The Effects of Process-Oriented Organizational Design on Firm Performance: A Comparison between Manufacturing and Service Organizations

Master's Thesis

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Statutory Declaration

I declare that I have authored this thesis independently, that I have not used other than the declared sources/resources, and that I have explicitly marked all material which has been quoted either literally or by content from the used sources.

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Abstract

Process orientation (PO) is a concept where the firm's organizational design focuses on business processes ranging from customer to customer rather than on the functional structure. Various authors and studies refer to a positive impact of PO on firm performance, building the study's underlying research hypothesis. Although literature in this field has been growing, certain gaps are still remaining. This Master's Thesis contributes to a greater clarity and better understanding of how PO influences organizational performance in two ways. Firstly, the empirical study regards the PO construct as a multi-dimensional measure. On that account, a firm's exhibited degree of PO is measured along the dimensions (i) continuous process improvement; (ii) corporate culture in line with the process approach; (iii) process owner role; (iv) management commitment towards the process program; (v) process performance measurement; and (vi) process knowledge and documentation. Organizational performance considers financial and non-financial aspects, including customer satisfaction and different types of innovation. Secondly, the investigation is performed as a function of industry type in order to identify differences between manufacturing and service companies regarding the effects under examination. For this purpose, data from selected Austrian manufacturing and service enterprises were collected on the basis of personalized web surveys. This led to a final sample size of nearly 500 companies. The regression results indicate that the culture in line with the process approach is positively related with financial and market performance as well as customer satisfaction. Furthermore, continuous process improvement, the process owner role and management commitment are positively associated with certain types of innovation. However, the findings also reveal negative impacts of process culture on exploitative innovation on the one hand, and process knowledge and documentation on explorative innovation on the other hand. These effects do not seem to depend on industry affiliation wherefore they can be deemed as valid in both industries.

Zusammenfassung

Prozessorientierung (PO) ist ein Konzept, das Geschäftsprozesse und nicht funktionale Strukturen in den Mittelpunkt des Organisationsdesigns stellt. Diese Art des Organisationsdesigns ist seit vielen Jahren zentraler Bestandteil zahlreicher theoretischer und praxisorientierter Publikationen. Viele dieser Veröffentlichungen weisen auf die Vorteile von PO und dessen positiven Einflüsse auf die Leistungsfähigkeit bzw. den Erfolg von Unternehmen hin, jedoch fehlt häufig deren empirische Überprüfung, vor allem auf quantitativer Basis. Trotz der steigender Anzahl von Studien blieben dennoch wichtige Fragen bisher unbeantwortet. Das Ziel dieser Arbeit besteht darin, zum besseren Verständnis der Beziehung zwischen PO und der Unternehmensleistung beizutragen. Viele Studien betrachten PO nur unter eindimensionalen Gesichtspunkten. Das Wissen über den Einfluss einzelner PO-Dimensionen ist daher noch unzureichend. Aus diesem Grund werden im Rahmen dieser Masterarbeit die Dimensionen (i) kontinuierliche Prozessverbesserung, (ii) Unternehmenskultur im Einklang mit dem Prozessgedanken, (iii) Prozesseigner, (iv) Selbstverpflichtung des Managements, (v) Prozessleistungsmessung und (vi) Wissen über Abläufe und deren Dokumentation näher betrachtet. Die untersuchte Unternehmensleistung umfasst sowohl finanzielle als auch nichtfinanzielle Aspekte, wie beispielsweise Kundenzufriedenheit oder unterschiedliche Innovationstypen. Des Weiteren soll diese Arbeit Aufschluss darüber geben, ob die erforschten Effekte zwischen dem Produktions- und Dienstleistungsbereich variieren. Um diese Fragestellungen zu beantworten, wurden entsprechende Daten österreichischer Produktions- und Dienstleistungsunternehmen mittels Online-Umfragen erhoben. Die Angaben der fast 500 Unternehmen umfassenden Stichprobe wurden mithilfe von Regressionsanalysen ausgewertet. Die Ergebnisse zeigen, dass die Kultur im Einklang mit dem Prozessgedanken zum Finanz- und Markterfolg als auch zur Erhöhung der Kundenzufriedenheit beisteuert. Die Selbstverpflichtung des Managements, kontinuierliche Prozessverbesserung und Prozesseigner stehen in einem positiven Zusammenhang mit bestimmten Typen der Innovation. Jedoch wird durch die Ergebnisse auch aufgezeigt, dass Prozesswissen und dessen Dokumentation eher hinderlich für explorative Innovation ist und die Prozesskultur ihrerseits exploitative Innovation hemmt. Bezüglich dieser Einflüsse konnten keine signifikanten Unterschiede zwischen Produktions- und Dienstleistungsunternehmen festgestellt werden, weshalb die angeführten Effekte für beide Industriesektoren Gültigkeit besitzen.

Brief Contents

Contents

1 Introduction

Business reality has changed. Consistency and predictability are conditions which no longer apply for today's economic environment. As a result, the way of thinking of earlier times does not fit anymore. [Hammer, Champy 1993, p. 17] Today's business is driven by speed and efficiency [McCormack, Johnson 2001, p. 11]. Customers, competition and change are among the most influential factors in this context. The company itself no longer decides what goods and services have to be provided, to what time, how and to what price – now this is done by the customers. The number of competitors has increased and, above all, their kind has changed. This leads to the change itself whose nature performed a change too. It has become a pervasive and persistent companion of enterprises and has furthermore been regarded as a normal phenomenon in the meantime. [Hammer, Champy 1993, p. 17ff] This affects the companies' functional environment and creates the need of (i) a perpetual review of their position over competition on the market; (ii) continuous improvement of their good and/or service quality; and (iii) searching for innovations and competitive advantages [Becker, Kahn 2008, p. 3; Kueng 2000, p. 67].

As a consequence, focusing on the insider's view of a company becomes more important. Activities within an enterprise should be performed efficiently and innovatively. [Becker, Kahn 2008, p. 4]. This fact was also underlined in the early 90s by Stalk, Evans and Shulman [1992, p. 62]. A more dynamic business environment leads to the requirement of more dynamic strategies. The authors collate competition with a "*war of movement*" in which those enterprises will win who anticipate market trends and respond quickly to changing customer needs. A characteristic of successful competitors is their ability to open up and close products, markets or even business sectors quickly. For this process, the metaphor of an interactive video game is used. Not the structure of a firm's products and markets builds the core of the strategy within this dynamic environment, but the dynamics of its behavior. As a result, a company needs to identify and develop organizational capabilities which are hard to imitate in order to successfully differentiate themselves from its competitors. The authors define a capability as a "*set of business processes strategically understood*" [Stalk, Evans, Shulman 1992, p. 62]. Such value delivering processes are evident within each single company. This goes in hand with the statement of McCormack and Johnson [2001, p. 11] that the key to the achievement of competitive advantages is a full process understanding with reference to customer requirements.

In the preceding decades, the companies' orientation towards efficient execution of single functions resulted in local optimization and perfection of areas of activity. The interrelations of business functions became a background issue. Giving functional areas more autonomy leads to increasing coordination costs between the single departments. In order to dismantle interfaces and strengthen the enterprise in its entirety, it is necessary to place emphasis on entrepreneurial processes. [Becker, Kahn 2008, p. 4f] In this way functional, departmental or occupational group borders are overcome [Schmidt-Rettig 1999, p. 212]. Therefore, a process-oriented organizational structure can be seen as antithesis to a function-oriented one [Müller, Schlaudt 1999, p. 202].

The foundations of this kind of design go back to the beginning of the 20th century and Frederick Taylor. The American already analyzed and partitioned processes. In the 1930s it was stated that a company's organizational structure should be separated from its operational structure [Hiller, Minar-Hödel, Zahradnik 2010, p. 14] and that the former should follow the latter. This drew attention to the necessity of a process-oriented organizational design.

Nevertheless, business economics kept focused on the organizational structure for a long time. [Schmelzer, Sesselmann 2006, p. 44] According to Becker and Kahn [2008, p. 5], process orientation (PO) regained importance in corporate practice through the development of the concepts of business process re-engineering (BPR) and business process management (BPM). Further impulses came from publications regarding activity-based costing (ABC) and the business excellence model of EFQM [Schmelzer, Sesselmann 2006, p. 44]. Yet in the 2000s, organizational success was largely driven by process performance. It is essential for high-performing companies in today's marketplace to identify and correct process weaknesses. However, it is at least as important to achieve strategic competitive edges by making use of process strengths and opportunities. [Smith 2007, p. 1]

Summing up it can be said that the consideration of processes has a long history [Hiller, Minar-Hödel, Zahradnik 2010, p. 16]. However, it took a rather long time until companies finally became aware of the close link between processes and future success. Nowadays, several companies put emphasis on PO [Kohlbacher 2009, p. 1]. PO means focusing on business processes which range from customer to customer [Reijers 2006, p. 392], but also organizing the company around its core business processes [Vera, Kuntz 2007, p. 55].

1.1 Initial Situation

For many years the issue of process-oriented organizational design is an integral part of theoretical and practice-oriented publications [Schantin 2004, p. 196]. Although many investigations refer to a positive relationship between PO and firm performance, there is a clear lack of quantitative studies empirically verifying these findings [Kohlbacher 2009, p. 32]. According to Kohlbacher and Grünwald [2011, p. 710], one of the considerable remaining gaps in BPM literature is the fact that many studies regard the PO construct as a unidimensional measure. The importance of this issue in general has often been highlighted. Nevertheless, there are still many grey areas regarding the impact of individual PO dimensions on organizational performance.

Basically, this Master's Thesis is both a continuation and expansion of the empirical study performed by Kohlbacher [2009]. Within this work, the effect of PO on organizational performance within the Austrian machine and manufacturing industry was examined. However, not only a unidimensional measure of PO but also a multi-dimensional one was used for this purpose. This present work continues with the suggested research ideas of applying the study to other industries and carrying out a cross-industry study [Kohlbacher 2009, p. 183f]. The preparation for this Master's Thesis already started in the summer term of 2010. In an initial work [Weitlaner 2010], a literature review was performed in order to collect quantitative studies and their operationalizations of organizational performance. The focus was mainly on such studies which involved service providers. The reason for this decision was twofold: (i) the service sector was not considered at all in the working basis; and (ii) some of the used performance measurement items seemed to be unsuitable for the service area. In a second stage, again, another literature review [Weitlaner 2011] providing an overview of different methods of quantitative and qualitative research was conducted in order to figure out which of the available methods are suitable for answering the research question of this Master's Thesis.

