pitfalls. Al-Mashari has identified five factors that cause success and failure of BPR activities:

Change management. During the implementation of new processes, all human and social related issues have to be taken into account.

Management competence and support. This consists of a committed and strong leadership combined with a successful change in management.

Organizational structure. The structure of an organization has to be based on effective teams with capable people who work in a cross-functional manner.

Project planning and management. The management and planning of projects consists of factors such as good project planning and management techniques, adequate resources, and effective implementation as planned.

IT structure. Information technology is an enabler to BPR activities and a fundamental requirement for successful BPR activities (Al-Mashari and Zairi, 1999).

According to practitioners Hammer, Davenport and Short (1990), Hammer and Champy (1993), and Alter (1994), a successful BPR implementation program has great potential to improve the capability and profitability of a company. Despite of the fact that a BPR implementation is a risky endeavor and is prone to failure, it is important to make a proper project plan and to be proactive in the risk assessment (Al-Mashari and Zairi, 1999).

Customer perceived value. The concept of customer perceived value refers to the benefits that are available to the customer through the business relationship. Kotler (2003) defines the customer perceived value through Total Customer Value, which is the monetary value of the perceived alternatives and the total customer cost. Kotler defines marketing, stating, "It is no longer enough to satisfy customers. You must delight them." Company must be able to build and keep customer satisfaction and create value in order to retention its customer and create a new customer relationship by doing better job and exceeding customer expectations (Kotler, 2003). Lillrank and Holopainen (1998) define customer perceived value as the results of improved quality and features, such as easy transactions.

Perceived time period. It is recommended that BPR activities take place over the long term instead in the short term by focusing on quick wins and on cost control and cost cutting measures (Al-Mashari and Zairi, 1999).

Lean Management. Lean management is a mechanism whereby an organization boosts added value actions for the customer, diminishing non-value added actions (Hannus, 1997).

Al-Mashari classifies business processes into four groups: core processes related to business operations, support processes that ensure operational preconditions for core processes and functions, management processes related to organizing and controlling, and business network processes that take care of organizational boundaries (Al-Mashari and

Zairi, 2000).

Customer oriented high capability processes based in processes that receive input from the customer refine products and services to the customer in a demand-driven manner (Laamanen, 2001). Company core processes have to be defined through value creation to the customer. Some common classifications for company core processes are Product and Service Creation (PSC), Customer Relationship Management (CRM), and Supply Chain Management (SCM) (Laamanen, 2001).

Laamanen (2001) names three different starting points to help define processes:

- Analyzing the current way of action
- Analyzing the success factors
- Analyzing the customer processes

The fundamental goal, to define company processes, is to define a company's processes and operations such as product and service development, sales and marketing, and product delivery as they are performed using the criteria mentioned above (Laamanen, 2001).

Jouko Hannus (1994) notes that core processes penetrate organizational boundaries, as seen in Figure 1.

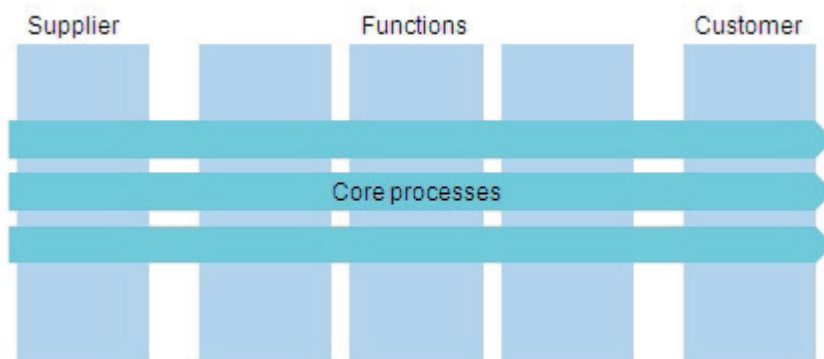


Figure 1. Process Map, (Hannus, 1994).

Process Map. The process map is a description of core processes that penetrate company stakeholders and functional departments. Here the intention is to define the core processes of the company and stakeholders in order to consider and optimize the process capability of the company and to create added value to the customer. Typical core processes include Product and Service Creation process (PSC), Customer Relationship Management (CRM), and Supply Chain Management (SCM). Hannus quotes Hammer by saying that in the future a company's core actions are not based on functions; rather, a modern company has to implement its core actions in the manner of process organization, where the core processes take on a horizontal direction and where process owners have responsibility over the process operations and the development actions (Hannus, 1994).

The case company has organized its operation on three core processes: Customer Relationship Management (CRM), which consists of two sub processes, Sales and Marketing; Portfolio Management (PM), which consist of two sub processes, Product Portfolio Management and Product and Service Creation Process; and Supply Chain Management (SCM), which consist of Product Delivery Process and Supply Management Process.

CRM Customer Relationship Management

The main task of the CRM process is to bring the main responsibility for value creation to the customer. This includes goals such as managing customer relationships with existing customers, finding new potential customers, and promoting product offerings to them. In the business point of view, the main target of CRM is to establish long-term customer relationships coupled with high profitability.

It is obvious that all customer contacts do not bring in new business. Laamanen and Tinnilla (2009) have represented customer and product offering using a funnel model, as displayed in Figure 2.

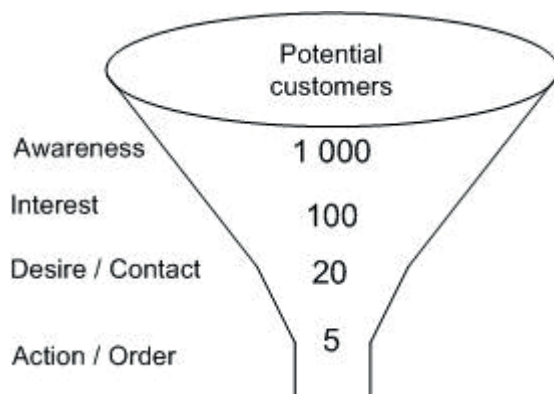


Figure 2. Funnel model for marketing and sales (Laamanen and Tinnilla, 2009).

Rababah et al. represent CRM's main task as knowing customers better and by serving them better to ensure customer loyalty. They categorize CRM in three levels: strategic, operational, and analytical. Strategic CRM is a customer business culture that creates better value to customers than competitors. Operational CRM is the practical daily cooperation with a customer on issues, such as collecting data, processing transactions, and workflows. The analytical CRM use the collected data to create preconditions for other organizations by analyzing data and creating information (Rababah et al., 2011).

PM Portfolio Management

Portfolio Management (PM) is herein considered as a wholeness that consists of: Product Portfolio Management, Product and Service Creation Process, and Project Portfolio Management.

Smith et al. state that the product development process is related into technology and business decisions. Important considerations in the product development process are the

commercial and the technical requirements (including customer perceived value), accurate coordination and integration of the development cycle time, and the development cost. Due to the invariable likelihood of an increase rivalry, enterprises are forced to manage and optimize their product development process by continuously improving their internal and external operations. Smith et al. summarize the product development execution as covering: wholeness of product development, product project management, and the product portfolio management (Smith and Lerapeprou, 2011).

The service business emergence and its potential in enterprise business force to consider to develop services besides tangible products in new product introduction process. Due importance and potential of the service business, the product concept in the enterprise has to be extended to cover both services and products. A natural continuation for this definition is to consider product portfolios to include both services and tangible products. Difficulties of defining, performing and evaluating product portfolio management success is due to the difficulties of measuring the success of project portfolio management (Killen et al., 2007).

Jouko Hannus (1994) defines the product creating process as being based on customer needs and current market demand, and says it is necessary in order to create a new product and to make it available in the market.

SCM Supply Change Management

SCM may have different definitions in different contexts. In this research it is considered in general terms as containing all activities that are required in order to fulfil customer demand for products and services.

EPM defines SCM activities as:

- A plan consisting of all activities that are needed to strategic and operative actions to full fill customer demands with expected capability.
- A source containing all strategic and operational activities related to managing procurement and purchasing beginning from supplier relationship ending to inventory optimization and everything between these.
- The manufacturing containing all operative and strategic actions related to production, testing, packing and shipment that are needed to full fill the customer demand.
- The delivery containing all operative and strategic actions related to logistic and warehousing.
- The return taking care of all deviations occurred during shipments.

Traditionally, companies have put a lot of effort into optimizing their SCM processes because there is usually huge potential to increase competitive advantage and achieve improved profitability (EPM, 2009).

3. BPR methodology

For successful BPR implementation in the company a proper methodology and accurate BPR project plan is needed. The literature review above presents information about important issues that must be considered when designing a BPR methodology and implementing a BPR project plan. The intention of the present research is to exploit the literature of good BPR practices while avoiding the common BPR pitfalls.

BPR theory for the project planning

Al-Mashari et al. (1999) represents BPR in a holistic framework, as seen in Figure 3.

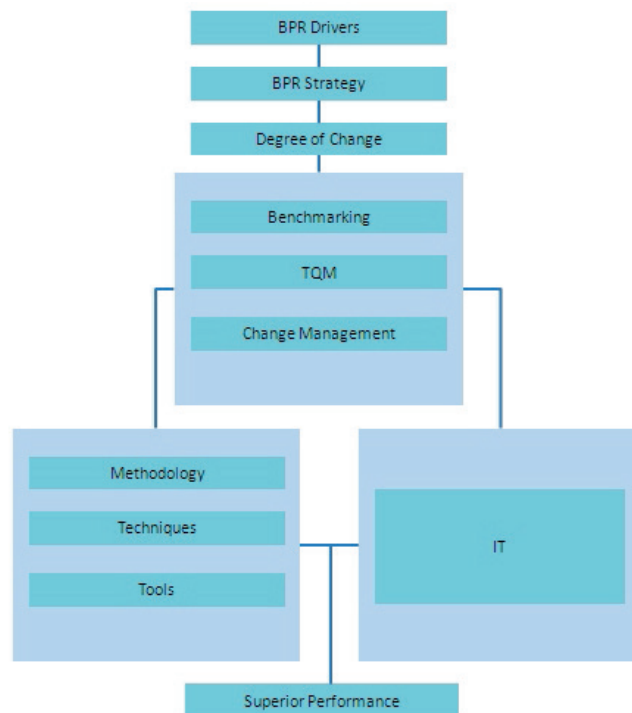


Figure 3. BPR holistic framework (Al-Mashari et al., 2001).

Building the BPR methodology to fit current needs

Organization-specific considerations have to be taken into account when defining a BPR methodology. In Figure 4, the case company's key drivers for the BPR methodology are presented.



Figure 4. Case company BPR key drivers for the BPR methodology.

A strategic standpoint is the most important driver for designing and implementing BPR activities. Strategic initiatives have to be consistent with the company vision and mission. The BPR starting point has to be described by both a current process map and a new process map, in accordance with the expectations of the organization. Process improvement actions have to be defined and further evaluated and prioritized to make a proper project plan for reaching the defined improvement actions. Up-to-date process description tools that may be used for documentation must be available, as well as information sharing, communication, and training of an adequate level. According the authors, the implementation phase is often the most challenging part of the BPR process and includes tasks such as human involvement, change management, information sharing, and training.

Management in the case company guided the development group to work with following manner:

- Divide BPR actions into clear steps and with a break down in work schedules and size of scale
- Take a systematic approach by dividing work tasks in different levels: (1) core processes, (2) sub processes, (3) sub processes stages, and (3) swimming line type detailed process description and work instructions for teams.
- Develop tasks in all the above-mentioned levels so that they follow the same general systematic 4Q (Measure, Analyze, Implement and Sustain) project development concept so that it has been released in all functions and at all process levels.

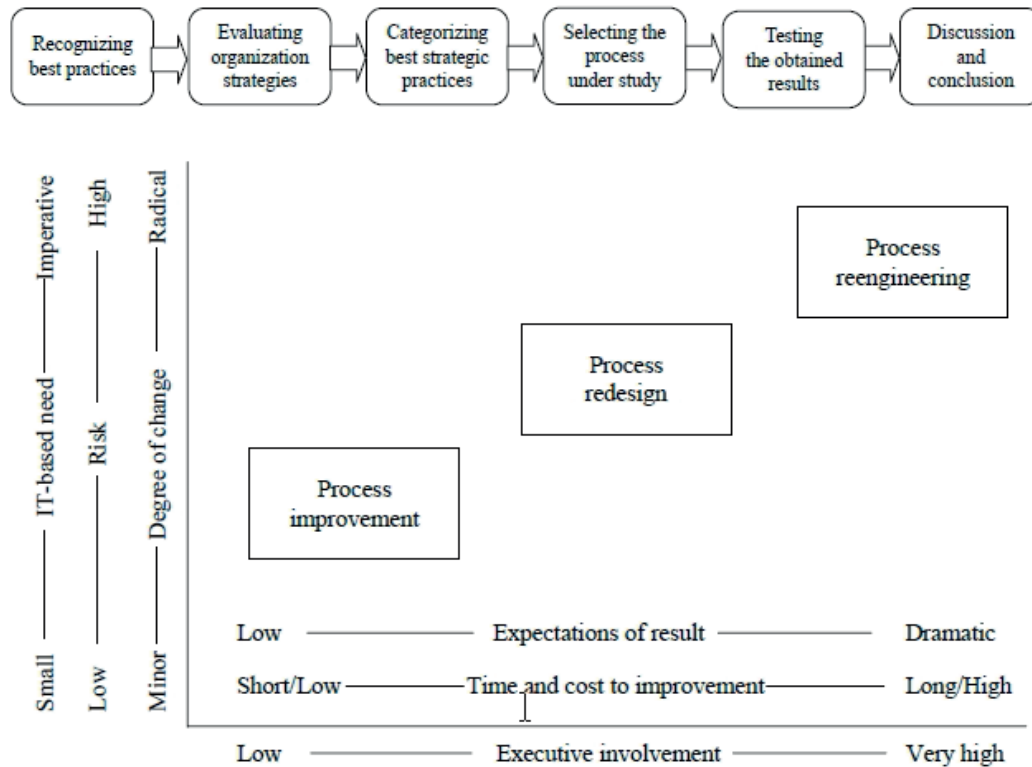
After an organization has defined both BPR identification and BPR development objectivities, the next stage is to define the BPR methodology and BPR project definition. Management of the case company guided the development team by selecting an agile way of action as an important driver for BPR methodology. This agile way of action means herein a straight working method to move from stage to stage without the need to stop and consider each stage too much by the principle that it is enough to have a

reasonable understanding about the current situation of the organization. In other words, it is not necessary to strive for perfection.

BPR means radical changes to core process and other important processes reengineering. This means a radical change to the current way of actions in operations in order to challenge the old ways of functioning and thinking that, in the worst case scenario, may lead to functional silos. From the customer point of view, the challenge to the organization may be that nobody has responsibility in a cross-functional processes that penetrates departments and functions, whose task is to create the added value to the customer (Kiiskinen et al., 2002).

BPR scale

It is important to recognize the scale of the change that the organization is pursuing. Almost equally important is to define the reengineering concept. In Figure 5, the differences between process improvement, process redesign, and process reengineering is illustrated.



Source: Macdonald (1995)

Figure 5. Differences between process improvement, process redesign, and process reengineering (Hanafizadeh et al., 2009).

Organizations have to consider how dramatic the change that is need should be. In such considerations, there are three important aspects to take into account: the IT based need, the risk level that organization intends to take, and the degree of change that the organization expects. Each of these aspects has to be considered separately and carefully. Besides the above-mentioned aspects, organizations also have to consider how dramatic

are the results that they are expecting to achieve, what is the time scale of improvement and change, and how much executive involvement has to be ensured (Hanafizadeh et al., 2009).

The case company set a target of radical change by vitalization of its processes. IT was estimated to be in an adequate level and the company wanted the risk level of the vitalization of processes to be kept as low as possible. Nonetheless, it recognized that the required changes couldn't be achieved without risk-taking.

BPR systematic approach

BPR has to be planned and implemented by a systematic approach.

BPR actions have to be done systematically and must be divided into clear steps. Satu Kiiskinen et al. (2002) have divided BPR into five phases, as shown below:

- Step 1: Managerial expectations and project coordination planning
- Step 2: Analysis of organization's current situation
- Step 3: Defining BRP objectives
- Step 4: Designing new BPR models and ways of action
- Step 5: Implementation of new BPR models and ways of action

Ulla Martola and Riku Santala have also defined BRP actions by the above mentioned method. They have also added a sixth step, readiness for change (Martola et al., 1997, p. 47).

Balasubramanian (2006) presents the commonly used classification for BPR steps as follows:

- Step 1: Begin organizational change
- Step 2: Build the reengineering organization
- Step 3: Identify BPR opportunities
- Step 4: Understand the existing process
- Step 5: Reengineer the process
- Step 6: Blueprint the new business process system
- Step 7: Perform the transformation

4. Total productivity management

David Sumanth defines Total Productivity Management (TPM) as a formal management process that consists of four productivity cycles: total productivity model, productivity evaluation, productivity planning, and productivity improvement.

Quality is a multidimensional concept. Quality cost is often difficult to recognize due to its subjective nature. According to the authors, quality cost is in a typical company 20%

to 30%. Quality improvement actions tend to have a dramatic effect on an enterprise's financial results.

Technology is sometimes misunderstood. Herein, technology is categorized in four groups: product, process, information and managerial technology. Process technology has a significant impact to improve productivity through operational efficiency. Manufacturing technology improves productivity through machine cycle time, reliability, inventory, labour, flexibility, and quality.

Productivity is considered as total productivity. Herein, it is defined by dividing output by input. Sometimes it is useful to define partial productivity, for example the ratio between output and labour expense. Nowadays, the labour expense is sometimes a minor factor of total expense; for this reason, the partial labour productivity index must also be considered of minor importance.

Production improvement does not necessarily mean improvement in productivity, just as efficiency improvement does not necessarily mean productivity improvement. In general, to improve productivity one needs improvement in both effectiveness and efficiency (Sumanth, 2000).

Total Productivity is presented in Figure 6 and it consists of four parts, each part progressing in these stages: measurement, evaluation, planning, and improvement.

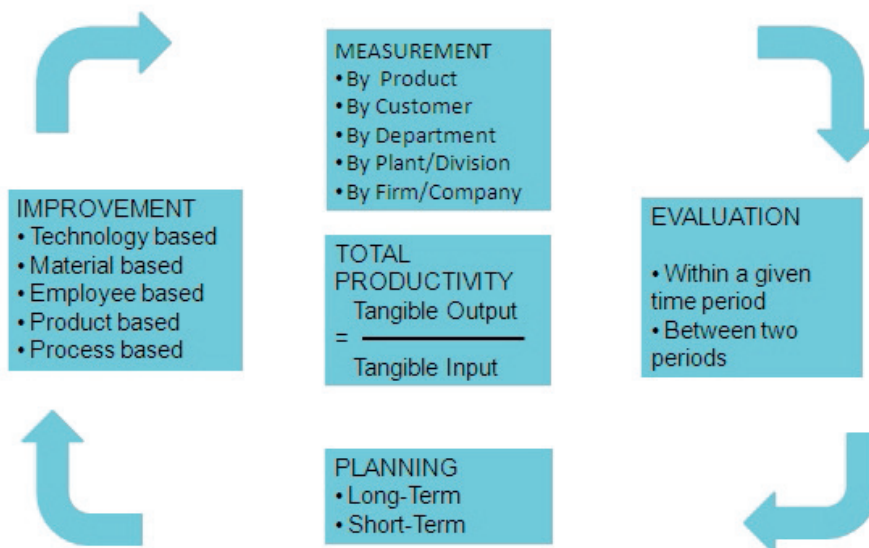


Figure 6. Total productivity perspective through the productivity cycle (Sumanth, 2000).

5. Results

It is important to clearly define the objectivities for which an organization strives in order to successfully carry out a BPR project. The difference between functional and process-

based organization has been defined. The limitations of function-based actions like narrow targets and focusing too much on the expense by reducing the way of action can't make a corporation succeed. Meanwhile, process organization offers a lot of potential to gain the financial and other measurable objectivities of the corporation and also capability to create added value to the customer and increase customer perceived quality.

The three core process models—CRM, PM, and SCM—have been defined from the case company point of view and also a short description is presented of each of main activities of the core processes.

The BPR framework by several authors and the case company main drivers are presented. It is important to consider the BPR framework in a holistic manner. Presented models and case company main drivers are the starting point for further case-company specific BPR methodology and BPR project definitions. This can be seen as an answer to the first research question about the appropriate BPR methodology for the case company.

The Total Productivity Management (TPM) tool presented herein can be considered as a companywide management tool that can and has to be implemented in different levels, from the strategic management level to the team level throughout the company.

The second research question about the BPR success factors and possible pitfalls has also been answered in the literature review and partly also within methodology definition.

6. Discussion

The main goal of BPR is to achieve considerable improvements in company operations. The BPR actions in the company have to be done in a holistic manner. The important viewpoint herein has been that of customer perceived quality and added value creation for the case company. The intention of the literature review was to find viewpoints that strengthen this intention.

The most important thing to consider is the current situation of the case company and to define what is worth to develop and improve on. The enterprise mission and vision provide general guidelines and is an important starting point in defining the BPR objectivities. As discovered in this study, it has to be clearly defined how radical a change organization believes is needed and how radical the new way of actions must be to effect meaningful change and lasting benefit.

It is important to consider the motivation behind the need to increase the company capabilities. The reality today is that companies are forced to seek continuous improvement in order to stay competitive in the market. Thus, timing is a very critical issue. A company must have a visionary way of thinking to start and perform strategic development actions proactively.

In the literature review are many important BPR related issues and these BPR phenomena

have to be discussed in the organization. Successful BPR needs a holistic and systematic definition, design, and implementation. In the definition phase it is useful to define the most common success factors and pitfalls. In the design phase it is useful to consider the practical issues of the scope of change project, to define the starting point for organization, to make realistic but challenging objectives for change, and to decide how radical the change must be expected to be and how big the risks are that the organization is willing to face. The starting point of the implementation phase is laying down an adequate plan. According to the authors, the inherent difficulties of change management have often been emphasized in the final stage during implementation of the development actions.

In the case company, one of the starting points has been to implement a TPM management system and put it into practice. The system is planned to include TPM actions as defined by BPR planning and implementation, as well as continuous improvement practices based on the systematic 4Q and other organizational development activities to improve operational excellence.

The introduction section considered to what degree a new theory was discovered or not. At this stage, it is too early to answer to this question, as a more detailed methodology definition is needed.

7. Further research

This study considered the BPR actions needed in the case company. The next step is to exploit the presented theory by defining, designing, and implementing BPR activities in the case company.

Reference

- [1] Al-Mashari M. and Zairi I., BPR implementation process: an analysis of key success and failure factors, *Business Process Management Journal*, 5 (1), 1999, 87-112.
- [2] Al-Mashari M., Zahir I. and Zairi M., Business process reengineering: A survey of international experience, *Business Process Management Journal*, 7 (5), 2001, 437-455.
- [3] Balasubramanian S., Successful BPR Implementation Strategy, <http://hosteddocs.ittoolbox.com/SB41806.pdf>, 2006.
- [4] Childe S. J., Smart P. A. and Weaver A. M., The use of generic process models for process transformation, <http://www.tech.plym.ac.uk/soc/research/mabs/pubs/ifip96.pdf>, 1995.
- [5] Dolan T., Best practices in process improvement, *Quality Progress*, 36 (8), 2003.
- [6] EPM, Management Accounting: Enterprise Performance Management, The Institute

of Cost and Works Accountants of India, Kolkata, India, 2009.

[7] Hanafizadeh P., Moosakhani M., Bakhshi J., Selecting the best strategic practices for business process redesign, *Business Process Management Journal*, 15 (4), 2009, 609-62.

[8] Hannus J., *Prosessijohtaminen, ydinprosessien uudistaminen ja suorituskyky*, Gummerus Kirjapaino Oy, Jyväskylä, Finland, 1994.

[9] Husic I and Gospodarstvo N., A New Model For Renewal of Business Processes in Innovative Enterprises, *ABI/INFORM Global*, 55 (5/6), 2009, 1-20.

[10] Kallio J, Saarinen T ja Tinnilä M., Efficient change strategies Matching drivers and tracers in change projects, *Business Process Management Journal*, 8 (1), 2002, 80-92.

[11] Kallio J, Tinnila M and Tseng A, An international comparison of operator-driven business models, Helsinki School of Economics, Electronic Commerce Institute, Helsinki, Finland, 12 (3), 2006, 281-298.

[12] Kiiskinen S, Linkoaho A and Santala R., *Prosessien johtaminen ja ulkoistaminen*, WSOY, Helsinki, Finland, 2002.

[13] Killen C.P, Robert A. Hunt R.A., Elko J. Kleinschmidt E. J., Project portfolio management for product innovation, *International Journal of Quality & Reliability Management*, 25 (1), 2008, 24-38.

[14] Kotler P., *Marketing Management*, Pearson Education Inc., New Jersey, USA, 2003.

[15] Kubiak T. M. and Benbow W. D., *The Certified Quality Engineer Handbook*, 2008.

[16] Kumar V., Choisine F., de Danuta G., and Kumar U., Impact of TQM on company's performance, *International Journal of Quality & Reliability Management*, 26 (1), 2009, 23-37.

[17] Laamanen K., *Johda liiketoimintaa prosessien verkkona*, Keuruu, Finland, 2001.

[18] Laamanen K. ja Tinnila M., *Prosesijohtamisen käsitteet*, Teknologiateollisuus OY, Helsinki, Finland, 2009.

[19] Lillrank P. and Holopainen S., *Journal of Organizational Change Management*, 11 (3), 1998, 246-259.

[20] Mansar S. L., Reijers H. A., (2007). Best practices in business process redesign: use and impact, *Business Process Management Journal*, 13 (2), 2007, 193-213.

[21] Martola U. ja Santala R., *Liiketoimintaprosessit: BPR muutoksen johtaminen*,

WSOY, Porvoo, Finland, 1997.

[22] Praveen G (2006), Beyond PDCA-A: New Process Management Model, *Quality Progress*, 39 (7), 2006.

[23] Rababah K., Mohd H. and Ibrahim H., *Customer Relationship Management (CRM) Processes from Theory to Practice*, 1 (1), 2011.

[24] Smith B.V., Ierapepritou M.G., Modeling and optimization of product design and portfolio management interface, *Computers and Chemical Engineering*, 35, 2011, 2579–2589.

[25] Si S., Takala J. and Yang L., (2008). Competitiveness of Chinese high-tech manufacturing companies in global context, *Industrial Management & Data Systems*, 109 (3), 2009, 404-424.

[26] Sumanth D.J., *Total Productivity Management*, CRC Press LLC, Boca Raton, Florida, 2000.

[27] Tinnilä M., Strategic perspective to business process redesign, *Business Process Re-engineering & Management Journal*, Helsinki, Finland, 1 (1), 1995, 44-59.

DESCRIPTION OF A PROCESS DEVELOPMENT PROJECT

Abstract

Purpose - The purpose of this case study is to create a competitive operating management system to improve efficiency and quality performance in a mid-sized electronic manufacturing company. Research has been carried out in a case study manner with the objective of increasing the economic value of the case company by streamlining its processes to create a more customer-focused organisation and thereby more value for the customer.

Design/methodology/approach – The action research method is used in this study to define the most critical development areas in a business process redesign and increase customer closeness and perceived quality by the customer. A qualitative research method with interviews and workshops has been created and utilised to collect data through in-depth expert interviews. The case also applies some features of the constructive research method and weak and strong market tests.

Findings – Customer closeness and added value creation were key development areas of the implemented BPR actions.

Practical implications - Business process reengineering (BPR) has been implemented and processes have been renewed and implemented into practice.

Originality/value - This paper presents a BPR method which complements the existing BPR theory.

Keywords: *Perceived quality by the customer, competitive advantage, added value creation, business process reengineering, business process management.*

1. INTRODUCTION

The purpose of this study is to define the business process reengineering (BPR) method, design and implementation in the case company. This study is a continuation of the research TIIM2012, a study whose objective was to identify the most critical areas of the workflows and processes needing improvement and create an appropriate method to implement a BPR project in the case company (Uusitalo, 2012, pp. 1-2). This study is based primarily on empirical research with a research focus on the practical implementation of the BPR project. The TIIM 2012 study focused more on BPR theory based on a literature review.

The author of this paper is a project manager in a process reengineering project that was carried out in the case company. A good starting point for the study is describing the empirical aspects of the work. The study is an empirical report of the process reengineering project carried out in the case company. A strategic approach is taken into account in the project itself and in this report as well.

The research has been carried out in a case manner. The purpose of the research is to increase the economic value of the case company by streamlining its processes to be more customer-focused to create more added-value for the customer. The primary research method is the action research method based on process reengineering to improve case company competitiveness. The case study also applies some features of the constructive research method due to its process development methods. The research further includes features of weak and strong market tests by defining and implementing a developed BPR method. The results of the implemented development actions in the case company affect the long-term that can be indicated on a time scale of one to three years.

As a result of the successful execution of this project, BPR has been implemented and processes have been renewed and implemented in practice. This study consists of the following sections: 1) Introduction, 2) Theoretical framework, 3) BPR framework, 4) Project implementation, 5) Results and discussion 6) Conclusion. The following research questions have been defined:

RQ1: How can the case company move towards more customer-focused actions in order to strengthen added value creation for the customer?

RQ2: How can the required growth in response to turnover be enabled?