1.2 Objectives of the Master's Thesis

As suggested by the title, this work aims at obtaining a better understanding of how firm performance is influenced by PO and its individual dimensions respectively. As a guideline for this study acts the overall working hypothesis depicted in Fig. 1-1 on the next page. It

states that PO has a positive effect on firm performance. This positive correlation has already been proven in different studies.

Fig. 1-1: The Master's Thesis' working hypothesis

Within this empirical study the manufacturing and service sector will be compared. Through the involvement of service providers this study differs from the groundwork of Kohlbacher [2009]. On this basis, potential differences regarding the driving forces behind a company's performance should be identified. Accordingly, the following research questions can be derived from the above working hypothesis:

Research Question 1 *Which PO dimensions have an individual effect on organizational performance?*

Both, PO and firm performance exhibit a multi-dimensional nature. A culture in line with the process approach or the process owner role – to name just a few – can be regarded as individual dimensions of PO. Financial and non-financial dimensions such as customer satisfaction can be taken into consideration in the context of organizational performance. Owing to the fact that performance dimensions address the issues of various stakeholders [Carton, Hofer 2006, p. 5], it might be possible that PO or specific dimensions are more or less important for individual performance outcomes. Answers to this research question provide insight into which individual PO dimensions are drivers for high firm performance.

Research Question 2 *Does industry affiliation moderate the PO dimensions' effects on firm performance?*

This is the central question of this research (represented graphically in Fig. 1-2). Physical goods and services are fundamentally different. Goods can be described as a means to an end. In contrast, services typically provide solutions to customer problems representing the 'ends' directly. [Gustafsson, Johnson 2003, p. 3f] The outcome of a requested service (the customer benefit) is always of intangible nature [Kühhirt 2009, p. 39]. Furthermore, the production of goods and services is disparate. The former are produced within factories without the presence of the customer. The latter involve the customers directly in the production process [Gustafsson, Johnson 2003, p. 4]. Consequently, the production process of a service is already generating a benefit, in contrast to the production of physical goods [Benkenstein, Steiner 2004, p. 37]. Answers to this research question provide insight whether the companies' PO strategy and its outcomes differ from industry to industry.

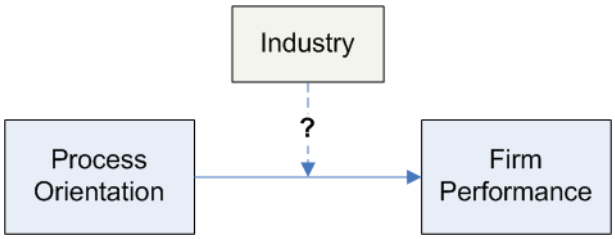

Fig. 1-2: Graphical representation of research question 2

1.3 Approach and Scope

The research process starts with the formulation of the already discussed research questions. To obtain a better understanding of the topic, chapter 2 briefly describes some basic principles of BPM, including definitions of essential elements and a comparison of function-oriented and process-oriented organizational designs. Furthermore, key differences between physical goods and services as well as some statistical basics are outlined. In a next step, a literature review on the effects of PO on organizational performance is conducted. Due to the selected research design, the main emphasis is put on quantitative studies. This step is carried out in chapter 3. The discussion of the research design takes place in chapter 4. This chapter provides information on the research population, how the variables of interest are operationalized, what measurement errors can be made and how these errors can be avoided. Furthermore, the survey instrument, data collection procedure and data pre-processing are described. Data analysis, the presentation and interpretation of the empirical findings are carried out in chapter 5. Chapter 6 concludes the Master's Thesis with a summarization, research limitations and issues for further research.

2 Theoretical Foundations

This chapter gives an introduction into some central topics of this research. First of all, the concept of BPM and PO is discussed. The operationalization and description of the single dimensions of PO can be found in section 4.4.1. Furthermore, some key differences between physical goods and services are outlined in order to gain a better understanding why there might be differences between the two industries regarding the investigated effects. At the end of this chapter some fundamentals of the statistical techniques applied in this work are briefly described. An overview of empirical research can be found in Weitlaner [2010].

2.1 Basic Principles of Business Process Management

In the last 20 years thinking in processes has become anchored in most large-scale enterprises. Meanwhile, small-scale companies are also increasingly pondering on processes. Today, however, the term process is used in a wide range. The whole value-added chain, administrative procedures, selected production methods or single transactions within an information system are referred to as processes. Additionally, some companies argue that they have a process-oriented culture. [Suter 2009, p. 88] Another factor which causes process complexity is the different understanding of terminology between the real entrepreneurial world and the virtual IT world. It is frequently assumed that both worlds express the same. However, a process in the entrepreneurial world appears on the strategic level of organizational units while it often occurs on the operational level of data processing in the IT world. [Suter 2009, p. 62] These examples demonstrate that the doors are open to arbitrary process comprehension [Suter 2009, p. 88] and that it is necessary to develop a common understanding of relevant terms. Therefore, a brief overview of the business process management concept and process orientation is provided.

2.1.1 What is a (Business) Process?

Due to the difficulties already mentioned above, it is not surprising that literature also provides a wide array of definitions for the term process in general. To avoid going beyond the scope of this work, emphasis is on business processes in order to keep the discussion of the term process itself rather short. This originates in the fact that the term business process is used with various meanings as well and a consensus within business theory has been achieved neither [Suter 2004, p. 83].

2.1.1.1 Definition

It is the purpose of an enterprise to generate goods and services (within processes) satisfying customer needs and ensuring corporate economic success through their commercialization. A process is a sequence of activities generating a defined result (output) from a defined input. [Schmelzer, Sesselmann 2006, p. 59] These few process characteristics build the common denominator for the broad range of existing definitions [Schantin 2004, p. 41]. A process requires input factors such as equipment, energy or materials. Goods and services represent the concrete process output. In this context, it is frequently spoken of so-called customer-supplier-relationships or input-output-relationships because inputs are provided by suppliers while customers receive the outputs. Nevertheless, the term process provides neither information about the borders, range, content and structure of the process itself nor on the recipient of its results. [Schmelzer, Sesselmann 2006, p. 59]

The question which needs to be answered now is: What makes a business process special? It has two main features. Firstly, business processes focus on customers and customer relationships. In this way, the entire company's thinking and acting is concentrated on

customers. Secondly, only value-adding activities take place within a business process. These are activities which contribute to the satisfaction of customer needs. [Schmelzer, Sesselmann 2006, p. 62ff] Fig. 2-1 contrasts processes and business processes in a graphical manner.

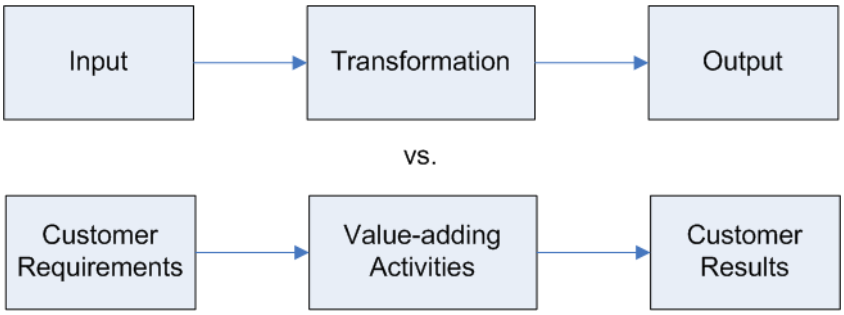

Fig. 2-1: Process vs. business process [Schmelzer, Sesselmann 2006, p. 60]

Customer requirements or expectations stand at the beginning of the business processes while the provision of the desired results to the customers builds its end. Thus, a business process is characterized by a requirement-result-relationship and not by the input-output-relation. Goods, services or their combinations created within the process contribute to the companies' turnover and results wherefore they ensure the firms' survival and future. Nevertheless, all other stakeholders, such as suppliers, partners, employees, investors and the environment, impose their own business process requirements. All activities necessary for the creation of results are organizationally bundled (across organizational borders such as functions and departments) within a business process. [Schmelzer, Sesselmann 2006, p. 61f]

Various authors have taken these considerations into account when formulating concrete definitions. A small selection of available definitions should be mentioned at that point to illustrate their similarities, but also differences in the level of detail:

- According to Hammer and Champy [1993, p. 35], a business process is a "*collection of activities that takes one or more kinds of input and creates an output that is of value to the customer*".

- From the point of view of Schmelzer and Sesselmann [2006, p. 60] a business process consists of the cross-functional and cross-organizational linkage of value-adding activities. Those activities generate goods and services expected from the customers and realize process goals derived from the business strategy.

- Davenport and Short [1990, p. 12] define a business process as "*a set of logically related tasks performed to achieve a defined business outcome*". Their two main business process characteristics mentioned are the internal and external customers who receive the outcomes, and their ability of overcoming organizational boundaries.

- For Suter [2004, p. 86] a business process is a factually and temporally logical sequence of operational activities aiming at producing a clearly defined output which creates a customer benefit. A business process (i) has a determined scope of performance; (ii) is determined by a defined measurable input and output; (iii) is repeatable; (iv) adds customer value to process objects; (v) has process owners with continuous responsibility; and (vi) has all required resources and information at its disposal.

- According to Hinterhuber [1997b, p. 115], a business process is an entirety of integrated activities which are used to create a product or to provide a service. Suter's above quoted properties (ii) to (v) correspond with the ones mentioned by Hinterhuber, but the latter adds that a business process (i) is increasing the satisfaction and competitiveness of external customers; and (ii) simplifies the work of internal customers and increases their efficiency.

2.1.1.2 Process Types

Various kinds of processes exist within an enterprise. Thus, it is not surprising that those processes can be categorized according to a large number of possibilities (see Tab. 2-1).

Author/s	Criterion	Types
Davenport and Short [1990]	Entities	Interorganizational processes; Interfunctional processes; Interpersonal processes
Davenport and Short [1990]; Hohmann [1999]	Process object	Material/physical processes; Informational processes
Davenport and Short [1990]; Hohmann [1999]	Kind of activity	Operational processes; Managerial processes
Hohmann [1999]	Market orientation	Primary processes; Secondary processes; Innovation processes
Osterloh and Frost [2003]; Lok et al. [2005]; Vera and Kuntz [2007]	Competitive advantage	Core processes; Support processes
Hinterhuber, Handlbauer and Matzler [1997]	Responsibility for customer satisfaction and influence on core competences	Core processes; Critical processes; Support processes
Hohmann [1999]; Gardner [2004]; Fischermanns [2006]; Gadatsch [2008]; Meister and Meister [2010]; Hiller, Minar-Hödel and Zahradnik [2010]	Company function or proximity to core business	Business processes[1]; Management processes; Support processes
Suter [2004]	Business process' role with regard to its temporal provision and impact	Value-creating processes; Value-defining processes; Management processes; Support processes
Wagner and Käfer [2008]		Management processes; Business processes; Support processes; Measurement, analysis and improvement processes
Armistead and Machin [1998]	Nature of business processes	Direction setting processes; Operational processes; Supporting processes; Managerial processes

Tab. 2-1: Distinguished process types in literature

[1] Also referred to as core, execution or performance processes by the authors relating to the proximity criterion.