2. LITERATURE REVIEW

Quality is one of the key issues in the electronics manufacturing business. The competitive advantage of the case company depends on the quality of the manufactured Intelligent Electronic Device (IED), design of the electronics and software of the IED, and the interface between other parts of the electric power network or power system devices (ABB, 2011). The Certified Quality Handbook categorises quality in management and leadership, the quality system, product and process design, product and process control, continuous improvements and quantitative methods and tools (Kubiak & Benbow, 2008). Quality is a diverged concept in a general point of view. Sometimes a simple question such as "What is quality?" is presented. Nowadays customer satisfaction is one of the paradigms that drive company actions. The research literature indicates that quality conformance has a significant impact on customer satisfaction (Maiga, 2004, p.1). Therefore, quality can be defined through customer satisfaction. Kumar et al. represent in their article that better customer satisfaction and business profit can be achieved through a high level of product design, effective manufacturing and high level of service quality (2009, p. 3). On the required organisational capacity to support quality, Gordon writes: "*product delivery is the culmination of all of the business processes, and output is a measure of system capability*" (2008, p. 2). To deliver high quality products and services, the optimisation of all processes has to be taken into account instead of settling for sub-optimisation (Uusitalo & Takala, 2011, p. 2).

3. BPR FRAMEWORK

The case company management identified that its customers sometimes encounter unwanted quality issues and variations in on-time delivery (OTD). It was also identified that current operations models do not perform in an optimum manner. Besides variation in OTD, the case company identified the need to improve customer closeness and be more aggressive in the market to meet the sales turnover goal set by the senior management.

As a result of an identified lack between expected and experienced capability that the customers sometimes meet, the case company management made a decision to prioritise the allocation of resources for a survey to analyse the case company's current status. A preliminary interview study was carried out and after that a sense and respond multi-criteria decision making method was applied to find more detailed information about the current situation of the case company.

Based on the findings, the case company senior management defined preliminary expectations of how daily business should be carried out. The following steps were to consider the concrete BPR actions in order to improve customer closeness, perceived quality by the customer, and product quality.

The process reengineering project carried out in the case company consisted of two main steps: BPR framework and BRP project implementation. The BPR framework consists of the following steps: preliminary study of the company capabilities, identification of organisation development actions, process development objectives, BPR development method, and project objectives. The BRP project implementation consisted of the following steps: work breakdown structure (WBS), pilot projects, and IT development.

3.1 Preliminary study of the company capability

The preliminary study was carried out in four independent phases. In the first stage, a key person of the organisation was interviewed in a manner of thoughtful discussion to give the interviewee an opportunity to convey his/her opinion on the status of the case company organisation. Based on these opinions, he/she offered suggestions for developing the most critical areas. Secondly, a sense and respond multi-criteria decision making method was carried out and applied to collect data through in-depth expert interviews with a questionnaire. In the third stage, the management's expectations of the processes are presented, and in the fourth stage the guidelines of the strategy are presented.

The preliminary interviews were carried out by conducting discussions between the researcher and individuals. Based on the discussions, the following important items were indicated as potential areas for development.

The operations of the case organization identified based too much on functional departments instead of following the guidelines of process-based approach. Communication was also identified to be inadequate between the functional departments and the core and sub-processes.

Considering customer closeness, the following development needs were identified: customer quality in case handling needed a more effective and systematic way of taking action in order to meet customers' expectations; service delivery and customer support processes needed more systematic ways of taking action to find the root causes of product failures that customers sometimes identify. Furthermore, added value creation for customers was indicated to be one of the key requirements.

In product portfolio management, there was a need for improvements to identify customer requirements and then provide this information to the product and service creation (PSC) process. Pricing, mostly based on general market pricing, required more feedback on profitability, contributions to margins and customer expenses. More systematic procedures were required to link different kinds of product variations to profitability identification in the product creation phase.

Customers sometimes experience unwanted variance in on-time delivery (OTD). Therefore, OTD needed to be developed to provide greater predictability and stability (less variance). Transporting and warehousing conditions did not always meet the general requirements of sensible electronics devices. The case company sometimes encountered problems in transporting and warehousing conditions and was forced to take responsibility for mistakes of third parties and dereliction of duty.

Sense and respond, a qualitative research method applying a multi-criteria decision making tool was created and utilised to collect data through in-depth expert interviews. The performance measurement and improvement system developed was implemented in practice in the case company (Uusitalo, Takala, 2011, p. 1).

Management expectations for organisational capabilities have been identified from two perspectives: current status of process capabilities; and identifying important imperatives for successful operations. The current status of process capabilities was estimated through mature process steps with all

together 10 steps, whereby the first step indicates process ownership and the highest step indicates world class operations. The current processes in the case company were shown to be between steps 2 and 5.

The case company strategy emphasis focused on the following important issues: growth, profitability, flawless operation by operational excellence, and perceived quality by the customer.

3.2 Identification of organisation development actions

Based on the case company's strategy, the case company made a decision to start a business process reengineering project to improve processes with the intention to move from the current functional way of operating towards a process-oriented way of operating. Other fundamental changes to the current situation include a strong motivation to move towards a more customer-focused way of operating in order to create added value for the customer by increasing perceived quality by the customer.

The impetus for defining the case company's current situation was based on the estimation that its operations ran too much in functional silos. In this context, the silos refer to the organisation's vertical structure. Important development areas were identified and categorised as: strategic issues, processes, quality, customers, R&D, products, and cross-functional issues.

- Strategic issues include business planning; product positioning; product pricing; and service delivery and customer support processes; which were considered important improvement areas.
- Process-related issues that needed improvements were identified as mostly related to: customer relations management and product portfolio management.
- Quality-related issues: Quality feedback from customers and from the supply chain management process were identified to need more systematic procedures. The maintenance process was identified as needing a process owner and integration with other processes. The service delivery process identified the need for R/D support and the customer support process was identified as needing a performance?? boost.
- Perceived quality by the customer: Customer closeness, good practices in customer relationship management, smooth customer complaints handling, and field returns were identified as the most important areas.
- Research and development activities were identified as needing more systematic information sharing partly in the early phase of new product introduction (NPI) and also in all other life cycle phases. In addition to the above, the role of research in the product and service creation process needs more clarification.
- Life cycle time maintenance: Core processes and roles in customer relationship management (CRM), portfolio management (PM) and product delivery management (PDM) required clarification. PM identified the need for more systematic procedures and the products and services creation process was identified as needing more focus on customer support; and to work in a more proactive manner.
- The customer was identified to be the most important matter and issues like customer requirements, requirement specifications, product features, technical solutions, life cycle time maintenance, and product engineering were considered to need systematic procedures during the whole life cycle. Products: Product offering, product delivery and after sales service were identified to be performing at a reasonable level while improvements were needed in the communication of customer claim issues, HW variation optimisation, and ownership of the product support process.
- Development actions between functions: Total value chain management was considered to be the starting point of processes and functions. Information sharing between processes was identified to need improvements. Service delivery and customer support processes were identified to have a great potential to commercialise services.

3.3 Process development objectives

The case company carried out BPR development identification very carefully and all results achieved were documented as part of the necessary scope of the project. The next step was to consider BPR development objectives.

To develop a more customer-oriented business, the case company needed to identify customers' needs and improve its ability to generate added value for the customer. Process development actions needed to be based on the facts. Specifically, the organisation was required to continually develop its processes based on: the measurements, customer needs and changes in the environment. Processes exceeded the boundaries of the functions and the departments. Therefore, process development needed to improve the interaction between the functional departments and the processes by streamlining the processes to operate more efficiently.

Processes are described in such a way that the documentation is readily available for all of the organisation. Training, communication, change management and the deployment of the new procedures are an important part of the BPR.

The above-presented BPR objectives were quite general and thus it was necessary to identify more specific targets:

- The steering group had to be established for the BPR, in order to take responsibility for guiding and monitoring the BPR activities. A systematic follow up had to be performed by regular BPR steering group meetings.
- A current process map had to be identified.
- Managerial practice, guidance and measuring needed to be defined.
- Enabling and hindering preconditions of the current IT system had to be identified.
- Added value creation for the customer had to be improved.
- A high level process description for the three core processes based on suppliers, inputs, process, outputs and customers (SIPOC) method had to be made. After SIPOC, more detailed information about sub-processes was needed. To gain more specific information, a sub-process breakdown had to be done to identify activities performed in each sub-process and sub-processes' steps, and also identify if there were some activities missing.
- Descriptions had to be defined, including a BPR Road Map, BPR development plan, coherent terminology, and roles of different stakeholders as the process owners and the process developers.

BPR was considered to cover development of core processes including the sub-processes. BPR's purpose was to challenge the current core processes and how actions were performed, and to evaluate and make needed development actions.

Besides the above-presented development targets, senior management provided objectives to the BPR development team:

- The BPR plan required strong and visible support from senior management and their commitment to BPR objectives.
- The main tasks and expectations of the strategy and processes were identified.
- All critical processes were identified.
- The case company's worldwide market share varies in different market areas. The target during the 2014 strategic session was to achieve a market-leading position.

The following general imperatives and objectives were identified for the BPR in the case company:

- Growth: It was a challenge to gain enough production capacity and retain OTD at a reasonable level.
- Quality: Perceived quality by the customer had to be improved
- Global responsibilities had to be identified in portfolio management and the product and service creation processes. This was a challenge for product and service development and the product maintenance activities.
- The total productivity management (TPM) actions had to be intensified. In the case company, the purpose of TPM is to improve operational excellence.
- Sales had to be expanded to cover solutions and services to move ahead in the value chain.
- The capability of the processes had to be identified in order to differentiate its products and services from competitors.
- Intensify the capability of the processes in order to differentiate from competitors.
- The processes had to be based on the customers' requirements and the company's main task is to create added value for the customer.
- Information sharing had to be done through an effective and appropriate manner.
- The processes' capabilities had to be measured and maintained through regular procedures.

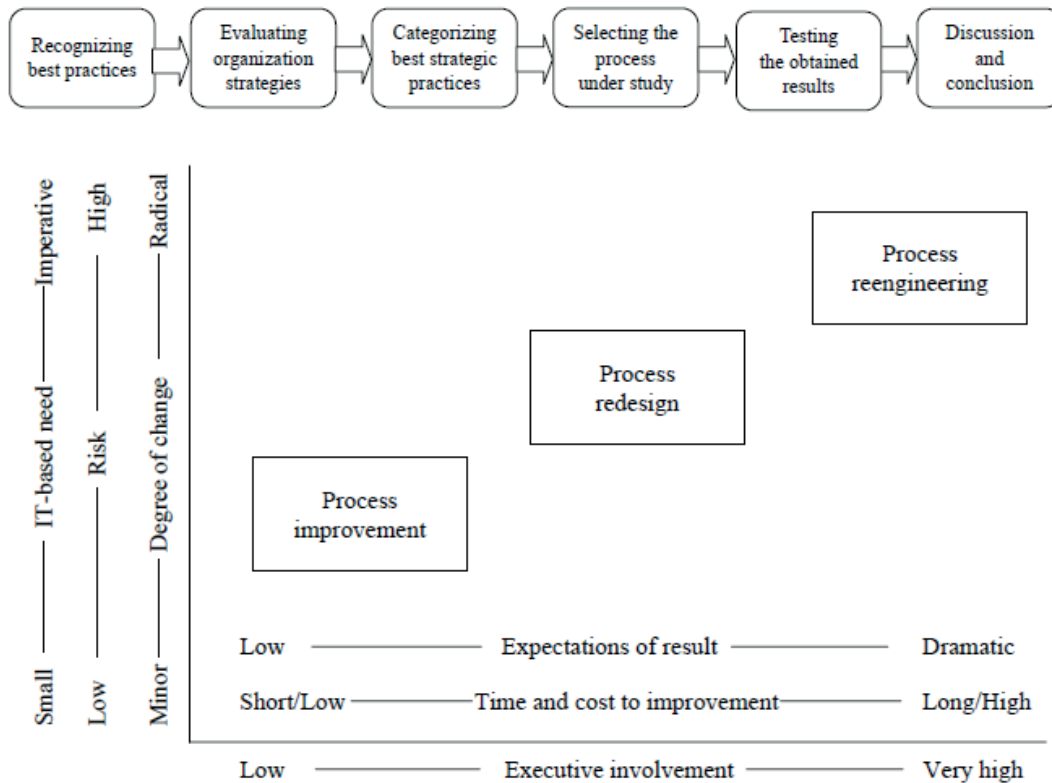
3.4 BPR development methodology

After the case organisation had defined both BPR identification and BPR development objectives, the next step was to define the BPR method and BPR project plan. The senior management guided the development team to adapt an agile way of working, which here meant a straight working method to go onwards step by step. According to Kiiskinen et al., BPR means radical process reengineering. In the case company context, this means a radical change from current ways of doing business in order to challenge the old functional ways of thinking, which in the worst case may lead to functional silos (Kiiskinen et al, 2002, 27; Uusitalo 2012,15). Everyone has responsibility in cross functional processes and the task to create added value for the customer.

3.4.1 BPR methods in the literature

The first and most important step in the BPR is to identify the content of change. Almost equally important is to define the reengineering concept. In figure 1, the difference between process improvement, process redesign and process reengineering are presented

Figure 1. Differences between process improvement, process redesign and process reengineering.



Source: Hanafizadeh et al, 2009, p.3.

The organisation has to consider how dramatic a change is needed. There are three important aspects to be considered: IT-based needs, risk level that the organisation intends to take and degree of change that the organisation is expecting. Each of these aspects has to be considered separately and carefully. Besides the above-mentioned aspects, an organisation has to consider how dramatic of results it is expected to achieve and the time scale of improvement and change, as well the level of executive involvement has to be ensured (Hanafizadeh et al., 2009, 3; Uusitalo 2012, 15).

The case company set a target of radical change to renew its processes. IT-based needs were estimated to be at an adequate level; meanwhile, the company sought to keep the risk level as low as possible, but it was also recognised that the required change could not be achieved without risk-taking.

BPR actions have to be performed systematically and divided into clear phases. Satu Kiiskinen has divided BPR into five steps as follows:

- Step 1: Managerial expectations and project coordination planning.
- Step 2: Analysis of organisation's current situation.
- Step 3: Defining BRP objectivities.
- Step 4. Designing new BPR models and action plans.
- Step 5 Implementation new BPB models and action plans (Kiiskinen et al, 2002, 3; Uusitalo 2012, 16).

3.4.2 BPR development method in the case company

The development team defined a practical BPR development method in order to perform BPR activities in a systematic manner. The defined BPR development method consists of the following steps:

- Step 1: Establishing a three core processes model
- Step 2: Identifying all activities and all sub-processes
- Step 3: Identifying which sub-processes belong to which of the three core processes
- Step 4: Identifying and evaluating improvement actions needed in each sub-process
- Step 5: Prioritising above identified improvement actions
- Step 6: Defining a project plan for BPR
- Step 7: Implementing the BPR project
- Step 8: Implementing BPR continuous improvement

The three core processes model has been established in the case company. Presentation of all sub-processes in the same large picture helped to understand the processes as a whole, as well as the mutual activities and the interaction between them. Moving from a five core processes model to a three core processes model required identification of which core processes each sub-process belongs to. This identification was made on the basis of what core processes each sub-process mostly represented.

Improvement actions were first identified and then evaluated by the important factors of quality and customer closeness. The following steps prioritised the identified improvement actions. As a result, a priority order of development actions was defined and utilised in the BPR project plan.

3.5 Project objectives

The first step was to move fast to establish a three core processes model. The new three core processes model instead of the earlier five core processes model was based on a management decision. Another important driver for the BPR method was its agility in carrying out the action plan.

3.5.1 Management expectations for process -based approach

Management set objectives for process-oriented organisation:

- The processes must be based on customer requirements.
- The processes work in a cross-functional manner by crossing through the functions and the departments.
- The process descriptions and the documentation are easily available to all personnel.
- Education and communication ensure that all personnel understand the process-oriented organisation's operations.
- Continuous process development actions have to be based on measurements, customer requirements and changes in the environment.

The case company established a three core processes model: customer relationship management (CRM), portfolio management (PM) and product delivery management (PDM).

The development project needs adequate resources to perform the required definition, planning and implementation actions. The following resources have been identified to perform the process development actions:

- Process owners: responsibility of process functionality and capabilities.
- Process developers: responsibility of implementing process development actions.
- Project managers: coordinates the development project in its entirety and ensures the overall optimisation between core processes.

3.5.2 Project description

The following issues were identified in the rough project description.

- (1) The process status was identified by the SIPOC method:
 - The sales channels and end customers identified a need for active customer relationship management in order to improve customer closeness.
 - The process map renewing is a large undertaking and therefore adequate resources have to be ensured.
 - All concerns and problems in the past have to be documented in order to utilise them while establishing the BPR actions.
 - The SIPOC shall be done separately for all core processes and later for all identified sub-processes.
- (2) Interconnections between the core processes
 - The main objective is to identify the most important connections that exist between the processes, at first between the core processes and then, in more detail, between the sub-processes.
 - The second target is to prepare a plan to establish a new process map with three core processes instead of the earlier five core processes.
- (3) CRM process detailed definition
 - The CRM core process was identified as the most critical and the process needs more detailed SIPOC. This deeper CRM core process identification has to be done together with other processes such as customer support and product and service delivery processes.
- (4) Guidance and monitoring
 - Project guidance and monitoring are to be performed by the senior management and steering group.
 - The senior management of the case company provides the general guidance and all practical guidance is managed by the steering group.
- (5) Terminology
 - A general glossary of the most frequently used terms related to BPR has to be defined in order to ensure the consistency of the terminology used in the case company.
 - Process owner and process developer roles have to be defined.
 - Sub-processes have to be defined, and those that already exist and those that will be established during BPR.
- (6) Personnel information and training
 - Process-related information and training are planned to be a part of change management.
 - A detailed plan has to be made.
 - The BPR needs systematic process documentation, which can be utilised in information sharing and training.

4. PROJECT IMPLEMENTATION

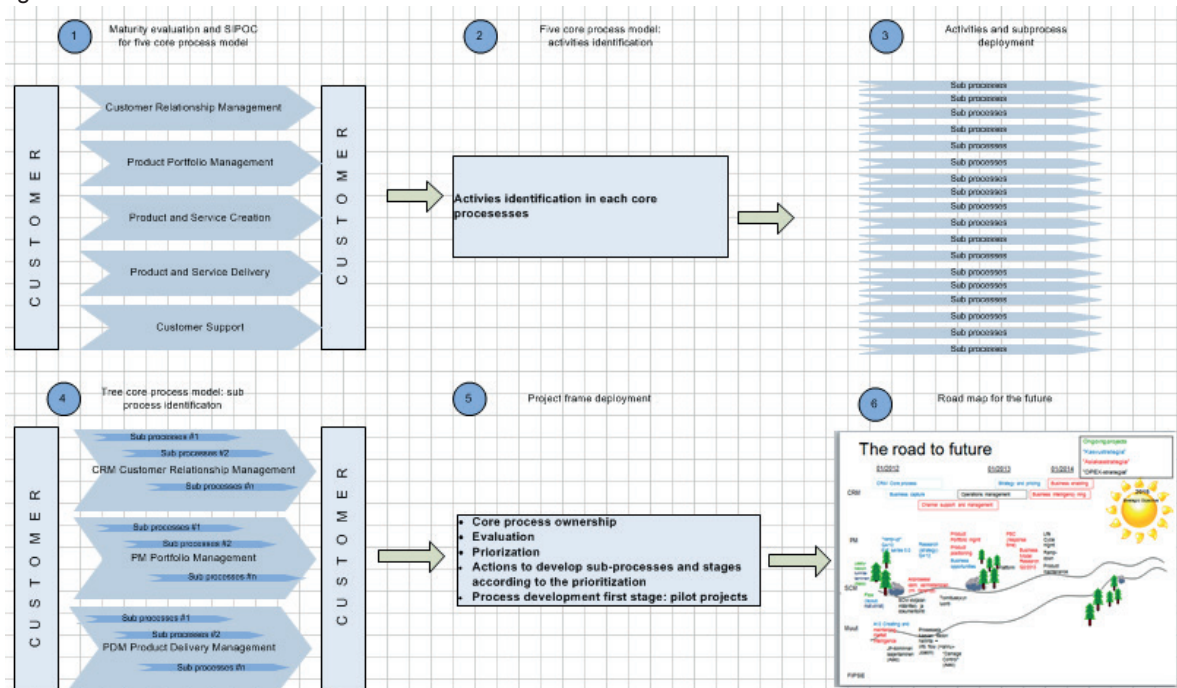
In the first step the current overall process status was considered. The second objective was to obtain more detailed information about the processes, their interconnection and how the processes work together as a whole. The third target was to consider the next step of the BRP project and to guide the project group to move forwards with the BPR project.

Process maturity was identified, followed by the SIPOC procedure. Then, focus was placed on sub-processes activity identification, sub-process and activity deployment, and establishment of a new three core process model. Finally, a BPR project frame and a BPR roadmap for the future were defined.

4.1 Work breakdown structure (WBS)

Because of the large scope of BPR, it was necessary to draw up a work breakdown structure (WBS) to develop a systematic approach to the BPR project. The WBS is presented in figure 2.

Figure 2. Work breakdown structure.



1 The maturity evaluation of the five original core processes and SIPOC procedure were carried to identify the current status of the core processes. The current process maturity was evaluated with a scale of 10 steps: 1) process ownership is defined; 2) process description is defined; 3) objectives are defined; 4) measurements are implemented; 5) continuous improvements are implemented; 6) cooperation within the organisation is achieved; 7) global cooperation is realised; 8) trend analysis is implemented; 9) benchmarking by others; 10) best in class. The results indicated that the maturity of the processes was between levels 3 and 5. Furthermore, important development areas were indicated; customer closeness, perceived quality by the customer and cross functionality between the processes.

The current status of the processes was identified by the SIPOC method. The CRM processes main target is: "To create and develop mutually beneficial, long running and deep customer relationships to improve competitive strength." The following important key findings by SIPOC were identified in order to develop CRM sub-processes:

- CRM development actions have to be identified more precisely.
- The added value creation to the customers is one of the most important areas when considering the development of the processes.
- Identified interconnection between the customers processes and the case company processes provided a lot of new information to BPR.
- The business relationship between the customer and the case company must be based on confidence in the partnership in order to enable a profitable business.
- Time response in communicating between the customer and case company has been identified as an important development area.
- Customer support identified that it must be more active in earlier product life cycle phases in order to promote its services and increase service demand in later product life cycle phases.
- Funnel-based sales follow up is identified to be an important development area, which includes a lot of potential in establishing proactive sales.

The PM processes' main target is to: "enable profitable growth by developing and managing customer oriented, high quality and competitive products and services at the right time." The following important key findings by SIPOC were identified in order to develop PM subprocesses:

- The case company's products have a very long life cycle time. There is still demand for a product series that was launched in the 80s.
- Product requirement specification has to be based on customer needs.
- Quality is a self-evident issue related to competitive customer-oriented products. The PM and product and service creating-process (PSC) have an important role in order to fulfill the quality and other customer requirements of the products and services.
- Time to market is an increasingly important competitive factor and therefore requires continuous improvement. Time to market pressure sometimes creates the temptation to make rectifications in product development projects, but unfortunately this kind of quick win may cause problems in the long run.
- The case company faces challenges fulfilling customer requirements such as the usability of products.

The PDM processes' main target is to: "fulfil the commitments to our customers by consistently delivering high quality products on time." The following important key findings by SIPOC were identified in order to develop PDM subprocesses:

- Customers sometimes meet deviations in OTD
- PDM meets challenges while taking care of: a wide ranging product portfolio; the large scale of product variants; ensuring material availability according to strong demand variation combined with optimising the inventory level.
- Sales forecast is an important factor that provides necessary information for material procurement and production planning.
- Because of strong sales demand change, it is a challenge to maintain OTD and product lead time in reasonable level and inventory levels in agreed target level. From the customer point of view, both product lead time and OTD are important competitiveness factors.

Service delivery and customer support processes were considered separately even though they are not a separate core process. Service delivery and customer support processes are a part of all other core processes – CRM, PM and PDM – and its main task is to provide services and technical support to the customer. Service delivery and customer support development actions are identified mostly to be in the early and late phase of product life cycle phases.

2 Activity identification was started with sub-processes identification. Each sub-process went through an identification of all existing activities. Sub-processes were renewed with sufficient accuracy. Some sub-processes were combined with each other and accordingly some new sub-processes were identified. One other important aspect that was considered was the mutual interconnection. It was identified that sub-processes engage in a complicated interconnection with each other. Interconnection herein means cross functionality. The interactive relationship varies a lot between activities and sub-processes. Cross functionality consists of information or material movements. Information consists of numerous different content: text, numbers, drawings, design documents, customer related documents, and so forth.

3 After sub-processes and activities of each sub-process have been identified, the next step is to perform more detailed identification of activities and sub-processes. Customer closeness, perceived quality by the customer and added value creation for customers were identified as the most important drivers in order to perform sub-process deployment. Sub-processes were considered in their entirety and the target was to ensure that all sub-processes work together in order to optimise added value creation to the customer, and respectively avoid activities that do not create added value.

4 Three core process model deployments were done in the following steps. Other important issues that were considered were: process owner and process developer roles

identification; BPR terminology used in the case company; process description model; and IT solutions and tools that are needed in the processes renewal. Process owner and process developer roles were identified. The case company made a decision to establish the following core processes: customer relationship management (CRM), product management (PM) and product delivery management (PDM).

Process description is defined to be an interactive hierarchic model presented in the IT environment, where the highest level represents the three core process model, and by an interactive manner users can drill down in the process hierarchy first to the sub-process level, then to the sub-process stage level and finally to swimming lane type block diagram. BPB terminology in the literature is complex and due to this, it was necessary to define and specify the BPR terminology used in the case company project. The terminology definition helped the case company personnel to support mutual communication and decrease misunderstandings.

Currently used IT tools did not fulfill the future needs of the renewed process description and process operating site. The process IT requirement specification was done and clarification of suitable IT solutions for the process portal were considered. Sharepoint and Visio Professional were identified to fulfill the requirements of the IT tool. Going forward, it was recognised that the IT Sharepoint portal development needs a separate development project.

5 In the following steps, development actions were evaluated and prioritised. The following key drivers used in the evaluation and the prioritisation were defined: customer closeness, perceived quality by the customer, and added value creation for the customer. The project frame deployment was made in each sub-process according to the prioritised development actions. As a next step, the project frame was deployed as the road map to the future.

6 The development road map time period was defined to be the same as the existing strategic time period. Development actions were presented in the road map. One of the most important issues was to consider the adequacy of resources in parallel-moving development projects. It was recognised that BPR actions need a lot of time and people to take part in BPR development projects, in addition to their own work. Due to the limited time of the participants in the development projects, these parallel-moving development projects were interlinked with each other to allow smooth progress of the parallel-moving development projects.

4.2 Pilot projects

The identified BPR method provided a good starting point for the implementation of the following steps of the BPR project. It was decided that the BPR project implementation was to be carried out in two steps:

- (1) The ramp-up and the business capture processes have been renewed as pilot projects.
- (2) Thereafter the rest of the sub-processes will be renewed.

The targets set for the pilot project were to develop both the sub-processes to a reasonable level and further to create an appropriate process development method. The developed process development method was used in the remaining sub-processes' development actions. After the pilot projects reached a reasonable level, the following step was to start renewing other sub-processes. The entirety of the sub-processes renewal will be implemented according to the road map.

4.3 IT development

The need for a new IT system was identified in the early phase of the BPR. The identification of the technology choice was the first step when considering the IT portal. The target of the IT project was to create an IT environment called Sharepoint Process Portal, which provides all necessary services for process description and process operational use. The starting point for the IT environment was that all the process-related information would be centralised in one place. Another important issue was the

presentation of a hierarchical description of the processes in which the user drills down from process top level to levels further down. After considering the various options, the Microsoft Visio Professional and Sharepoint were chosen as IT tools. The Sharepoint portal design was completed as separate project.

The IT development project was carried out in about 10 weeks. The project was completed in four steps: specification, design, test and implementation. The project implementation was carried out successfully in the designed time. The IT projects covered the implementation of the Sharepoint Process Portal and functionality for two sub-processes: CRM / Business Capture and PM / Ramp up. The entire process system consists altogether of about 20 sub-processes. The required IT design of these remaining sub-processes was implemented in connection with the sub-process renewal.

5. RESULTS AND DISCUSSION

Life in the electronics manufacturing business is a battle to eternally develop better and better approaches to doing business. BPR is the most effective approach to business recovery when it is done at the right time. There is a significant difference between performing BPR actions in a company which is in crisis compared to a company which is doing business in an adequate manner.

A company's development efforts are not always straightforward. A company must be sensitive to actions, be able to identify development areas and always consider better practices. This conditions were present in the BPR of the case company. Open discussion and identifying actions in the processes that were not working well and did not create added value to the customer led to BPR renewal. It is noteworthy that the case company's competitive position was good before starting to consider future BPR action. The case company renewed its business processes in a strategic manner to ensure the ability to retain its competitive advantage in the long term, 3 – 6 years ahead.

In the beginning, it is a challenge to an organisation to recognise which processes need business process renewal, and furthermore to change the whole organisation into a positive culture for doing BPR. It also seems quite difficult to make an accurate assessment of BPR, not to mention the method that has to be implemented. It is recommended that the company use external BPR experts at the beginning of the project to ensure the appropriate scope for the BPR.