The above table provides an overview of how different authors tried to distinguish between different process types. Some of these classification schemes are briefly described below.

One of the dimensions along which processes can be defined, is built by organizational entities which are involved in the process. Davenport and Short [1990, p. 18f] distinguish between three process types in this case. If two or more business organizations are involved in the process, it is called interorganizational. Interfunctional processes – typically management process – involve various divisions or departments within an organization. The third type is the interpersonal process. These processes constitute activities which are performed between small working groups.

Hinterhuber, Handlbauer and Matzler [1997, p. 153f] differentiate between three kinds of processes as well, but according to their responsibility for customer satisfaction and their influence on core competences and potentials. Those business processes, which refer on the one hand to performance and excitement requirements and on the other hand are based on core competences, are of strategic importance. Therefore, core processes have the highest priority for process management. The so-called critical processes have a huge influence on customer satisfaction, but do not coincide with the core competences. It has been tried to design and manage those processes in such a way that competitiveness can be achieved or kept up. Within this context, the term support process is used for classifying such processes which are only regarding basic customer requirements. These processes do not create customer satisfaction. They are required to keep up regular business.

Meister and Meister [2010, p. 38] as well as Schmelzer and Sesselmann [2006, p. 74] state that in practice corporate processes are mainly assigned to the categories business, management and support processes. This is supported by the literature reviewed although the label for the first category is not used uniformly. Nevertheless, this work favors the classification scheme of Suter who splits up business processes into value-creating and value-defining processes. This decision originates from the fact that the value added consists of two parts, a preceding value-defining part and an order-specific value-creating part [Suter 2004, p. 102].

- Value-creating business processes represent the company's daily business. Those operative processes provide all goods and services designated for the external customer on a profit-oriented basis. All required transformations and transfers to gain, handle and deliver a customer's order are executed by them. Their main aim is to satisfy customer needs effectively and efficiently. [Suter 2004, p. 103]

- Value-defining business processes not only define and specify offered goods, services and information but also the company's value added which should be created within value-creating business processes in the future in accordance with the strategy. Those processes have longer-term impact on the company's activities and are not directly intended for external customers or the market. The primary aim of value-defining business processes is to implement the strategy into daily life. [Suter 2004, p. 103]

- Management processes are responsible for strategy development and assembly. Furthermore, they monitor and coordinate resource provision, leadership and development of employees as well as the maintenance of corporate culture development. Those processes aim at providing suitable structures and systems as well as circumstances for running operative business. [Suter 2004, p. 104]

- Support processes concern those performances which are supplied to value-creating and value-defining business processes as well as management processes in order to support or enable their provision of services. [Suter 2004, p. 104]

2.1.2 Business Process Management

Already the conjunction of a few activities in order to create an output by adding value to an input is a process wherefore literally hundreds or thousands of processes are going on within a company [Harrington 1995, p. 36]. These processes, however, have to be coordinated in such a way that the result of the constructed chain satisfies the wishes, requirements and expectations of (external) customers. In practice, this activity generates remarkable problems and costs. BPM was developed to redress this deficit. [Schmelzer, Sesselmann 2006, p. 60] BPM aims at enabling a purposeful and structured communication within corporate processes as well as their design, control and further development. This is not a task which can be performed quickly. Its nature is, therefore, medium-term and durable. [Hiller, Minar-Hödel, Zahradnik 2010, p. 18] This is an essential difference to the concept of BPR where a radical change is performed within a single project [Schmelzer, Sesselmann 2006, p. 337]. Instead, BPM tries to manage processes on an ongoing basis [Armistead, Machin 1997, p. 887]. Furthermore, BPR often involves single processes, their analyses and radical transformations [Mills, Dye, Mills 2009, p. 97] while BPM is seen as holistic organizational and leadership approach [von Eiff 2003, p. 11]. The holistic view is required in order to overcome the isolated departments' piecemeal improvements which frequently do not lead to optimal solutions [Hung 2006, p. 23].

However, BPM should not be seen as a form of organization. In fact, it is a tool for executives and those who want to contribute to the design and further development of the enterprise. For Hiller, Minar-Hödel and Zahradnik, BPM is an enabler, but never a solution. It tries to organize those activities providing the basic value added and, therefore, ensuring success. [Garscha 2002, p. 68; Hiller, Minar-Hödel, Zahradnik 2010, p. 18] Further, BPM is a suitable and well-established concept to react flexibly to new requirements and perform necessary adaptations. Those properties are crucial in today's dynamic business to achieve a competitive advantage. [Schmelzer, Sesselmann 2006, p. 2] Doing the right thing in the right manner sounds easy, but in practice it is not. BPM can help in this context because problems regarding effectiveness and efficiency are mainly caused by missing or poorly mastered business processes. [Schmelzer, Sesselmann 2006, p. 4]

Based on these deliberations Schmelzer and Sesselmann [2006, p. 4f] define BPM as follows: An integrated concept of leadership, organization and controlling which enables a purposeful governance of business processes. It is targeted towards the fulfillment of customer and other groups of interest's needs. BPM contributes essentially to the attainment of strategic and operative corporate goals. It is the BPM's objective to increase company effectiveness and efficiency in order to increase the value of an enterprise simultaneously.

2.1.3 Functional vs. Process Organization

This sub-section tries to point out the differences between and the development of function-oriented and process-oriented organizational designs. Furthermore, related advantages and disadvantages are outlined.

2.1.3.1 Historical Development

Adam Smith's concept of the division of labor led to increased productivity due to the specialization of workers who perform single steps in the production process. Most

companies which operated at the beginning of the 1990s were typically based on this idea of labor division. [Hammer, Champy 1993, p. 11] However, the specialization of workforce and the number of separate steps increases when organizations are getting larger. This is not only valid for manufacturing companies, but also for service providers. [Hammer, Champy 1993, p. 12] Henry Ford broke down the entire work in even smaller pieces than Smith. This partition into repeatable tasks led to simpler activities, but increased the coordination complexity of people and results. Alfred Sloan then introduced smaller, decentralized divisions. Managers were able to control these divisions via financial and production figures. This corresponded with labor division on management level. [Hammer, Champy 1993, p. 14]

After the Second World War companies had a large number of controllers and planners serving as eyes and ears of the executives [Hammer, Champy 1993, p. 15]. One of the benefits of the pyramidal organizational structure was its scalability due to the fact that new workers could be added at the bottom of the hierarchy and the upper layer became another management layer. Furthermore, controlling and planning were easy. The simple and uncomplicated tasks did not require much training and the technological progress in the 1960s crumbled the piecemeal activities again into tasks which made automation and mechanization possible. However, increasing the number of tasks resulted in an increasing complexity of the good production or service delivering process and its management simultaneously. This multilayer hierarchy led to the fact that customers and senior management were distancing more and more. [Hammer, Champy 1993, p. 16] Customers who placed their concerns at the bottom of the hierarchy became a faceless number when reaching the top [Hammer, Champy 1993, p. 17].

2.1.3.2 Traditional Functional Structure

Hohmann [1999, p. 148] states that many companies had a function-oriented organizational structure at the end of the 90s. However, it seems that this situation has not changed in practice. A function-oriented organizational design is still most widely used [Suter 2009, p. 63]. Characteristics of a functional organization are control and specialization [Gardner 2004, p. 18]. Within this organizational form where tasks are divided into sub-tasks and grouped together into organizational units, the company's organizational structure builds the center of organizational design while the operational structure moves into the background [Hohmann 1999, p. 148].

The traditional organizational structure is comparable with a pyramid of multiple hierarchical levels. Basically, division of labor is performed on the basis of functions. As already mentioned, over many years this labor division was characterized through high effectiveness and profitability [Hinterhuber, Handlbauer, Matzler 1997, p. 141] wherefore customer satisfaction was receding into the background [Schmelzer, Sesselmann 2006, p. 69]. This organizational form provides substantial learning potential for a company when tasks and activities remain constant [Hinterhuber, Handlbauer, Matzler 1997, p. 141]. Therefore, it can be said that this organization type has its justification within stable environments because low levels of adaptivity and responsiveness are required [Gardner 2004, p. 18]. Such situations were rather natural at the end of the 1960s. Employees' mobility was limited and job changes happened infrequently. Process knowledge was stored in the employees' head and passed on to successors in the case of retirement. [Smith 2007, p. 2] Frequently, no change was made at all for decades with the result that employees just had to learn the process once [Mayer 2005, p. 2]. The dominating concept of specialization caused large vertical organizational structures [Smith 2007, p. 3]. Due to the fact that the development of communication technology was still at a very early stage at that time, competition was rather local, customer choices were rare

and companies, therefore, did not feel the pressure of improvement [Smith 2007, p. 5]. Thus, following the strategy of mass production, stability and growth was successful and caused no problems because no quick reactions and flexibility were required [Hammer, Champy 1993, p. 28].

However, the employees' requirements concerning their abilities are drastically reduced. A separation exists between (i) those who think and decide; (ii) those who execute, produce and sell; and finally (iii) those who control. Decisions are made on the top of the pyramid and are transferred downwards via the middle management level. At this level strategic decisions are converted into instructions, guidelines or process specifications. Instructions are received by the employees on the lowest level of the pyramid. These people only need to care that the instructions are executed according to the supervisor's wish. [Hinterhuber, Handlbauer, Matzler 1997, p. 141] As a consequence, a holistic view is missing. Employees overlook only a small part of the whole value-adding process they are involved in instead of the total result provided to the customer. [Schmelzer, Sesselmann 2006, p. 70] No one feels responsible for the overall performance wherefore adjusting and harmonizing with other related functions does not take place [Meister, Meister 2010, p. 8]. Learning effects and the identification with the end-customer's goods and services are finally lost. [Schmelzer, Sesselmann 2006, p. 70]

In today's business world this design decision does not cause problems in smaller companies due to the fact that the employees know each other and understand the interaction between functions and projects. Growing organizations typically accomplish more complex tasks wherefore divisional directors tend to see only their own tasks anymore. [Osterloh, Frost 2003, p. 28] As a result, departments become large silos and internal blockades are encountered [Gadatsch 2008, p. 12]. Companies were already confronted with that problem in the early 1990s. In such a situation outward-orientation towards customers is missing. An employee who is involved in a process is inward-oriented towards its department. [Hammer, Champy 1993, p. 28] Communication between divisions is reduced to written reports [Osterloh, Frost 2003, p. 28]. At the same time, these employees are upward-oriented towards their superior [Hammer, Champy 1993, p. 28] activating the so-called chimney effect which means that cross-departmental problems are pulled up to the corporate management due to missing horizontal communication [Gadatsch 2008, p. 12f]. However, the management is frequently completely overtaxed with these coordination problems [Osterloh, Frost 2003, p. 29] and cannot focus their attention on strategic concerns anymore [Gardner 2004, p. 18]. Those hierarchies, therefore, leave a mark on management and employees. More time is spent on jurisdictional matters than on the question how customer needs can be satisfied. [Schmelzer, Sesselmann 2006, p. 70] Another drawback which arises in this evolved situation is that innovations and creativity are no longer promoted. New ideas have to be accepted at every management level while a single 'no' at one level signifies its end. [Hammer, Champy 1993, p. 28] In general it can be said that the upward information flow towards managers caused by the missing decision competence of employees results in delays and distortions [Gardner 2004, p. 18]. Such structures, finally, do not hamper the recognition of large market changes [Hammer, Champy 1993, p. 29].

Fig. 2-2 (see page 12) shows how an order is processed in a function-oriented enterprise. The business process is divided into multiple working steps which are executed in further consequence by employees within different departments [Schantin 2004, p. 40]. However, the given structure does not reflect its natural sequence [Kohlbacher 2009, p. 7]. The result is passed from one department to the next within the production chain. As a result, interfaces are created between functional borders. [Meister, Meister 2010, p. 9] Subsequently, coordination and control efforts are increasing, misunderstandings and faults occur, decisions are delayed,

additional time is spent, communication is hampered, information losses happen more frequently and the quality of results as well as productivity in general decline [Schmelzer, Sesselmann 2006, p. 70]. In this context it could be thought of the game 'Chinese whispers'. However, it should not be forgotten to mention that such interfaces often cannot be precluded. They enable information exchange and are therefore required for the viability of organizational units and their process results. [Meister, Meister 2010, p. 10]

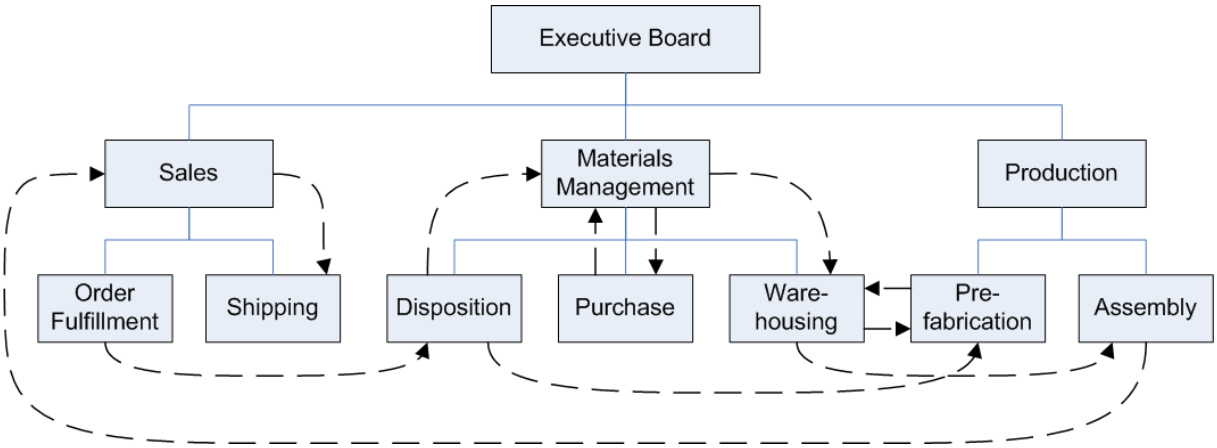

Fig. 2-2: Order processing in a function-oriented organizational structure [Hohmann 1999, p. 150]

The illustration above clearly indicates that a high effort of coordination and regulation of relationships is required. The settling of conflicts can take place on multiple hierarchical levels due to the fact that the order passes through different functions and departments. The figure underlines that there is also a clear lack of responsibility for an order and furthermore, responsibilities are changing while order execution. [Hohmann 1999, p. 148]

Summing up, it can be said that under consideration of today's dynamic environment this traditional functional structure has serious disadvantages [Hinterhuber, Handlbauer, Matzler 1997, p. 141f]: (i) a vertical mindset is promoted and functional areas may develop a life on their own; (ii) the hierarchy is stressed and its rigid structure is difficult to change; (iii) courses of business and competences which traverse all functional areas within the enterprise are not reflected; and (iv) goods, services and the customer are not part of the overall picture. Therefore, business processes evident in functional organizations are characterized by fragments, inefficiency and customer unresponsiveness. Furthermore, problems occur when overall performance should be managed due to the invisibility of cross-functional value-creating business processes. [Gardner 2004, p. 19] In today's economic situation of increasing competition, dynamic markets, faster innovation cycles and increasing customer expectations the mentioned disadvantages can no longer be afforded by the companies [Hinterhuber 1997b, p. 114]. In order to remain competitive, high flexibility and a quick and affordable handling of complete processes are required [Schantin 2004, p. 40]. Process-oriented organizations are seen as alternative [Schmelzer, Sesselmann 2006, p. 71].

2.1.3.3 Process Orientation

Companies are confronted with process problems which have multiple origins, such as performing unnecessary tasks, misunderstanding of instructions, a lack of understanding of the role of single tasks for result creation or the limited sight angle of employees. However, processes were frequently overlooked due to the fact that organizational structures were task-oriented since approximately the year 1800 and it was, therefore, tried to solve these problems with task-specific solutions. [Hammer 1997, p. 5f] When focusing on processes, work was and is performed by groups of people who originate from different departments. However,

these working groups did not fit into the classical organization structures. Furthermore, the need that a team makes its own internal decisions did not correspond with the traditional, hierarchical nature of management levels. [Hammer 1997, p. 7] This created the demand for a more suitable organizational design. Finally, the so-called process-centered organization was born because it was decided to adapt the companies towards the new working style although this shift would cause difficulties and resistance. In such an organization the operations' and management's emphasis is on processes. The shift towards processes started rather slowly at the beginning of the 1990s. However, since companies recognized that this concept was the only solution to make newly introduced high-performance processes work, the stream finally became a flood. [Hammer 1997, p. 8] Globalization was one of the catchphrases in the mid-2000s [Smith 2007, p. 8]. At latest at this point companies should have been aware of the fact that it is necessary to handle business processes cost-effectively and quickly in order to remain competitive [Hohmann 1999, p. 150]. Following the process-oriented principle requires mainly a shift of perspective which means putting processes into the foreground and tasks into the background. [Hammer 1997, p. 8]. An essential characteristic of such an organization is that processes must be recognized and focused on by everyone within the company. [Hammer 1997, p. 9]

According to Kugeler and Vieting [2008, p. 236], the term PO is often used in practice as an alibi for new structures without disclosing what exactly is process-oriented. PO simply means focusing on and improving business processes typically ranging from customer to customer rather than putting emphasis on hierarchies and functions [Reijers 2006, p. 392] or organizing the company around its core business processes [Vera, Kuntz 2007, p. 55]. In literature various synonyms for the term process-oriented organization can be found: process-centered organization [Hammer 1997], horizontal organization [Hinterhuber, Handlbauer, Matzler 1997], process organization [Osterloh, Frost 2003; Meister, Meister 2010], process-focused organization [Gardner 2004] or process-based organization [Vera, Kuntz 2007]. Basically, it can be said that the concept of BPM is applied by a process-oriented organization [Kohlbacher 2009, p. 11], as PO is one of the BPM's dimensions [Schmelzer, Sesselmann 2006, p. 8].

What makes process-oriented organizations different? When designing a structure, regardless whether organizational or operational, it is crucial to take processes explicitly into account. Therefore, those processes have to be modeled in order to act as basis for design decisions. These measures and decisions aim at obtaining a process organization as a structure. [Kugeler, Vieting 2008, p. 237] In effect, this implies that business processes should build the organizational center [Hinterhuber, Handlbauer, Matzler 1997, p. 144; Schantin 2004, p. 41; Smith 2007, p. 20] acting as key organizing elements [Gardner 2004, p. 39]. Business processes traverse the company horizontally. As a result, the hierarchical structure is not becoming entirely redundant, but fades into the background. [Hinterhuber, Handlbauer, Matzler 1997, p. 145] The organizational structure is not the only difference between traditional and customer-oriented companies. The structures should optimally support the processes with respect to time, costs and quality. Hence, resource efficiency still plays a role because their inefficient usage affects process costs. PO also means shifting the weighting of efficiency criteria. Resource efficiency dominates function-oriented organizations. This results in interface problems due to the neglect of process efficiency. In contrast, within a process-oriented organization the focus is on process efficiency. In the context of PO, resource efficiency, however, is often forgotten. It should be mentioned that the minimization of costs can only be achieved when using resources economically. [Kugeler, Vieting 2008, p. 237]

Hierarchy levels and interfaces are reduced due to the horizontal merging of tasks, with the result that coordination efforts are decreasing while efficiency is increasing. [Schmelzer, Sesselmann 2006, p. 71] Delegation efficiency is another central aspect supporting this movement. Delegating decisions to executing positions makes processes slimmer and faster due to the fact that no relevant information for decisions has to be passed to superior positions. [Kugeler, Vieting 2008, p. 238] Market effectiveness is considered in the way of processes' customer-to-customer relationships supporting customer orientation and, hence, market efficiency. [Kugeler, Vieting 2008, p. 238] Organizations based on business processes have an outside-inside-view in contrast to the ones based on functions. This means viewing the organization from the customer's perspective. External customer requirements, needs and expectations determine the goods and/or services produced within the business processes. The focus of activities is on those accomplishments which have a value for the customer and are bought by them in further consequence. [Schmelzer, Sesselmann 2006, p. 71] Furthermore, PO increases adaptation efficiency because short decision-making paths facilitate fast adaptation measures. [Kugeler, Vieting 2008, p. 238] This is a very important ability in today's dynamic environment of fast changing market and customer requirements.