Once the company has recognised the need for BPR, the visible commitment of senior management is an important factor for getting started. Early success is also important to strengthen the company atmosphere and motivation to go further. In the later steps of BPR organisation, commitment is needed to implement the new concepts into practice.

As a result of BPR activities a process portal, which consists of a process description section and an operational section, has been designed and implemented. The processes are presented in a hierarchical manner allowing users to drill down from the core process level towards each sub-process. The operational section of the process portal provides all necessary functionality to run sub-processes in an operative manner.

Solutions to the three research questions are:

RQ1: Customer closeness and added value creation were the key drivers in BPR; those were the most important evaluation and prioritisation criteria; and the key development areas of the BPR actions. It is remarkable that all core processes are equally responsible for customer relationships, not only CRM. The added value creation serves not only the customer; it is equally important for the company itself to retain its competitive advantage.

RQ2: Enabling required growth in turnover is an extremely big challenge to a company. It is obvious that both internal and external elements of competition affect this. The most important development actions to ensure and make required growth in turnover possible are: CRM core process strengthening; systematic portfolio management in PM; and production capacity and effectiveness in PDM.

The next study is to consider all remaining sub-process development in a continuous improvement manner.

6. CONCLUSIONS

The pilot project was implemented in three different projects: the CRM / Business capture sub-process development project, the PM / Ramp up sub-process development project and the IT / Sharepoint site IT development project in the first step. These three parallel development projects were considered as pilot projects, whose purpose was to test the BPR development concept in practice. The experiences gained from the pilot project are to be utilised in later steps, in which the remaining sub-processes will be renewed. All three pilot projects were carried out in the given time. The other objectives of the pilot projects were also achieved.

The case organisation made fundamental changes in practices while moving from a functional approach towards a process organisation. This new approach was necessary to develop such strategically important key issues as customer closeness and perceived quality by the customer. The case company utilised some new and activated some old key performance indicators (KPI) to monitor the results achieved. A BPR project of this magnitude requires strong and visible leadership from senior management. In addition the organisation must have the ability and the resources required to design, implement and put into practice the necessary changes to the organisation's operation. It should be noted that such changes affect the organisation with a delay. The effect of the implemented changes will be shown in the performance measurements from two to five years' time.

Methodological reflection on the research may consider in terms of the case company's individual situation, type of business and from a clockspeed point of view. The individual situation of the case company can be considered from two important viewpoints: personnel motivation and capability to change; and the structure of the organisation. As earlier mentioned, to make change possible in the organisation, the visible support of the senior management is required, as is the capability to define the appropriate BPR method and apply it in practice. The company structure has a significant effect on the implementation of BPR. The structure of the organisation such as: its size, business, and whether it is an engineer-oriented office environment or heavy mechanical engineering industry has to be considered in the BPR.

It makes a substantial difference if the organisation consists of 80 percent white-collar workers and 20 percent blue-collar workers, or vice versa. The type of business reflects at least two of the viewpoints: how technology oriented the products and services that the company provides are; and the clockspeed of the business that the company is running.

Technological challenge is related to the complexity of the products and services, and what kind and how many different expert resources are required. Charles Fine has defined the term clockspeed to mean the time between product renewals. He mentions for example a jumbo jet whose clockspeed is about 30 years; on the other hand, computer CPU renewal is measured in months (Fine, 2009). Time must be considered in terms of the company's age and from the present time point of view. Knowledge and available resources of the company increase cumulatively with the company's age, which can be utilised while performing BPR.

The development and implementation of the BPR method in the case company complements the existing BPR theory from the following perspectives:

- (1) The case company's situational factors have to be considered when defining BPR actions. Factors such as: company age, type of business, organisation capability for change management, structure of the organisation, degree of technology level, and the clock speed of the case company's products and services have to be taken into account.
- (2) The presented BPR method has been tailored for a case company that designs, manufactures and markets LEDs in a competitive global market.
- (3) The relationship between core processes, sub-processes and individual activities are taken into account in more detail.

- (4) BPR has been expanded to include a new IT system design and implementation. A process description has been presented in an interactive manner in the developed IT environment, in which users can drill from up to down in the process structure.
- (5) BPR project implementation has been divided into two steps: in the first step sub-processes are renewed, and then the process development will be shifted to the continuous improvement mode.

The next study is to consider all remaining sub-process development issues in a continuous improvement manner.

REFERENCE LIST

1. EPM (2009). Management Accounting: Enterprise Performance Management. The Institute of Cost and Works Accountants of India. India, Kolkata:12, Sudder Street.
2. Fine, C. (1999). *Clockspeed: Winning industry control in the age of temporary advantage*. Cambridge, MA: Perseus Books Group.
3. Gordon, K. D. (2008). Product vs. system quality. *Quality Progress*, 41(1), pp. 83-85.
4. Hanafizadeh P., Moosakhani M., & Bakhshi J. (2009). Selecting the best strategic practices for business process redesign. *Business Process Management Journal*, 15(4), pp. 609-62.
5. Hannus, J. (1994). Prosessijohtaminen: ydinprosessien uudistaminen ja suorituskyky. Gummerus Kirjapaino Oy. Jyväskylä. ISBN 951-96708-0-7.
6. Kiiskinen, S., Linkoaho, A. ja Santala, R. (2002). Prosessien johtaminen ja ulkoistaminen. WSOY. Helsinki. ISBN 951-0-27418-6.
7. Kotler, P. (2003). *Marketing management*. Upper Saddle River, NJ: Pearson Education Inc.
8. Kubiak, T. M., & Benbow W. D. (2008). *The Certified Quality Engineer Handbook* (3rd ed). Milwaukee, WI: ASQ Quality Press.
9. Kumar, V., Choisine F., Grosbois de D., & Kumar U. (2009). Impact of TQM on company's performance. *International Journal of Quality & Reliability Management*, 26(1), pp. 23-37.
10. Laamanen, K. (2001). Johda liiketoimintaa prosessien verkkona. ISBN 952-5136-16-7.
11. Laamanen K ja Tinnila M (2009). Prosesijohtamisen käsitteet, Teknoliogiateollisuus OY. ISBN 978-952-238-001-1.
12. Maiga, S. A., & Jamar, J. (2004). Effects of management control systems on manufacturing performance: A path analytical model. *JAMAR*, 2(1), pp. xx-xx.
13. Martola, U. ja Santala, R., (1997). Liiketoimintaprosessit: BPR muutoksen johtaminen. WSOY Kirjainpainoyksikkö. Porvoo. ISBN 951-0-21673-9.
14. Sumanth D.J. (2000). *Total productivity management*. Boca Raton, FI: CRC Press LLC.
15. Uusitalo, T., & Takala, J. (2011). Proceedings from TIIM2012: *A Competitive Operative Management System in the Electronic Manufacturing Business*.
16. Uusitalo, T. (2012). Proceedings from TIIM2011: *Business Process Reengineering in the Electronic Manufacturing Business*.

STRATEGY IMPLEMENTATION BY MANAGING BUSINESS PROCESSES: A CASE STUDY IN THE ELECTRONICS INDUSTRY IN FINLAND

Abstract

Purpose – This case study creates an economically and technically competitive operating management system to improve the efficiency and quality of performance in a mid-sized electronics manufacturing company. The research was carried out with the aim of increasing the economic value of the studied company by implementing a process management approach to its challenging and dynamic global business environment.

Design/methodology/approach – The action research method is used in this study to implement continuous improvement in business process management and increase customer closeness and perceived quality. A qualitative research method was applied. In-depth interviews and workshops were used to collect data. The study also applies some features of the constructive research method, as well as weak and strong market tests.

Findings – The continuous development of business processes can facilitate adaptation to changes in the environment, which is crucial for companies that hope to maintain their viability.

Practical implications – A project implementation approach, in which a concept is created, applied in practice through a pilot project, and then widely implemented, was found to be a good practice.

Originality/value – Business development and regeneration achieve better results when they are carried out proactively, before a company has been plunged into financial or operational difficulties.

Keywords:

Perceived quality by the customer, competitive advantage, added value creation, strategic management, business process reengineering, business process management.

1. INTRODUCTION

World economic growth has been very moderate, and it is expected to remain moderate in the near future. The Finland Ministry of Finance's Economic Bulletin 1/2013 forecasts that the economy will remain in a state of moderate growth at least through 2013 and 2014 (Ministry of Finance, 2014). The world economic outlook and the moderate market growth rate force firms to create growth and differentiate themselves from their competitors by developing competitiveness.

This study examines process development, management, and implementation from a strategic point of view. The aim is to create ever-evolving processes in order to implement the strategic goals set by the company's senior management. The case company's strategic goal is to obtain a significant increase in market share. Achieving this goal requires the success of business process management. The case company identified the following critical success factors: enabling competitive advantage core competencies, developing critical resources, encouraging the organization's continuous learning, and as a result, maintaining and developing capabilities.

The case company identified the process management challenges as follows: The organization must better identify the customer's expectations and needs, create and capture additional value by developing the entire value chain, and engage in better strategic and business process management overall.

The research questions are as follows:

RQ1. What are the most important practical business process management measures needed to achieve the strategic goals?

RQ2. What are the practical benefits to a manufacturing company when the process management approach is used?

The research design is based on a study by Salmi and Jarvenpaa (2000). Scientific knowledge accumulates through empirical observations and conceptual clarifications. In the new study, the findings either confirm the existence of scientific knowledge or question it. Figure 1 presents the BPR concept created, and in this study, "BPR continuous improvement / BPR follow-up" is presented in more detail.

Figure 1: BPR concept

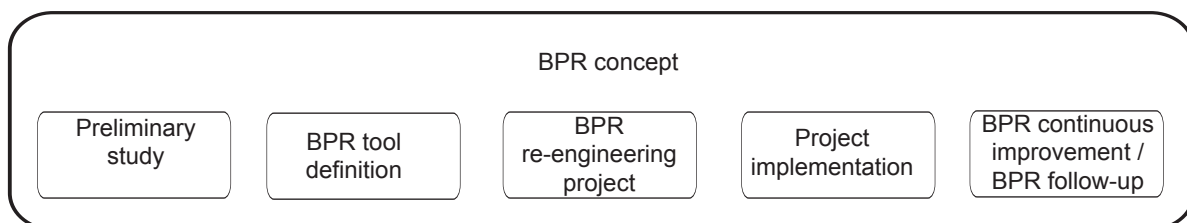
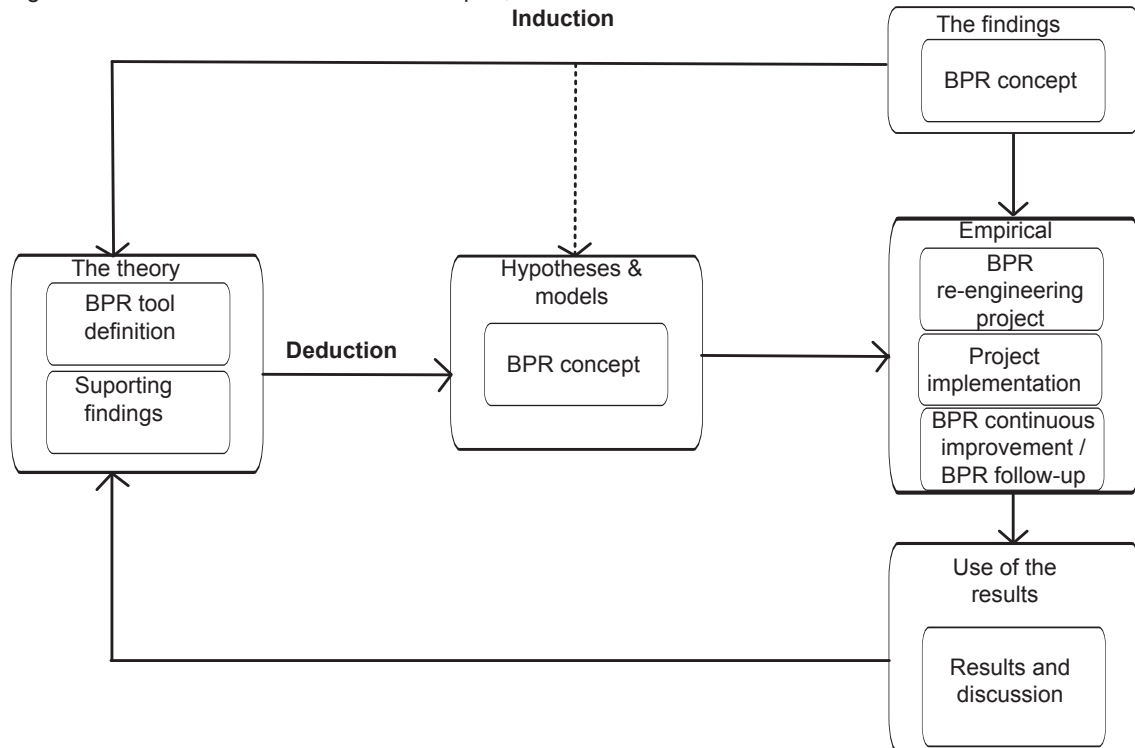


Figure 2 presents the interaction between deduction, induction, and new information based on the BPR concept, which is deployed to the modified model of Salmi and Jarvenpaa (2000).

Figure 2: Modified model Salmi and Jarvenpaa, 2000.



Source: Salmi and Jarvenpaa (2000).

The “BPR concept” (Figure 1) is deployed in the Salmi and Jarvenpaa model (Figure 2) as follows: The “BPR concept” (used in this study) is a key result of the study and represents the findings of the study; the “BPR tool definition” (Uusitalo, 2012) represents the theory that was used in the study; the “BPR concept” created (Uusitalo, 2011; Uusitalo, 2012; Uusitalo, 2013; this study) represents the hypotheses and models; the empirical section consists of the “BPR re-engineering project,” “Project implementation” (Uusitalo, 2013), and “BPR continuous improvements / BPR follow-up” (this study); and “Results and discussion” (this study) represents the use of the results, which also closes the loop by returning to the theory.

The assumption underlying the study was the view that the development of business processes could significantly improve the company's performance. This was based on the idea that the company's activities focused too greatly on functional management culture.

2. LITERATURE REVIEW

The literature review considers the relationship between strategic management and process management in order to create a company-wide management practice. Initially, the literature review focuses on organizational learning; secondly, it focuses on considering strategic management; and thirdly, it considers the central question of process management. In the end, the areas of learning organization, strategic management, and process management are linked together in a company-wide management practice, which is capable of responding to the turbulent, challenging, and ever-changing demands of the environment.

Organizational learning

In his book, *The Fifth Discipline* Peter Senge describes a learning organization as a place “where people continually expand their capacity to create the results they truly desire where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning how to learn together” (Garvin D.A., 1994, p.1).

Organizational learning is an essential part of a company's strategic processes in terms of organizational competitiveness, organizational innovation, and responding to dynamic business circumstances. Organizational learning, as a part of the strategic management perspective, is important for achieving and sustaining competitive advantage (Oh, 2012, p.3).

Organizational learning is also important for organizations' strategic renewal, which can be considered in terms of two dimensions: learning stocks and learning flows. Learning stocks are learning outcomes generated from changes in awareness, cognitions, and behaviors in the three levels of the organization: the individual, group, and organizational levels. Learning flows are learning outcomes in transition, in which learning and awareness move between the above-mentioned individual, group, and organizational levels. Both learning stocks and learning flows are considered to be a major key resource for strategic renewal, which can help achieve competitive advantage (Oh, 2012, p.3).

Garvin (1994) asks a simple question: What is a learning organization?

He considers organizational learning via the following definition: "*A learning organization is an organization skilled at creating, acquiring, and transferring knowledge and at modifying its behavior to reflect new knowledge and insights.*" Furthermore, he considers a learning organization to be one that engages in the following five main activities: systematic problem solving, experimentation with new approaches, learning from its own experiences and past history, learning from the experiences and best practices of others, and transferring knowledge quickly and efficiently throughout the organization (Garvin D.A., 1994, pp. 2-3).

Strategic Thinking

The Strategic Management Society was established in 1980 to promote strategic thinking. In the same year, Michael Porter released his famous five competitive forces strategies model (Santalainen, 2010, pp. 23-26).

Strategic thinking is seeing in five directions: seeing onwards, which is commonly referred to as being visionary; seeing backwards by utilizing experiences and tacit knowledge; deepening strategic thinking by looking at the big picture from the top down; understanding business and earnings logic via the interpretation of operational details from the bottom up; and looking to the side, which means the approaches and practices of learning, understanding, and implementing the strategies from the points of view of other sectors. Additionally, the sixth direction is seeing over the imaginable future vision, which means not only trying to predict the future but also actively acting in the process of creating the future (Santalainen, 2010, pp. 23-26).

In the 1990s, attention was paid to strategy management, the efficiency of internal processes, and organizational governance. At that time, there was a discussion of value creation and capturing, as well as resource management concepts. Strategic management emerged in two main directions: the structural analysis of industries and companies' positioning in the competition according to that analysis. Michael Porter has had a strong influence on this trend. The second main direction is resource management, which affected the evolution of strategic thinking, especially in the 1990s (Powell, 1995, pp. 2-4, Santalainen, 2010, pp. 23-26).

Resource management is seen as a way to obtain an important competitive edge over rivals in terms of positioning and customer-oriented operations. Resource management consists of the following factors: a diverse and inspiring vision; the creation of the necessary set of the core competencies; resource activation in the direction of the vision; and maintaining and strengthening the company's competitive position by updating developing resources (Santalainen, 2010, pp. 23-26).

Strategic management

In-depth multi-dimensional change is called transformation. In his book, Santalainen (2010) writes that strategic management that resembles a radical transformation includes elements such as the

following: business management, organizational structures and processes, culture, and people and processes (Santalainen, 2010, pp. 265-266).

Teese et al. (1997) identify three existing strategic management paradigms:

- 1) The competitive forces approach, created by Porter (1980), whose approach emphasizes creating defensive positions against competitive forces.
- 2) The strategic conflict approach, which pursues competitive advantage through strategic investments, pricing strategies, signaling, and the control of information.
- 3) A resource-based perspective, which emphasizes efficiency and effectiveness.

Teese et al. (1997) consider the question within the field of strategic management: What methods can a company apply in order to achieve and sustain competitive advantage? They answer this question through the dynamic capabilities approach, which emphasizes the development of management capabilities in the form of functional and technological skills in areas such as the management of R&D, product and process development, technology transfer, intellectual property, manufacturing, human resources, and organizational learning (Teese et al., 1997, p.2).

Hannus (2004) considers effective management strategy via the following five perspectives:

- Vision, which is a strategic goal that describes the organization's goal-oriented status over a given timespan.
- Strategic positioning, which consists of customer-product-channel selections, a competitive strategy, customer promise, and a revenue model.
- Strategic resources, which are composed of capabilities and intellectual and material resources.
- Critical success factors and strategic objectives and indicators that include the principles used by the organization to apply the strategy, concretization, setting objectives, and monitoring the implementation of the strategy.
- Strategic measures and development management include strategic-level projects and measures (Hannus, 2004, pp. 59-60).

Strategic competence

The best companies have created a successful strategy by successfully utilizing the core competencies they occupy. Prahalad and Hamel define the core competencies as the collective learning of the organization, especially those concerning the production of a wide range of skills, which is integrated into various technological streams (Prahalad et al, 1990, pp. 4-5, Santalainen, 2010, p. 134).

Strategic resources

Santalainen (2010) defines an organization's long-term competitive advantage based on dynamic resources, which are difficult to imitate, relocate, purchase, or reimburse (Peteraf et al, 1993, pp. 3-4, Santalainen, 2010, pp. 127-131).

The organization's competence and capability

Karami et al. (2008) highlight the importance of competencies, particularly HR's role, in increasing the core competencies of a firm. HR's active participation in the organization's business development and implementation improves the organization's efficiency in a holistic manner (Karami et al. 2008).

Figure 3 shows the interaction between resources and capabilities. Competencies are created by utilizing and combining resources. In this approach, the resources and competences are divided into four groups: the necessary resources are needed to meet the needs of the customer, the unique resources enable competitive advantage, the basic competencies are required for the exploitation of the necessary resources, and the core competencies are required for the exploitation of the unique

resources. Figure 3 further explains how new competencies are created through organizational learning. The creation and maintenance of core competences and unique resource require exceptionally in-depth strategic thinking (Johnson et al, 1997, pp. 137-146, Santalainen, 2010, pp. 134-135, Oliver, 2013, pp. 3-7).

Figure 3: Resources and competencies

	Same as those of competitors or easily retrievable	Better than competitors and difficult to track
Resources	The necessary resources	The unique resources
Competencies	The basic competencies	The core competencies

Source: Johnson et al, 1997, p.144, Santalainen, 2001, p.134.

Competitive advantage

In their article "Producing sustainable competitive advantage through the effective management of people," Pfeffer et al. emphasize that it is more important for a company to focus on staff capability instead of technology, patents, or strategic positioning to obtain long-term competitive advantage (Pfeffer et al., 1995 p. 1).

The company's performance

Santalainen (2010) holds that in order to reach peak performance, a company needs the following elements: intent, which includes the energy required and success culture; a vision that includes a strategic plan and direction for the business, as well as a business model; and dynamic focus, which includes the purposeful and concrete goal at which the company is aiming (Santalainen, 2010, pp. 21).

Achieving a high level of performance requires a strong intent (energy), vision (intent and target level), and purposeful action (Santalainen, 2010, p. 21). Let us consider peak performance through a sports-related example. Professional sports are a world of brutal competition. Finnish ice hockey coach Karri Kivi has twice steered his team to victory: first, in 2012, Pori Assat as Ice Hockey League Championship in Finland and, the following year, at the M20 men's Ice Hockey World Championship (Yle, 2014).

Picture 1: Head coach of Finland M20 national ice hockey team Karri Kivi.



Source: Yle, 2014.

Ice hockey coach Karri Kivi's coaching secret is a combination of a psychological eye, continuous learning, and careful statistical monitoring. Karri Kivi considers the following to be important key factors that help in winning championships: tactical managing, risk management, team spirit, team unity, visible management confidence, and the courage to make the right decisions under pressure (Yle, 2014).

Process Management

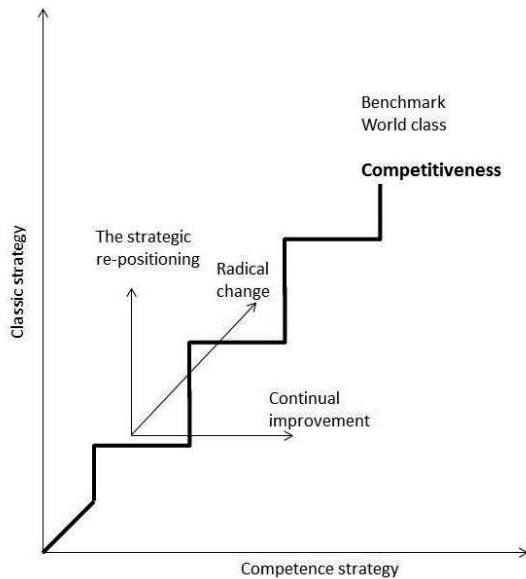
Tinnila (1995) mentions three important BPR perspectives concerning the operational BPR project approach: IT as an enabler, the potential of BPR redesign, and the role of business processes as a unit of strategic planning (Tinnila, 1995, p. 1; Uusitalo, 2012, p. 5).

The strategy is the assumption (hypothesis) that under certain conditions, it is expected to achieve certain results (in an ideal world with no distractions). Often, business strategy includes development projects, such as improvements in productivity, streamlining the product portfolio and sales, and/or targeting new market segments. These development projects are commonly referred to as strategic development projects or priorities (Laamanen, 2001, p. 230).

Strategic management and process management capabilities are linked to one another through a strategic capability approach. The competitiveness of this approach is shown in the four fields of Figure 4:

- On the y-axis is the classic strategy, i.e., the right things to do, which is composed of the following factors: investment, core competencies, capacities, range of products, distribution channels, etc.
- On the x-axis is the capability of a strategy, i.e., doing things right, which consists of the following factors: the company's capability development, such as quality, productivity, speed, flexibility, learning ability, etc., as well as its priorities (Laamanen, 2001, p. 237).

Figure 4: Classic vs competence strategy.



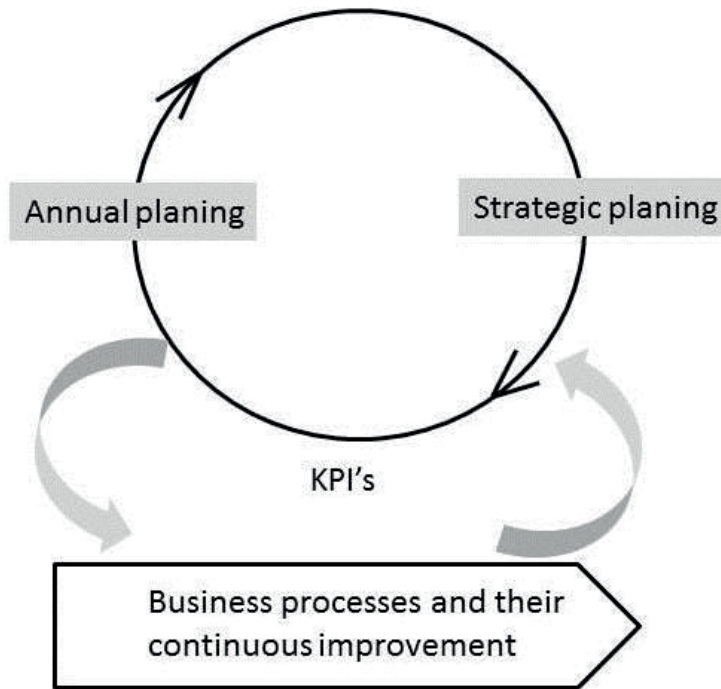
Source: Laamanen (2001, p. 237).

David Norton's study shows that nine out of ten companies fail in implementing their strategies. He has identified a variety of reasons for the failure of operational management: the directors' lack of genuine commitment to strategy implementation, only a small part of the personnel understanding the strategic objectives and the necessary means to achieve them, and the fees and budgeting not being sufficiently connected to the strategy.

Typically, organizations implement strategic objectives by setting goals, making plans, and implementing development projects. In practice, the implementation of a strategy means that the strategic objectives set by the management are communicated to the organization. Often, implementations of the strategic objectives are associated with setting up development projects in order to ensure the achievement of these strategic goals. Typically, the annual business strategy is planned at the beginning of the year, and correspondingly, the target design for the next year is accomplished at the end of the year, which will be the base for the following year's strategy.

The presented approach is not without problems, as Norton's research shows. Companies face challenges in implementing their strategies. In order to implement its strategy, a company needs operationalization, strategic objectives, and process indicators. The Key Performance Indicators (KPI) play an important role in the communication of strategic objectives. In practice, operationalization refers to a measuring system for the construction of processes that can be used to set development goals and monitor the development performance. Figure 5 illustrates how strategic planning and targeting are connected to processes in practice (Kaplan et al. 2009, pp. 23-34, Laamanen, 2001, p. 250).

Figure 5: Connecting strategies to processes through key performance indicators.



Source: Laamanen (2001, p. 250).

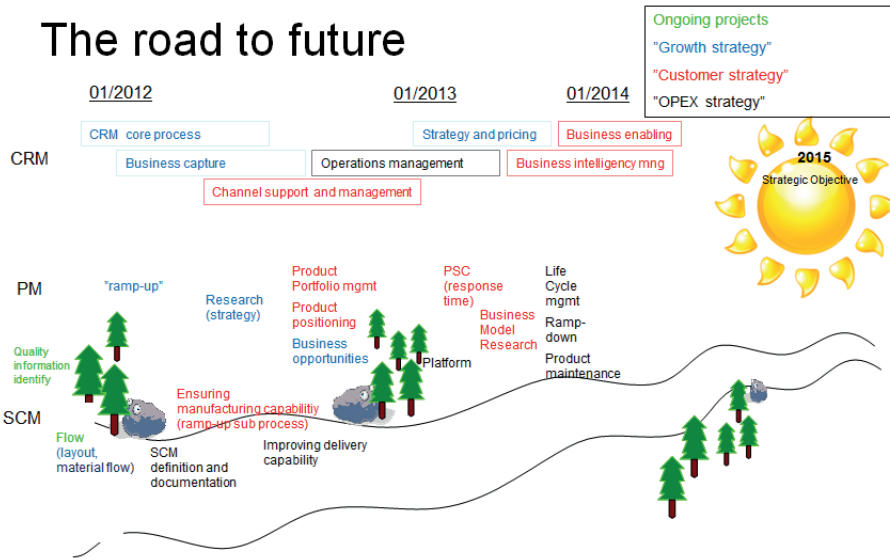
A strategy is realized through processes. Process management must be supported by guidance and reviews. Guidance is intended to ensure that certain matters are done properly, such as ensuring that quality remains at the desired level, ensuring agile and flexible working methods, and implementing learning organization practices, etc. The intent of the review is to ensure that the organization is doing the right things, such as that the organization possesses the correct and core competencies, that the investment is adequate and focused, and that capacity-related issues are sufficiently addressed (Kaplan et al. 2009, pp. 23-34, Laamanen, 2001, p. 250).