Company's operational organization and process organization should not be confused. In the former case, procedures are adapted to the prior defined organizational structure with its specialized distribution of tasks. In contrast, process organization focuses on the requirements of operational procedures which have priority over structuring criteria. The cross-functional character and aspiring after a holistic handling of iterations make up the center of a process organization. Not the isolated design of sub-tasks and their optimization, but the quick and smooth execution of cross-departmental processes geared to customers is essential for the company's success. [Meister, Meister 2010, p. 13] Structure and processes are closely related to each other. This implies that the separation of the two designs would be impracticable, since processes without structures or vice versa seem to be senseless. [Meister, Meister 2010, p. 11] A process organization is characterized by the fact that enterprise goals and strategies build the basis for business process alignment. Afterwards, company structures, systems and resources have to be aligned in such a way that they meet process needs. [Gardner 2004, p. 42] This means that posts, departments and areas are build according to the identified activities. The detached activities are then clustered according to their functional similarity or with regard to the process progress. This might, again, result in a function-oriented organization. However, the flow of material and information can, consequently, be realized in the company's organizational structure with the additional avoidance of interfaces. [Meister, Meister 2010, p. 11]

The importance of functional departments as classical line function has strongly decreased opposite to newly designed customer-oriented processes [Osterloh, Frost 2003, p. 108]. Although this kind of design has obvious advantages, functional benefits should not be overlooked [Smith 2007, p. 20]. Smith [2007, p. 4] argues that a certain degree of specialization is required in every company in order to ensure the presence of needed expertise although such a structure affects processes negatively. This is also supported by Schmelzer and Sesselmann [2006, p. 152] who state that function orientation is typically not completely abandoned, even in pure process organizations. Vera and Kuntz [2007, p. 56] argue that the process-based design concept is not an independent and self-contained one wherefore it is not possible to characterize a company as process-oriented or not due to the fact that an organization is always in possession of this feature but with a greater or lesser degree. Therefore, it can be said that in many areas the advantages of functional specialization continue to be required. [Osterloh, Frost 2003, p. 108] This results in different models of

integration and the spin-off of functions into processes [Osterloh, Frost 2003, p. 109]. Nevertheless, it should also be mentioned that neither the classical function-oriented nor a process-oriented organization alone can be a criterion for corporate success. Depending on customer requirements, cycle times, costs and resources the company has to decide for itself which organizational form or mixture is suitable. [Hohmann 1999, p. 150]

A deeper insight into the characteristics of a process-oriented organization can be found in section 4.4.1. However, the mentioned building blocks cannot be considered to be complete.

2.2 Physical Goods vs. Services

The term service is well-established in today's language of everyday life [Littkemann, Holtrup 2007, p. 201]. Originally, this term was associated with the servants' work for their masters [Lovelock, Wirtz 2007, p. 14]. Various definitions of the term service exist in literature. The first attempts to describe and define services go even back more than two centuries [Lovelock, Wirtz 2007, p. 12]. However, science has not been able to provide a common definition so far which results from the fact that the services exhibit an extraordinarily heterogeneous nature [Littkemann, Holtrup 2007, p. 201; Lovelock, Wright 2002, p. 6; Meffert, Bruhn 2003, p. 32] and involve often rather complex activities [Lovelock, Wirtz 2007, p. 14]. Due to the intangibility of many inputs and outputs, it is often hard to understand how service creation and delivery take place. This is why people have difficulties defining services, but almost no problems concerning manufacturing or agriculture. [Lovelock, Wright 2002, p. 6]

At a higher level, Lovelock and Wright [2002, p. 9] set goods apart from services in the following way: "*Goods can be described as physical objects or devices and services are action or performances.*" Nevertheless, each product or any industry's core output that is purchased and used by a customer delivers benefits. A rather common approach to differentiate services from goods is by focusing on consecutive characteristics [Littkemann, Holtrup 2007, p. 201]. Among the most often referred ones are intangibility, heterogeneity, perishability and inseparability (see Tab. 2-2). Although these generalizations are useful, they cannot be applied to all services equally. [Lovelock, Wright 2002, p. 9]

Goods…	**Services…**
are more tangible	are more intangible
are storable (can be inventoried)	are perishable (cannot be inventoried)
generally separate production and consumption	are co-produced with customers (production and consumption are inseparable)
are more homogeneous	are more heterogeneous

Tab. 2-2: Key differences between goods and services [Gustafsson, Johnson 2003, p. 5]

It is not possible to touch pure services such as consultancy whereas customers can touch a good and make their buying decision on the basis of characteristics, including color and/or texture [Baron, Harris 2003, p. 19]. Although tangible elements are often put into use in the service process and material changes might be caused, the service itself remains intangible [Lechner, Egger, Schauer 2008, p. 410; Littkemann, Holtrup 2007, p. 202, Lovelock, Wright 2002, p. 10; Matys 2007, p. 13]. Basically, the intangible elements such as processes or the personnel's expertise are responsible for creating most of the service value [Lovelock, Wirtz 2007, p. 17]. This makes it quite hard for customers to assess service features in advance and to evaluate its quality at the end [Lovelock, Wirtz 2007, p. 17; Gustafsson, Johnson 2003, p. 5].

Perishability is deduced from the lack of materiality of services [Matys 2007, p. 13; Baron, Harris 2003, p. 21]. Consequently, compensating temporal and quantitative incongruities between procurement, production and sales is only possible to a limited extent [Lechner, Egger, Schauer 2008, p. 411]. Such peaks and troughs, however, are common characteristics of service demands [Baron, Harris 2003, p. 21]. Even without consideration of the uneven demands the inability of storing services has an important consequence for the provider. Since no value in form of an object can be produced or even inventoried and, thus, not swapped for money, the companies are forced to plan their use of resources carefully. [Matys 2007, p. 14] On the one hand, production capacity (facilities, equipment and labor held in readiness = internal factors [Littkemann, Holtrup 2007, p. 202]) are wasted when there is no demand. On the other hand, too much demand might require sending away potential customers disappointed. [Lovelock, Wright 2002, p. 12; Lovelock, Wirtz 2007, p. 16]

The unsuitability for storage implies that a consumer can only make use of a service when it is 'produced' [Meffert, Bruhn 2003, p. 64]. This requires the synchronization of production and consumption and calls for the direct or indirect involvement of the service customer with the production process simultaneously [Lechner, Egger, Schauer 2008, p. 411]. In contrast, production and consumption of physical goods is separated and the customer is not involved in the production process. This simultaneity in the framework of services makes measurement and check of quality rather difficult. [Baron, Harris 2003, p. 20]

Not only the integration of external factors (people, their contribution, physical goods or services [Littkemann, Holtrup 2007, p. 201]) with their individual demands, but also the internal factors (especially employees) make the standardization and control of variability in both service inputs and outputs difficult. The physical good's compliance with quality standards can be checked before the customer comes into contact with the offered product. Since services are assembled in real-time, the quality of any service might vary (i) among employees; (ii) the same employee and distinct customers; or even (iii) at different daytimes. [Lovelock, Wright 2002, p. 11] For that reasons, many services have an individualistic, resource intensive and hard to standardize nature [Meffert, Bruhn 2003, p. 63] leading to the fact that there are no two provided services which are exactly the same [Baron, Harris 2003, p. 20]. According to Frei et al. [1999, p. 1211], process variations are frequently also a result of lacking rigorous formal policies and procedures.

Lovelock and Wright [2002, p. 9ff] as well as Lovelock and Wirtz [2007, p. 16ff] discuss the differences between goods and services in more detail.

2.3 Statistical Fundamentals

Quantitative evaluation methods have already been discussed in a previous work of the author (see Weitlaner [2011, p. 22ff]). Consequently, descriptive statistics, such as the units of central tendency and variability, will not be discussed in this work once again. However, the mentioned earlier work aimed at providing a brief overview of different methods of quantitative and qualitative research and at deciding which of these approaches are suitable for answering the research questions of this Master's Thesis. As a result, methods of analysis were not discussed in the required level of detail in order to understand the meaning of the figures which are calculated in the chapters 4 and 5. Foundations of correlation, factor and regression analysis will therefore be explained on the following pages.

2.3.1 Correlation Analysis

In general, correlation analysis deals with calculating a variety of measures for quantifying the extent of statistical correlation between two distinct variables or characteristics [Auer, Rottmann 2011, p. 92]. Researchers are frequently confronted with the task of examining whether two variables are related in a certain manner when performing statistical data analyses. A suitable measure for the strength and direction of an association between two variables is the correlation coefficient. More specifically, the correlation coefficient identifies linear correlations. [Brosius 2011, p. 517] Such a relation exists when it is possible to represent it by a straight line in a diagram. The regression coefficient is the most popular measure of correlation within social science and can be computed for different levels of measurement (for instance the Pearson product-moment correlation coefficient for interval-scaled variables [Janssen, Laatz 2007, p. 280]). One of the coefficient's benefits is its invariance of particular changes of variables' scales. Consequently, the strength of the linear correlation between two variables can be described regardless of the measurement unit. [Bortz, Schuster 2010, p. 153].