3. PROCESS MANAGEMENT IN THE CASE COMPANY

In the previous study (Uusitalo, 2013), a “BPR re-engineering project” was carried out that contained the deployment three core process, sub-processes, and their activities.

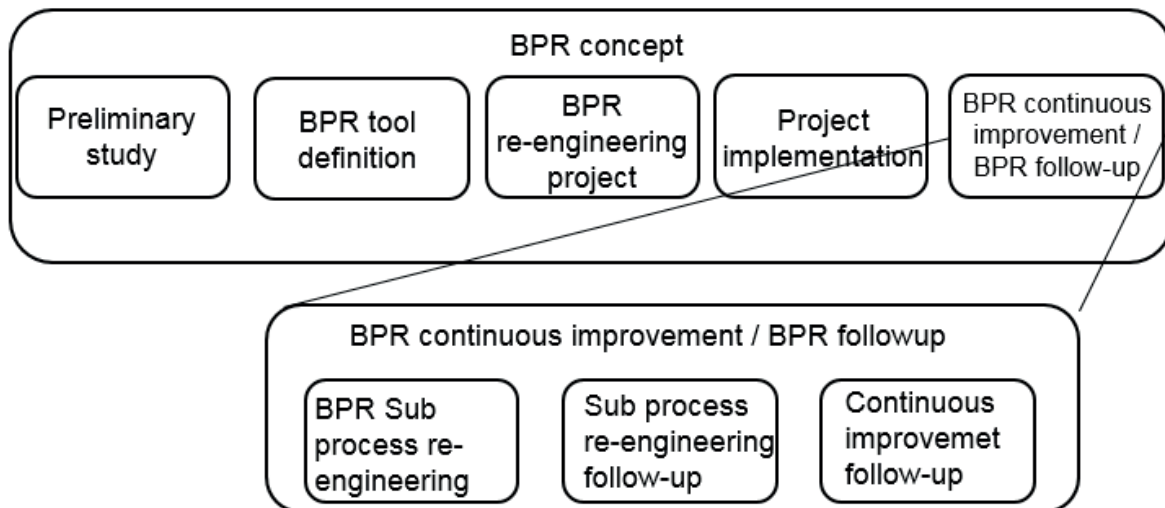
The starting point of the implementation of the development projects and the transition to the continuous improvement approach are shown in Figure 6. All identified sub-processes that require development activities are marked on the roadmap in order of priority.

Figure 6: The road to future.



The empirical portion of this study is a continuation of previous studies (Uusitalo, 2011; Uusitalo, 2012; Uusitalo, 2013). The BPR concept consists of the blocks shown in Figure 7.

Figure 7: BPR Concept.



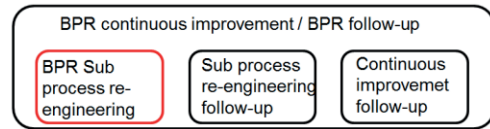
“Preliminary study” (Uusitalo, 2011) was the first study of the BPR concept, and the purpose of this study was to find the most critical areas of the quality development that needed improvement. “BPR tool definition” (Uusitalo, 2012) was the second study, and the purpose of this study was to identify the most critical areas of the workflows and processes that needed improvement and to create an appropriate tool with which to implement a business process reengineering (BPR) project. “BPR re-engineering project” (Uusitalo, 2013) was the subject of the third study, and the purpose of this study was to define the business process reengineering (BPR) project in the case company. The third study also contained the “Project implementation,” in which the ramp-up and business capture processes were renewed as pilot projects. In addition to the pilot projects, an IT development project was carried out in order to create an IT environment called Sharepoint Process Portal, which provides all necessary services for process description and operational process use.

This fourth study is the last part of the publication series, in entire the study is brought to a close by presenting the “BPR continuous improvement / BPR follow-up” steps and evaluating the results obtained throughout the entire study.

Figure 7 presents the work breakdown structure of the “BPR continuous improvement / BPR follow-up,” and it contains three sub-entities: “BPR sub process re-engineering,” “sub process re-engineering follow-up,” and “continuous improvement follow-up.”

3.1. BPR sub-process re-engineering

Based on the experience of the two pilot projects, each sub-process has been re-engineered according to the concept created during the piloting phase. The SIPOC tool was used to investigate the sub-processes on a detailed level. Thereafter, it was implemented via the sub-process activity deployment. Every activity was examined in sufficient detail so that each activity was described in an appropriate manner. The appropriate key performance indicators were also identified at this stage.



As a general rule, the key performance indicators (KPIs) were identified based on a sub-process’s capability. In other words, KPIs show the capability of the process, such as on-time delivery (OTD), which indicates the percentage of deliveries that are delivered on time. In this context, the process metrics, which indicate the effectiveness of the processes, were also considered. This was viewed to be important, but it was left as a development idea to be implemented later, during the continuous improvement actions.

3.2. BPR sub-process re-engineering follow-up

Because of the many development actions, it was necessary to implement a sub process re-engineering follow-up procedure in order to control and monitor the progress of the sub-process development projects. The sub process re-engineering follow-up procedure is presented in Figure 8.

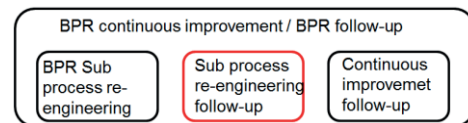
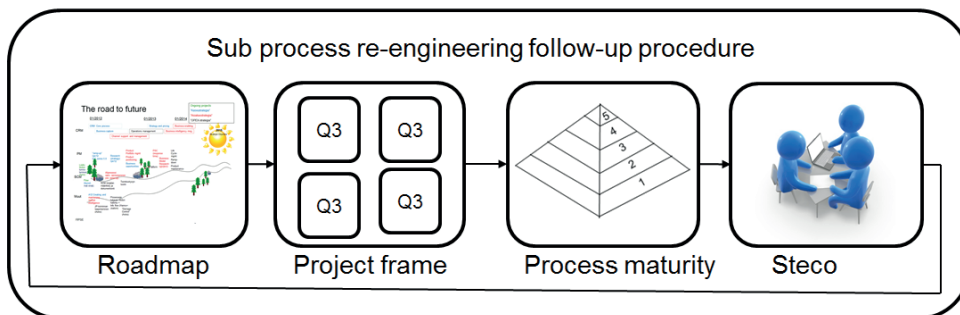


Figure 8: Sub-process re-engineering follow-up procedure.



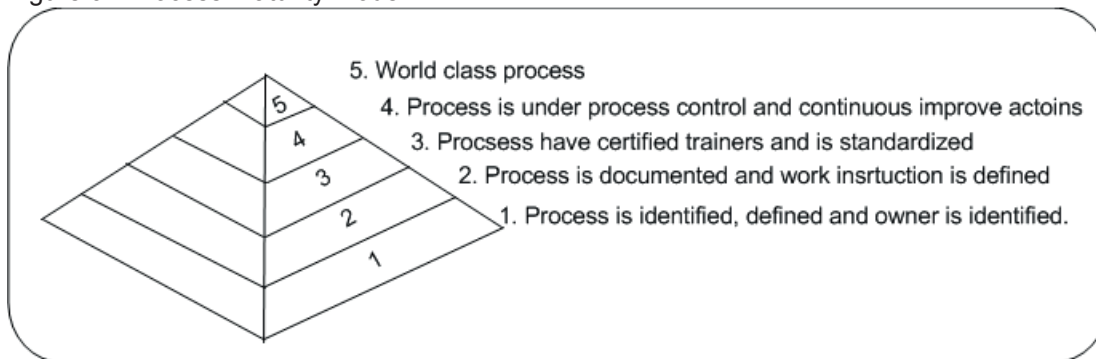
The roadmap is an overview presentation of the sub-process that must be re-engineered. It provides an estimated timeline in which the sub-process re-engineering is expected to be completed. It also helps to assess how many sub-process re-engineering projects can be performed in parallel.

Each sub-process re-engineering project is performed according to four-quadrant project frames. The Q1 phase contains information collecting regarding all important issues. Information collecting involves the following: the investigation of available measures, process descriptions, KPI results, etc. In the following phase, Q2, the gathered information from phase Q1 is analyzed in order to provide all necessary information for following phase, Q3. The most important tool in the Q2 phase is the SIPOC analysis tool, with which the process supplier, process inputs, process itself, process outputs, and customers of the process are investigated in a detailed manner. After that, the results of the SIPOC

procedure are utilized in sub-process deployment, where each activity is defined and described in a swim line diagram. In the Q3 phase, the newly deployed process structure is put into practice. This phase contains a great deal of training in order to activate all the new work procedures and link them to other processes. Also, old and new KPI measures are activated, and follow-up is started. The Q4 phases assess the Q3 phase development actions and ensure that the changes are sustainable. This is an important part of change management. It is crucial to ensure that organizations genuinely introduce a new approach because given the absence of a strong intention in the consolidation phase, the organization may be tempted to return to the old way of working.

An effective and practical way to evaluate processes' capability is to use the maturity model, which describes processes' current capability in a descriptive and concrete way. The process maturity model is a five-step scale assessment method used to self-assess all of a company's processes (SEA, 2004). The process maturity model is presented in Figure 9.

Figure 9: Process maturity model.



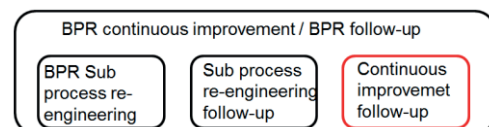
Source: SEA, 2004.

Steco was established to control and monitor continuous BPR improvement and follow-up. Steco consists of senior management, process owners and developers, and other necessary stakeholders. Steco's most important task is to provide adequate authority to implement organizational management practices in the re-engineering process.

The strategy management and process development projects are linked to one another through steco. This ensured that the strategically important views are adequately taken into account by developing processes. Another important role is associated with the use of resources and prioritization. Steco has sufficient powers for the development project's resource allocation and prioritization.

3.3 Continuous improvement follow-up

At this point, the monitoring and management of the sub-processes follow-up procedure was abandoned, and it was replaced with the follow-up and assessment of key indicators in order to perform adequate process management practices in the long term.



The process owners are responsible for the process capability and performance in the continuous improvement follow-up process management model. Each core process is monitored on a monthly base for the agreed-upon process KPI results. Development measures are taken in a continuous manner in order to eliminate unproductive work and correspondingly strengthen the customer-value-added work. The company's top management monitors the processes via reviews and audits.

RQ1. What are the most important practical business process management measures needed to achieve the strategic goals?

The BPR concept described in Chapter Three, as well as the development of measures, can be considered the answer to Research Question 1.

4. RESULTS AND DISCUSSION

The most important strategy elements, such as significant turnover growth, customer-perceived quality, and competitive products and services, have been the key drivers in the development of business processes. A development project of this magnitude is a major strategic measure taken in order to retain the company's competitive advantage in the long term, 3-6 years ahead.

Sub-process renewal was carried out over one and half years, and thereafter, the process management was moved into continuous improvement mode.

The process management challenges of the case company can be summarized as follows: the implementation of the management intent – change management must ensure that the new and more efficient practices will be sustainable in the organization's new permanent practice.

The development project took a long time, about two and a half years. In the organization, other changes also occurred: the relocation of individuals must be taken into account by providing information about the ongoing projects, including their orientation and objectives. In the other words, the new staff of the organization must be involved in the change management objectives.

Communication is a challenging part of change management. Communication must take place at all levels of the organization, and it must be visible in order to bring its content into the consciousness of the entire staff. There are a great variety of communication channels available in a large organization, such as intranet, e-mail, info events, and department meetings. It is important that all these communication channels are utilized in change management.

The importance of visible support on the part of senior management cannot be overstated. The company's senior management must put itself on the line on behalf of change management. They must be visible and active participants in the change management and trendsetters in terms of the introduction of new practices and roll-outs. They also have an important role to play in prioritizing the activities of the organization. The high priority of change-management-related activities indicates strong intent on the part of the senior management and the importance of the change management itself, which, in turn, contribute to new sustainable practices.

This fourth article is the last article in the author's series on the development of business-related research. The following chapter consists of three sections. The first section discusses the principal results achieved in the study, the second section discusses the important and relevant research-related points of the view, and the third section is about the tool developed and applied in the project.

4.1. The main results of the study

The main objective of the study is to improve the competitiveness of the enterprise by developing its business processes. A key objective of the study was carried out by renewing all of the company's business processes. The development project included the regeneration of both the core processes and the sub-processes, as well as the design and implementation of a new IT environment. In addition, it also covered the designing and deploying of a development tool that is used in the development project implementation. All the business processes and their associated activities were carefully carried out, and the necessary development measures were implemented. In the following, the business process development achievements are considered.

The most significant development measures in the CRM core process were carried out in the Business Enabling and Business Capture sub-processes. The Business Enabling process directly affects customer relationships in order to create customer-focused awareness and ensure the acceptance of the company's products and services. The most important developments in the Business Enabling sub-process are issues such as the categorization of services provided by the renewed process, the improvement of KPI setting, illustration follow-up and agility in reactions, cross-process communication improvement, and ownership clarification in roles and links to other processes. The most important development area in the Business Capture sub-process is believed to be the systematization of processes into a functional entity, where increasing revenue and customer satisfaction are two important areas of development. The Net Promoter Score (NPS) and the 2013 Revenue performance indicators have provided good results. The NPS is a customer satisfaction

survey in which promoters and detractors are tracked, and based on the results, NPS is calculated using the following formula: $NPS \% = \text{promoters \%} - \text{detractors \%}$. In terms of the NPS indicator, a significant level of lifting was reached, and the results are close to the company's goal of 50%. In terms of turnover growth, the target was not achieved, but considering the very challenging market conditions, keeping the turnover around the level of the previous year can be considered a good result.

The most significant development measures in the PDM core process were performed in the Order and Delivery sub-process and the Ensuring Testing Capability sub-process. The most important development area in the Order Delivery sub-process is on-time delivery (OTD) improvement, which is the ratio between the supplies delivered on time and all the supply deliveries, which is represented as a percentage. OTD was about 99% throughout the year, while the target is set to 100%. The most important area in the Ensuring Testing Capability sub-process development is test yield improvement regarding the final testing. Its most important performance measure is the first pass yield (FPY), which is the ratio between first-time-passed products and all tested products, expressed as a percentage. A significant improvement was obtained in terms of the entire year's performance measured in terms of FPY, and the results approached the target of 99%.

The development results achieved in the PM core process are considered via the Product Portfolio Management, Product Ramp-up, and Product Ramp-down sub-processes. All three sub-processes are important for the overall management of the product portfolio: Product Portfolio Management controls the whole the process; after the R&D phase, the Product Ramp-up sub-process efficiently readies new products for mass production; and the Product Ramp-down sub-process transfers the end-of-lifecycle products for post-manufacturing production. The development of the Product Portfolio Management process has intensified and systematized portfolio management. In terms of product sales and deliveries, two important aspects can be highlighted: the capacity to release new products, as well as the relocation of end-of-life products to post-manufacturing production. A significant improvement is obtained when controlled production volume is increased via the Product Ramp-up process after the product development project has released the product for sale and delivery. A fast and efficient product release into the market is particularly important in the early stages of a product's life cycle. The ramp-up process capability is measured via time-to-volume KPI.