As already noted, the correlation coefficient can only reveal linear correlations. Due to this limitation it can happen that the calculation results do not indicate any correlation although the two examined variables are perfectly non-linearly correlated. In order to uncover such relationships it is recommended creating scatter plots for the variables to be compared. By representing the corresponding value pairs as points (x, y) within the diagram, frequently a rather good impression of the strength and especially the form of a possible correlation can be received. [Brosius 2011, p. 517]

Before introducing the formula for calculating the regression coefficient the term covariance is shortly explained, since the correlation arises from the standardization of the covariance. Just as the correlation coefficient, the covariance represents a measure for the description of linear associations. [Bortz, Schuster 2010, p. 153] The covariance provides information on how far the data points are apart from the hypothetical straight line. High values indicate that the data points are close to the line. From a visual point of view, the point cloud in the scatter plot can be inspected. When the variables are normally distributed the points are encased by an ellipse which is becoming tighter when the covariance increases. In contrast, when the distribution of the data points converge to a circle, no covariance exists between the two variables. [Bortz, Schuster 2010, p. 154] The covariance is calculated as indicated in Equ. 2-1:

$$s_{xy} = \sum_{i=1}^{n} \frac{(x_i - \bar{x})(y_i - \bar{y})}{n-1}$$

Equ. 2-1: Covariance [Bortz, Schuster 2010, p. 154]

However, a high positive value does not automatically point towards a strong positive relationship between two variables. This means that the covariance can only show the direction, but not the strength of a correlation. It represents a dimensioned measure which can, therefore, be increased or decreased by changing the variables' measurement units. [Auer, Rottmann 2011, p. 94] This fact constitutes a large drawback, since the determination of an interval-scaled variable's scale is done in a rather arbitrary manner within the context of human or social research. As a result, the covariance is not well suited for denoting the strength of the relationship between two variables. Its application only makes sense when mandatory scales are predefined. Owing to this fact, the correlation coefficient was developed which measures the true correlation between two characteristics independent from their quantification. The coefficient is obtained by dividing the covariance of two variables by the

product of their respective standard deviations. [Bortz, Schuster 2010, p. 155f] This leads to Equ. 2-2 mentioned below.

$$r = \frac{s_{xy}}{s_x s_y}$$

Equ. 2-2: Correlation coefficient [Bortz, Schuster 2010, p. 156]

Differences in scales and distribution between the variables are compensated through the division [Bortz, Schuster 2010, p. 156]. The correlation coefficient can take values between -1 and +1. Positive values indicate a positive linear relation while negative values denote exactly the opposite correlation. The general rule is: The higher the value of the correlation coefficient, the stronger the linear correlation between the observed pair of variables. Hence, it can be concluded that a coefficient of 0 indicates the absence of a linear correlation. [Brosius 2011, p. 517] Typically, it is spoken of high correlations when the coefficients are ±0.5 or higher [Haleblian, Finkelstein 1993, p. 855].

It should not be forgotten to mention that a correlation between two variables is not a sufficient, but only a necessary requirement for causal dependencies. At the best case, correlations give indications between which pairs of variables causal relationships might exist [Bortz, Schuster 2010, p. 160].

2.3.2 Factor Analysis

The term factor analysis represents a group of multivariate analytical methods [Moosbrugger, Schermelleh-Engel 2012, p. 326] which basically aim at recognizing the underlying structure among large sets of variables. Such sets are typically characterized by the fact that the more variables are added, the more likely it becomes that these variables overlap and correlate respectively. [Backhaus et al. 2011, p. 330] This behavior is often intended by researchers when, for instance, multiple measures are used in order to overcome measurement errors. Thus, these correlated variables need to be managed in some way, for example by grouping together the highly correlated ones. Factor analysis provides tools for analyzing the correlations' or interrelationships' structure among variables by defining so-called factors. Factors represent highly interrelated variables and can be seen as data dimensions [Hair et al. 2010, p. 94] or hypothetical unobservable (latent) variables (or constructs) [Wolff, Bacher 2010, p. 334]. The relationship between variables and factors is depicted in Fig. 2-3. It shows the factor analysis' basic idea of attributing measured values of objects within a set of observable (manifest) variables to factors [Wolff, Bacher 2010, p. 334].

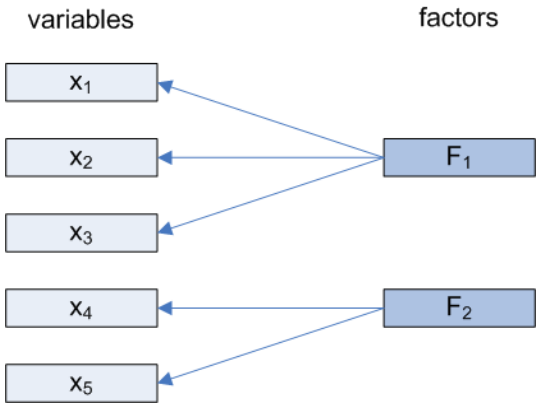

Fig. 2-3: Basic idea of factor analysis [Backhaus et al. 2011, p. 333]

The above-mentioned relationship is also briefly discussed in connection with the development of a measurement model in section 4.4. Factor analysis can be seen as part of the back-translation of the developed empirical instrument [Scholl 2003, p. 140].

Since the original data are compressed into factors whose number is typically lower than the original number of variables, it is probable that information is lost in the sense of explained variance. However, this fact is deliberately accepted. [Backhaus et al. 2011, p. 333] Further aims of this analysis include [Janssen, Laatz 2007, p. 531; Moosbrugger, Schermelleh-Engel 2012, p. 326]: (i) data reduction; and (ii) the development and validation of measurement instruments. Each of these cases can either be addressed in an exploratory or confirmatory manner [Janssen, Laatz 2007, p. 531]. Exploratory factor analysis (EFA) is typically applied when a structure among a set of variables is searched or data reduction should be performed. In contrast, confirmatory factor analysis is applied when the degree to which the data meets the researcher's expected structure should be assessed. [Hair et al. 2010, p. 94f] This study uses EFA, following the example of Kohlbacher [2009, p. 136] as well as Vera and Kuntz [2007, p. 61]. The single steps which need to be carried out within the framework of factor analysis will be briefly described below.

2.3.2.1 Conditions for Application

Hair et al. [2010, p. 102] mention numerous preconditions regarding the sample size for performing a factor analysis. A sample should at least contain 50 observations. However, a sample size of 100 or larger is preferred. Furthermore, the authors recommend having a minimum number of observations which is five times higher than the number of variables which should be analyzed.

In order to identify interrelated factors, variables need to exhibit a certain level of multicollinearity[2] [Hair et al. 2010, p. 103]. The quality of the raw data, expressed by correlations, is crucial for the quality of the factor analysis' results [Backhaus et al. 2011, p. 336]. Several approaches for testing the appropriateness of the correlation matrix to perform a factor analysis exist. These include: (i) the test for the significance of the correlation coefficients; (ii) the inverse of the correlation matrix; (iii) the Bartlett test of sphericity; (iv) the anti-image covariance matrix; and (v) the Kaiser-Meyer-Olkin (KMO) criterion [Backhaus et al. 2011, p. 340ff]. Backhaus et al. [2011, p. 339] recommend using at least two of the available statistical test criteria, but not necessarily all of them.

The significance level indicates the probability that a formulated hypothesis applies or not. These levels can be calculated for all correlation coefficients within the correlation matrix and describe the error probability for rejecting the null hypothesis (H_0). In this case, H_0 states that no correlation between the variables exists. The lower the error probabilities, the more likely H_0 can be rejected. [Backhaus et al. 2011, p. 340]

Bartlett's test examines the entire correlation matrix and investigates whether significant correlations among the variables are present [Hair et al. 2010, p. 104]. For this purpose, H_0 is constructed, again, stating that all variables are uncorrelated. If it is possible to reject H_0 because the defined significance level, for example 5%, can be reached, it can be assumed that the variables are sufficiently correlated and the application of factor analysis makes sense. [Backhaus et al. 2011, p. 341]

[2] A single variable can be explained by the other remaining variables in an analysis to a certain extent. This magnitude is expressed by multicollinearity. [Hair et al. 2010, p. 93] See section 5.2.1.

The KMO criterion, also known as Kaiser-Meyer-Olkin measure of sampling adequacy (MSA), not only assesses the sampling adequacy of the entire matrix, but also quantifies the variables' degree of intercorrelatedness. It is an index ranging from 0 to 1. A minimum level of 0.5 is suggested in order to apply factor analysis. [Hair et al. 2010, p. 104] The interpretation of the MSA values is listed in Tab. 2-3.

MSA value	Interpretation
≥ 0.9	Marvelous
≥ 0.8	Meritorious
≥ 0.7	Middling
≥ 0.6	Mediocre
≥ 0.5	Miserable
< 0.5	Unacceptable

Tab. 2-3: Assessment of the MSA value [Kaiser, Rice 1974, p. 112]

Furthermore, the MSA can be used for assessing single variables which is also suggested by the literature [Hair et al. 2010, p. 104; Brosius 2011, p. 796]. This gives an indication whether single variables should be excluded from analysis or not. The calculation of these values works nearly identically to the one of the overall MSA and follows the same evaluation criteria [Bühner 2011, p. 347; Pett, Lackey, Sullivan 2003, p. 79]. Backhaus et al. [2011, p. 342f] state that the MSA is the best available procedure for examining a correlation matrix.

2.3.2.2 Derivation of Factors

In the next step, factors are determined on the basis of the correlations. Multiple methods exist to perform factor extraction. Common factor or principal axis factor analysis and (principal) component analysis rate among the most important techniques. The choice depends on several factors including the knowledge about the partitioning of a variable's variance. In this connection, the determination of the communality plays a central role. [Backhaus et al. 2011, p. 355] The variance measures the total amount of variation of a single variable's values about its mean. As already noted, factor analysis groups together highly correlated variables. Two correlated variables share variance with each other (this amount results from the squared correlation). [Hair et al. 2010, p. 105] The term communality refers to the amount of total variance in a particular variable accounted for by all factors contained in the factor solution. In terms of figures, it is the sum of the original variable's squared factor loadings[3] for all factors. [Hair et al. 2010, p. 119]

Principal component analysis aims at reproducing the data structure as comprehensively as possible by using as few factors as possible. This means that most of the original information (variance) should be retained. The method assumes that the observed variables have been gained without measurement errors. Consequently, the original variables' total variance can be explained completely by the extracted factors. When the number of extracted factors equals the number of original variables, a communality of 1 is achieved. Typically, the number of factors is lower than the number of variables and the communalities are therefore below 1. The unexplained portion of the original variance is deliberately accepted and represents information loss. Most statistical programs perform principal components analysis by default. It tries to answer the question how variables which load highly on a factor can be

[3] The factor loading expresses the correlation between a variable and the factor [Hair et al. 2010, p. 112]. Consequently, the squared loading represents the "*amount of the variable's total variance accounted for by the factor*" [Hair et al. 2010, p. 116].

subsumed under a collective term in the context of interpretation. [Backhaus et al. 2011, p. 356f; Hair et al. 2010, p. 107; Moosbrugger, Schermelleh-Engel 2012, p. 327]

In contrast, common factor analysis reckons that the observed variables' variance always contains both the communality and the uniqueness (1-communality). The analysis considers solely the communality, which has to be estimated by the researcher, when defining the structure of the variables. This means that the unique variance is excluded. As in the case of principal component analysis, information loss occurs if the number of extracted factors is lower than the number of variables. When interpreting the factors the question reads as follows: what is the reason that is causing the high correlations between the variables? [Backhaus et al. 2011, p. 356f; Hair et al. 2010, p. 107]

Fig. 2-4 summarizes the differences between the two methods regarding the types of variance carried into the factor matrix. In general, the total variance can be divided into three types. Common variance is estimated by the variable's communality. The other two variance types cannot be explained by a variable's correlation with others. They represent the uniqueness of a variable. Specific variance refers to the variance that is unique to a specific variable. Finally, the error variance in a variable results from data collection and measurement errors. [Backhaus et al. 2011, p. 356; Hair et al. 2010, p. 105]

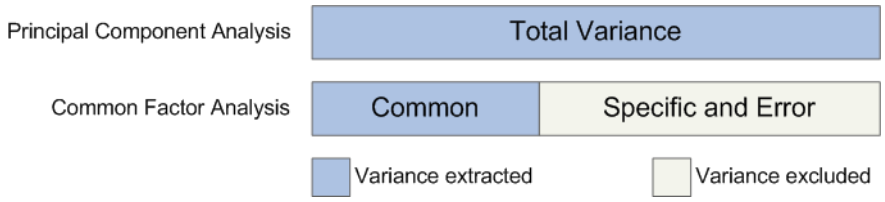

Fig. 2-4: Types of variance [Hair et al. 2010, p. 107]

No clear rules exist in order to determine the number of extracted factors. Nevertheless, it is the central decision when applying EFA [Moosbrugger, Schermelleh-Engel 2012, p. 329]. Currently used stopping criteria for the number of factors to extract include [Hair et al. 2010, p. 109f; Janssen, Laatz 2007, p. 540]: (i) latent root criterion; (ii) a priori criterion; (iii) percentage of variance criterion; and (iv) scree test criterion.