This approach emphasizes a separate development project in which the stepwise development of the processes moves them to a higher maturity level. The current process maturity is evaluated using a ten-step scale: 1) process ownership is defined; 2) process description is defined; 3) objectives are defined; 4) measurements are implemented; 5) continuous improvements are implemented; 6) cooperation within the organization is achieved; 7) global cooperation is realized; 8) trend analysis is implemented; 9) benchmarking by others; 10) best in class. The results indicated that the maturity of the processes before the development project was between levels 3 and 5. After the development projects, the results indicate some progress in the maturity of the processes: Process maturity levels are being moved from levels 3 to 5 to levels 4 to 6. In the other words, it can be concluded that most of the measures are implemented in the processes (level 4), and accordingly, many processes are carrying out successful cooperation with other processes (level 6).

4.2. Consider the important aspects of the study

The process-management-related responses were considered through three viewpoints: Why does process management gives the company a competitive advantage? What kind of know-how does process management consist of? What are the key development objectives of the actions?

Considering the first question, it is important that the company ensures its competitiveness by acting optimally in areas such as accomplishing the right things based on the customer's needs, doing the right things the first time; providing high-quality products and services, and implementing the necessary development measures rapidly.

Considering the second question, the process-know-how-related areas of expertise were identified as follows: the identification of customers' needs, understanding the whole the process by deploying appropriate development tools (SIPOC, etc.), describing the processes at the appropriate level, developing operations in a systematic manner, and ensuring necessary skills takeover and deployment in the area of project management.

Regarding the third question, the key issue regarding the development measures was to identify important factors such as business process reform and the creation of a new process map; development concept deployment and testing via the piloting method; further utilizing the obtained experience in sub-process development; the sub-process follow-up procedure (Roadmap – Project frame - Process maturity – Steco); and the continuous process improvement approach, in which processes independently measure, analyze, take corrective measures regarding, and sustain their new policies.

Creating a sustainable change

With large and long-enduring projects, "downgrading" may occur, in which there is a risk of failure in practical implementation and sustaining the project, and the organization may this return to using the old ineffective working practice. Establishing change management and sustaining new working practices involve visible senior management support, which refers their own and their subordinates' commitment to ongoing development actions, and process development measures based on the idea of continuous improvement (Measurement - Analysis - Development - Sustain).

Development measure timeliness

In the previous article, timing development measures in such a way that the development is carried out before the company faces the challenges caused by environmental changes was discussed. The case company's one major objective was revenue growth, which was pursued via business process development. The market has remained challenging as a consequence of moderate economic growth. Due to the implemented process development measures, the company's high level of competitiveness has been sustained. As a result of this, the company's profitability and turnover have remained at a high level as well. Taking into account the above-mentioned challenging market situation, the development measures in themselves have been successful and the proactive development method makes sense.

4.3. Tool developed and used in the study

A consistent and systematic approach is essential for business process development. Figure 10 illustrates the tool that has been developed and applied in this study. Its various phases are described in the image, as well as how these phases are linked together.

The "BPR concept," the middle part in Figure 10, is the main frame of this research. The "Preliminary study" is the first phase of the "BPR concept," and it is the starting point and groundwork for conducting the research in the following way: create of a basic overview of the areas that need development, initiate a debate regarding the most important matters that need development, and create a positive atmosphere for the development. Also, it was found that development activities should be accomplished proactively, before the company face challenges caused by weakened competitiveness.

In the next phase, "BPR tool definition," the BPR development tool is preliminary considered on a general level.

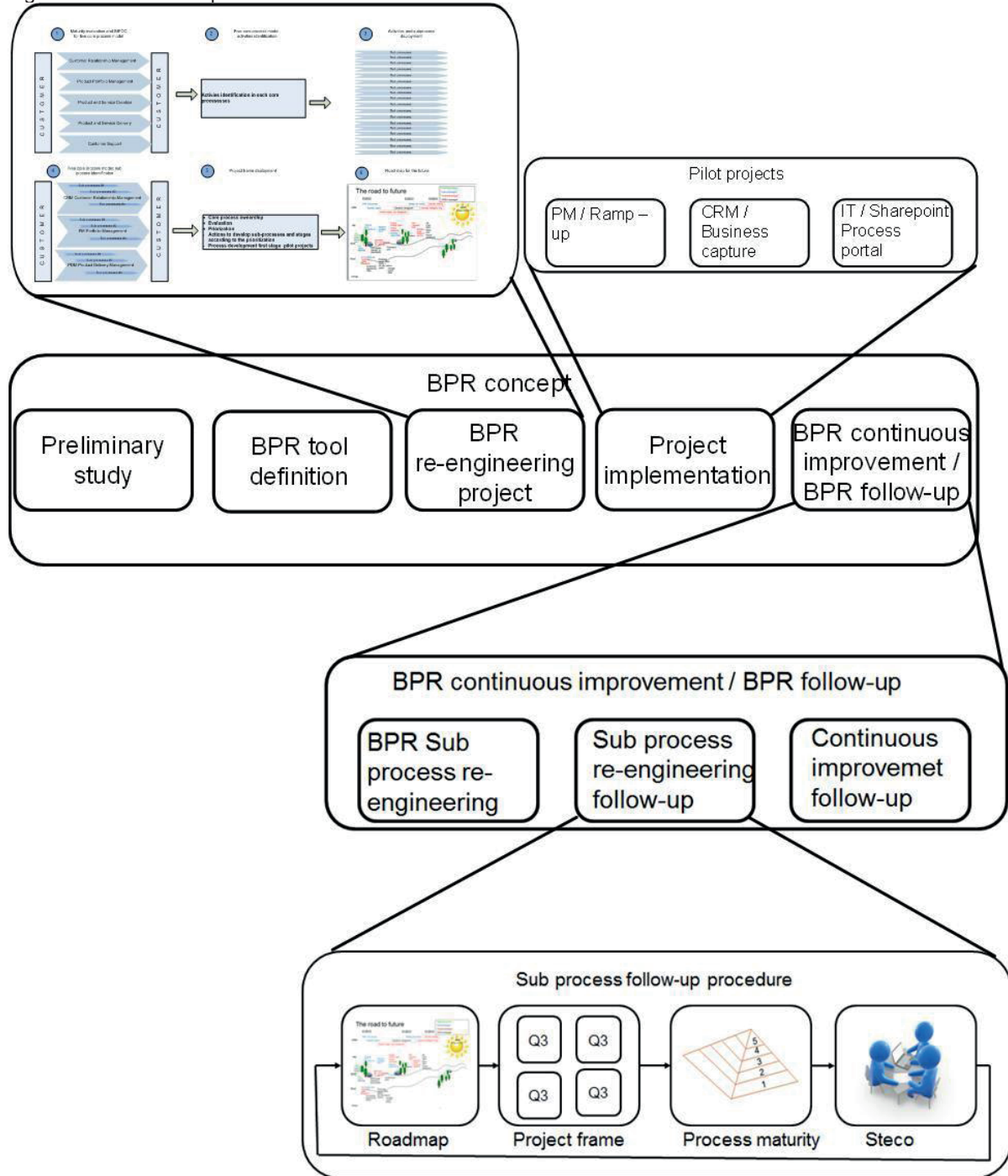
In the third phase, the "BPR re-engineering project," the process re-engineering is carried out in an appropriate manner. Individuals whose jobs relate to all functions and processes participated in this phase.

In the fourth step, the "Project implementation" phase, the two sub-processes' development projects were carried out, and the functionality of the development tool was verified via the pilot approach.

The pilot project approach turned out to be a good practice. It allows the functionality testing of the development tool, and at the same time, the organization learns about the process-related development practices. A regular review in which the development project's progress was monitored proved to be a good opportunity to share the good practices discovered via the development work for wider use in the organization.

The fifth phase, "BPR continuous improvement / BPR follow-up," was larger than the others. The project included a total of twenty sub-processes, which were re-engineered according to priority scoring and controlled via the BPR follow-up procedure. The continuous improvement phase can be considered to be a part of the organization's normal activity, in which all the sub-processes' performances are measured, evaluated, and developed.

Figure 10: BPR development tool.



The systematic research practice called the "BPR concept" used in this study turned out to be a good practice. The early phases of the project, such as the pre-study, considering the research tool, and the complete development project planning, and correspondingly, the late phases of the project, such as the implementing and sustaining the new working practice, are particularly important for the success of the project.

4.4. Generalization of the results

The study is based on the BPR theory, which was created in a study by Uusitalo (2012). Regarding this theory, the most significant references as follows: (Kallio et al., 2002; Al-Mashari & Zairi, 1999; Tinnilla, 1995; Laamanen, 2001; Jouko & Hannus 1994; Balasubramanian, 2006; Harrington, 1992; Davenport, 1993; Childe, 1995; Hammer & Champy, 1993; Kiiskinen et al., 2002; Hanafizadeh et al., 2009).

The "BPR concept" developed and described here can be considered to expand upon the theory presented in Uusitalo's 2012 study for the following reasons: The company's situation factors have been considered in greater detail and more widely; the research has a strong practical approach, and its practical implementation is shown in greater detail; the process management is linked to the company's strategy, as well as to the literature presented in this study; and the study is reported from a project implementation point of view and a practical process change management point of view.

4.5. Limitations and further studies

This results of the study confirm the assumption that the company's business could be improved by the development of the company's business processes. The company's situation factors, which follow, contribute significantly: the process development potential, the development potential of the company's business area, the company's focus on process improvement, etc.

The BPR re-engineering project and the practical measures of the sub-process changes, followed by establishing a continuous improvement approach, need still be tested in future studies in other electronics manufacturing companies, as well as in other industry sectors. Also the functionality of the developed tool (the BPR concept) need still be tested in practice, and its description could be further complemented and systematized in an appropriate manner.

RQ2. What are the practical benefits to a manufacturing company when the process management approach is used?

The results of the study described in Chapter Four can be considered to be the answer to Research Question 2.

5. CONCLUSIONS

The case company's experience with moving towards process management is very much in line with the content of the literature references used in the study. In particular, moving towards process management has improved the process flow between various function interfaces. Another important finding is the usefulness of a customer-oriented operation, including the fact that it highlights value-added work.

Process management emphasizes an approach in which the activities of the organization are continually monitored, evaluated and improved. This process management approach is very useful for the company in terms of maintaining and improving its competitiveness.

In this context, it is good to emphasize the importance of a proactive approach. A customer-based, visionary approach towards the future will allow the company to continuously create new business and adapt its operations by responding to environmental change.

REFERENCE LIST

1. Garvin, D.A. (1994). Building a learning organization. *Business Credit*, 96(1).
2. Hannus, J. (1994). Prosessijohtaminen: ydinprosessien uudistaminen ja suorituskyky. Gummerus Kirjapaino Oy. Jyväskylä. ISBN 951-96708-0-7.
3. Hannus, J. Lidroos, J. Seppänen, T. (1999). Strateginen uudistuminen. HM&V Research Oy, Helsinki. ISBN 951-98059-1-5.
4. Hannus J. (2004). Strategisen menestyksen avaimet. ProTalet Oy, Espoo. ISBN 952-99293-1-5.
5. Johnson G., Scholes K. (1997). Exploring Corporate Strategy. Prentice Hall Europe, Hemel Hempstead. ISBN 0-13-525635-6.
6. Laamanen, K. (2001). Johda liiketoimintaa prosessien verkkona. Laatuokeskus, Helsinki. ISBN 952-5136-16-7.
7. Kaplan R.,S., Norton D., P. (2009). Strategiaverkko, Talentum, Helsinki. ISBN 978-952-14-1375-9.
8. Karami A., Jones B.J., Kakabadse N. (2008). Does strategic human resource management matter in high-tech sector? Emerald Group Publishing Limited, 8(1), pp. 7-17.
9. Laamanen, K. (2001). Johda liiketoimintaa prosessien verkkona. Laatuokeskus, Helsinki. ISBN 952-5136-16-7.
10. Laamanen K., & Tinnila, M. (2009). Prosessijohtamisen käsitteet, Teknologiateollisuus OY. ISBN 978-952-238-001-1.
11. Ministry of Finance (2014). http://www.vm.fi/vm/fi/04_julkaisut_ja_asiakirjat/01_julkaisut/02_taloudelliset_katsaukset/2013_0619Suhdan/name.jsp
12. Oh S. (2012). The strategic use of QM practices for organizational learning and business performance. <http://www.ufhrd.co.uk/wordpress/wp-content/uploads/2012/11/UFHRD2012KM10docx.pdf>
13. Oliver J. (2013). Dynamic capability and superior firm performance in the UK Media Industry. http://eprints.bournemouth.ac.uk/20892/3/SO_MANUSCRIPT_Dynamic_Capabilities_of_TV_Broadcasters.docx.pdf
14. Peteraf M.,A., Kellogg J.,L. (1993). The cornerstones of competitive advantage: A resource-based view. *Strategic Management Journal*, 14 (3).
15. Pfeffer J., Hatano T., Santalainen T. (1995). Producing sustainable competitive advantage through the effective management of people. *The Academy of Management Executive*, 9 (1), p. 55.
16. Powell T., C. (1995). Total quality management as competitive advantage: a review and empirical study. *Strategic management journal*, 16.
17. Prahalad C.,K., Hamel G. (1990). The core competence of the corporation, *Harvard business review*, Reprint 90311.
18. Salmi T., Jarvenpaa M. (2000). Laskentatoimen case-tutkimus ja nomoteettinen tutkimusajattelu sulassa sovussa. *The Finnish Journal of Business Economics*, 49, pp. 263-275.
19. Santalainen T. (2008). Strateginen ajattelu. Talentum, Helsinki. ISBN 978-952-14-1122-9.
20. SEA (2004). Supplier improvement case study. http://seaonline.org/docs/ElectCompSupp_CS.pdf
21. Teece D.J, Pisano G., Shuen A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, 18 (7).
22. Uusitalo, T., Takala, J. (2011). Proceedings from TIIM2011: A Competitive Operative Management System in the Electronic Manufacturing Business.
23. Uusitalo, T. (2012). Proceedings from TIIM2012: Business Process Reengineering in the Electronic Manufacturing Business.
24. Uusitalo, T. (2013). Proceedings from MakeLearn2013: Description of a process development project.

25. Tinnila M. (1995). Strategic perspective to business process redesign. Helsinki School of Economics Finland, Business Process Re-engineering & Management Journal, 1(1), pp. 44-59.
26. YLE (2014). http://yle.fi/uutiset/karri_kivi_nain_mestaruus_voitettiin/7024904.