The latent root or Kaiser criterion is the most commonly used technique within this context [Hair et al. 2010, p. 109; Bryman, Cramer 2009, p. 29]. The rationale is that each retained factor should at least account for the variance of a single variable. As each variable within components analysis contributes to the total eigenvalue[4] with a value of 1.0, only those factors are considered as significant which have eigenvalues greater than the 1.0 cutoff. Furthermore, in the range between 20 and 50 variables, the eigenvalue cutoff is most reliable. [Hair et al. 2010, p. 109]

The a priori criterion is used when theories or hypotheses about the number of factors to be extracted are tested. In such cases the researcher knows the number of factors in advance and stops the analysis when this number is reached. In contrast to this, the percentage of variance criterion defines the cumulative percentage of total variance which should be explained by the extracted factors. [Hair et al. 2010, p. 109]

[4] The eigenvalue or latent root is "*the amount of variance accounted for by a factor*" and is composed of the sum of the squares of each factor loading (or "*the sum of the variances for each variable*") [Bryman, Cramer 2009, p. 29].

Finally, the scree test criterion follows a graphical approach. The latent roots are plotted against the number of factors according to their order of extraction; the eigenvalues are connected via lines. The result is a diagram in the shape of a mountain where scree is collected along its foot. The maximum number of factors to be extracted is represented by the point at which the graph is brought more into line with the abscissa (it begins to straighten). Relevant factors are the ones located preliminary to the resulting kink. The scree which represents the factors with the smallest eigenvalues for explanation purposes can be considered as unusable and will, therefore, not be extracted. [Hair et al. 2010, p. 110; Backhaus et al. 2011, p. 359; Janssen, Laatz 2007, p. 540; Moosbrugger, Schermelleh-Engel 2012, p. 330]

2.3.2.3 Interpretation of Factors

When the number of factors has been determined, the factors need to be interpreted. Initially, the factors represent abstract magnitudes. [Backhaus et al. 2011, p. 361] The underlying unrotated factor solutions primarily target data reduction. However, the researcher is interested in a solution which provides the most adequate interpretation of the variables involved in the analysis. This information is often not provided by the unrotated factor matrix. In order to make the factor solutions simpler and theoretically more meaningful the factors are rotated [Hair et al. 2010, p. 112]. Factor rotation aims at achieving a so-called simple structure. This means that each variable has a high loading on a single factor only while it has none or rather low loadings on others. Multiple rotation methods are available. Basically, it is distinguished between orthogonal and oblique factor rotations. [Moosbrugger, Schermelleh-Engel 2012, p. 332] In the former case it is assumed that the factors do not correlate among themselves and the axis remain at right angle to each other during rotation. Such a rotation is shown in Fig. 2-5 with factor loadings of V_2 exemplarily drawn as dashed lines.

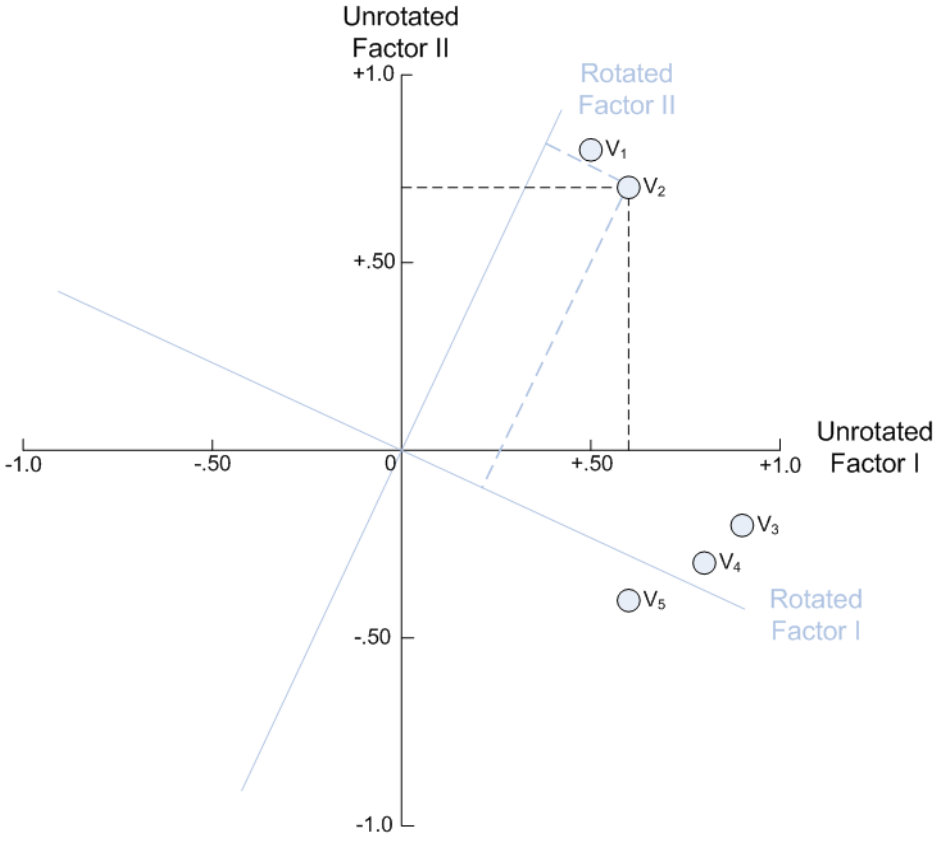

Fig. 2-5: Orthogonal factor rotation [Hair et al. 2010, p. 113]

In contrast, during oblique factor rotation the axis are rotated in an oblique angle to each other provided that the factors are correlated. [Backhaus et al. 2011, p. 363] VARIMAX rotation is the most widely used method in this context, as it proved successful in analytic practice. It rates among the orthogonal rotation methods and simplifies the columns of the factor matrices. This is based on the assumption that factor loadings close to ±1.0 or 0 are easy to interpret. For this purpose, the variances of the (squared) loadings within the factors are maximized. [Hair et al. 2010, p. 115f; Janssen, Laatz 2007, p. 546f; Pett, Lackey, Sullivan 2003, p. 141]

Next, the factor matrix of loadings needs to be examined and significant loadings for each variable identified. The researcher has to define a threshold for assigning a variable to a particular factor (that is the required height of the factor loading). A loading of at least 0.5 is considered as being high or practically significant. [Hair et al. 2010, p. 118f; Backhaus et al. 2011, p. 361] At this point cross-loadings might be discovered. This implies that a variable exhibits more than one significant loading. When all significant loadings have been identified, each variable's communalities have to be examined. In this way, the researcher has the possibility to find out whether a variable meets acceptable levels of explanation. This threshold has to be specified by the researcher, however, it is suggested that at least 50% of each variable's variance are taken into account. [Hair et al. 2010, p. 119ff]

It may happen that a researcher is confronted with one of the following problems: (i) a variable has no significant loading; (ii) although a variable has a significant loading, its communality is deemed to low; or (iii) a variable has a cross-loading, as already mentioned. To overcome these problems, any combination of the following remedies can be applied as long as a factor solution is obtained which is empirically and conceptually supported: (i) ignoring problematic variables; (ii) deleting problematic variables; (iii) using alternative rotation methods; (iv) decreasing/increasing the number of retained factors; and (v) modifying the factor model type. [Hair et al. 2010, p. 119f]

Basically, the factor interpretation can be seen as circular process consisting of the steps (i) estimation of the factor matrix; (ii) factor rotation; and (iii) factor interpretation and respecification [Hair et al. 2010, p. 112].

2.3.3 Regression Analysis

The simple fact that PO is treated as multi-dimensional construct requires the application of multivariate analyses in order to answer the research questions. Specifically, multiple regression analyses are used. Regression analysis, in general, rates among the most flexible and most frequently utilized analysis techniques and is primarily applied to investigate causal relationships between a single dependent variable and one or more independent variables [Backhaus et al. 2011, p. 56].

2.3.3.1 Multiple Linear Regression Analysis

In contrast to a simple linear regression analysis, a multiple regression analysis involves more than one independent variable which is a typical situation in most researches [Backhaus et al. 2011, p. 69]. In this case it is tried to explain the variance of a dependent variable (Y) over the variance of a set of independent variables (X_j) with the help of a single equation [Auer, Rottmann 2011, p. 419] having the form (Equ. 2-3):

$$\hat{Y} = b_0 + b_1 x_1 + b_2 x_2 + \cdots + b_j x_j + \cdots + b_J x_J$$

Equ. 2-3: Regression approach for more than one independent variable [Backhaus et al. 2011, p. 69]

The regression analysis aims at finding weighting factors for each independent variable which minimize the sum of differences between observed and predicted values [Bühner, Ziegler 2009, p. 651]. In a graphical point of view this implies that points within a scatter plot are as close as possible to the regression line. [Backhaus et al. 2011, p. 67] The regression parameters or coefficients are ascertained by minimizing the sum of the deviation squares [Backhaus et al. 2011, p. 69] which is frequently done with the help of the ordinary least squares (OLS) method [Auer, Rottmann 2011, p. 420]. This is necessary because pairs of values usually exhibit only a more or less linear course [Auer, Rottmann 2011, p. 421]. The purpose of squaring the deviations is to avoid that the positive and negative variations neutralize each other [Bühner, Ziegler 2009, p. 651].

The regression coefficients (b_j) are an indicator on how a change of X_j affects Y. Those parameters, however, are not a measure of importance, since the variables are not always measured in the same units. In order to make the values comparable, they are typically standardized to eliminate the variable's various measurement dimensions resulting in the so-called β-values. This calculation is shown in Equ. 2-4. [Backhaus et al. 2011, p. 70]

$$\hat{b}_j = b_j \frac{s_{X_j}}{s_Y}$$

Equ. 2-4: Standardized regression coefficient [Backhaus et al. 2011, p. 70]

2.3.3.2 Examination of the Regression Function

After the estimation of the regression function has taken place its quality has to be checked [Backhaus et al. 2011, p. 461]. This means answering the question whether the regression model represents the total population or only the sample [Hair et al. 2010, p. 192]. Within this context two basic forms of assessment are differentiated [Backhaus et al. 2011, p. 72; Hair et al. 2010, p. 192; Auer, Rottmann 2011, p. 430ff] which will be explained below.

Significance of the Overall Model

The global examination provides information about the regression function as a whole in order to assess how well Y is explained by the regression model [Backhaus et al. 2011, p. 72]. That implies providing an answer on the questions how close the estimated value of Y is placed to the original one or how well the regression function fits in the data [Auer, Rottmann 2011, p. 430]. The coefficient of determination (R^2) and F-statistics rate among the global measures [Backhaus et al. 2011, p. 72].

Coefficient of Determination

It is the most commonly utilized measure for assessing the regression model's prediction accuracy [Hair et al. 2010, p. 164]. The goodness of fit of the regression function is measured with R^2 on the basis of the residual values (deviation between the estimated and observed values of Y). It expresses the ratio of explained variance and total variance of all observations. As can be seen in Fig. 2-6 on the following page, the total variance of a single observation can be divided into the explained variance and the residual (not explained variance). The greater the proportion of the explained deviation, the better the estimation of the observed value y_k. The overall total variance is built by the sum of the squared total deviations of all observations. This leads to Equ. 2-5 of R^2 below. [Backhaus et al. 2011, p. 72ff]

$$R^2 = \frac{\sum_{k=1}^{K}(\hat{y}_k - \bar{y})^2}{\sum_{k=1}^{K}(y_k - \bar{y})^2}$$

Equ. 2-5: Coefficient of determination [Backhaus et al. 2011, p. 74]

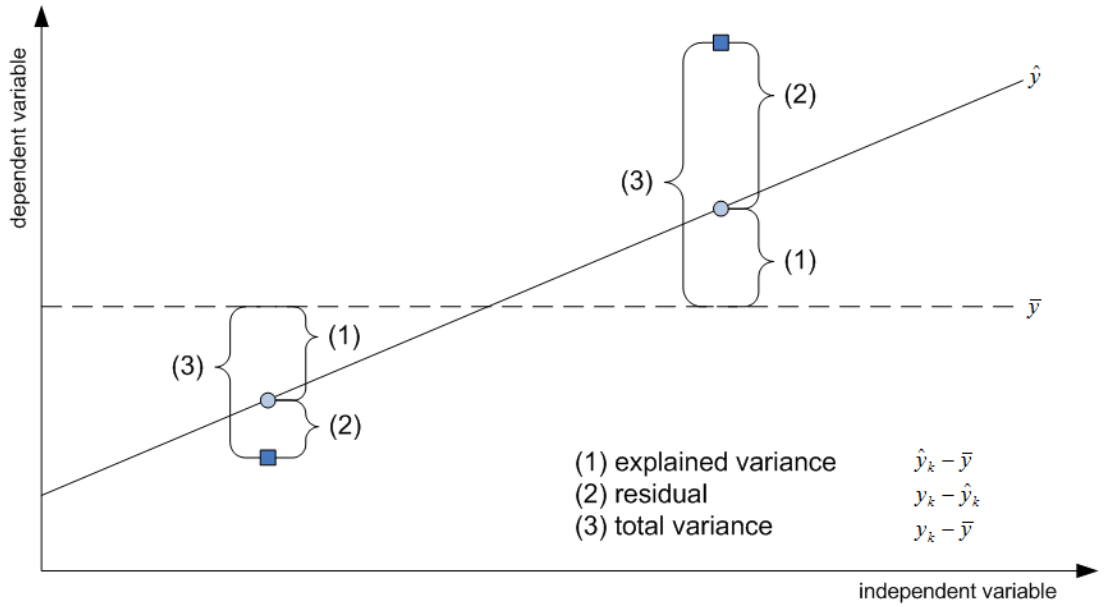

Fig. 2-6: Composition of total variance [Backhaus et al. 2011, p. 74]

R^2 can take values between 0 and 1. The higher the proportion of the explained variance, the greater becomes the value of the coefficient of determination. A value of 1 expresses the best case where the regression function optimally fits the empirical data. [Backhaus et al. 2011, p. 75; Auer, Rottmann 2011, p. 432] It is noted that there is also an adjusted version of R^2 which addresses the fact that the number of independent variables affects the coefficient (adding an additional independent variable typically increases the value) [Backhaus et al. 2011, p. 76].

F-Statistics

In order to assess whether the estimated model is also valid for the population and not only for the sample, the model has to be significant. F-statistics is used to perform the significance test. It takes the partition of variance and the sample size into account, since a high value of R^2 does not automatically mean that the regression model is generalizable[5]. [Backhaus et al. 2011, p. 76] If there is a causal relationship between X_j and Y the real regression coefficients cannot have a value of 0. Based on this observation H_0 is formulated which states that no such causal relationship exits. An F-test can be used to test H_0. [Backhaus et al. 2011, p. 77] This test is based on four steps. Initially, the empirical F-value is calculated according to the formula (Equ. 2-6):

$$F_{emp} = \frac{\sum_{k=1}^{K}(\hat{y}_k - \bar{y})^2 / J}{\sum_{k=1}^{K}(y_k - \hat{y}_k)^2 / (K - J - 1)} = \frac{R^2 / J}{(1 - R^2)/(K - J - 1)}$$

Equ. 2-6: Empirical F-value [Backhaus et al. 2011, p. 78]

The variances in the numerator and denominator are weighted by the related degrees of freedom [Bühner, Ziegler 2009, p. 665]. The degrees of freedom[6] represent the number of freely varying variations in the deviation calculation [Bortz, Döring 2006, p. 417]. In the

[5] Hair et al. [2010, p. 175] state that a result is generalizable if the ratio between observations and independent variables is 15:1 or 20:1 provided that the sample is representative.

[6] Example: The sum of K deviations from the mean is always 0. To ensure this situation, only $K-1$ deviations can vary freely. [Bortz, Döring 2006, p. 417]

above equation, *K* expresses the sample size while *J* represents the number of independent variables and simultaneously the degrees of freedom of the explained variance. The degrees of freedom of the residuals follow from the number of observations minus the parameters which are estimated. [Backhaus et al. 2011, p. 77f]

In the second step, the significance level is specified which is required for all statistical tests. Typically a value of 1% or 5% is chosen as significance level. Next, the theoretical F-value is extracted from a predefined table on the basis of the degrees of freedom. The empirical F-value has to exceed this critical value in order to refuse H_0 and confirm the relationship postulated by the regression relation. Finally, these two F-values are compared and H_0 either retained or refused. [Backhaus et al. 2011, p. 77ff]

Significance of the Regression Coefficients

This needs to be done only if the overall model is significant (not all regression coefficients are 0 [Backhaus et al. 2011, p. 81]). In this case it is examined how and to what extent the single independent variables contained in the regression model contribute to the explanation of *Y*. The t-value rates among the measures for examining the regression coefficients. [Backhaus et al. 2011, p. 72]

In contrast to the F-test which tests multiple parameters simultaneously [Auer, Rottmann 2011, p. 496], the t-test is most frequently used to test hypothesis regarding only single parameters [Auer, Rottmann 2011, p. 461; Backhaus et al. 2011, p. 83]. The approach is similar to the one of the F-test. The empirical t-value of a particular independent variable is calculated by dividing the regression coefficient by its standard error[7]. As shown in Equ. 2-7, the formula can be simplified due to the assumptions made in H_0. [Backhaus et al. 2011, p. 81]

$$t_{emp} = \frac{b_j - \beta_j}{s_{b_j}} = \frac{b_j}{s_{b_j}}$$

Equ. 2-7: Empirical t-value [Backhaus et al. 2011, p. 81]

This t-value can also be negative. Therefore, the absolute estimated value has to be compared to the theoretical one in order to confirm or refuse H_0. [Backhaus et al. 2011, p. 81f] An alternative to the predefined tables is the usage of the p-value as decision base which represents the smallest significance level to refute H_0. The refusal of H_0 is possible if the calculated p-value is smaller than the accepted error probability. [Auer, Rottmann 2011, p. 466].

2.3.3.3 Interaction or Moderator Effects

Such an effect exits if the correlation between the independent (*X*) and dependent variable (*Y*) is affected by another independent variable (*Z*), the moderator [Hair et al. 2010, p. 180]. Hence, the basic idea behind this effect is that the correlation between the *X* and *Y* varies depending on the increasing or decreasing values of *Z*. In order to test whether a moderator effect exists or not a multiple regression analysis is performed where the independent variables correspond to *X*, *Z* and the product of these variables (which is the moderator term). [Bühner, Ziegler 2009, p. 700f] This results in Equ. 2-8 quoted at the top of the next page.

[7] Mean error made when *Y* is estimated by using the regression function [Backhaus et al. 2011, p. 80] or the expected variation of the estimated regression coefficients due to sampling error [Hair et al. 2010, p. 194].

$$\hat{Y} = b_0 + b_1 X + b_2 Z + b_3 XZ$$

Equ. 2-8: Moderated regression equation [Hair et al. 2010, p. 181; Aiken, West 1996, p. 9]

Literature does not agree on the criteria to decide whether an interaction effect exits or not. Hair et al. [2010, p. 181] suggest estimating first the original unmoderated equation, then the entire moderated relationship and finally to assess the change in R^2. If this change is statistically significant, then an interaction effect is present. In contrast, Bühner and Ziegler [2009, p. 701] state that a moderator effect is present if the β-weight of the moderator term is statistically significant.

In the case of continuous variables it is likely that the moderator term correlates with the two individual variables, since it is their product. Due to the fact that all three variables are entered in the regression analysis, the problem of collinearity (see section 5.2.1) occurs which leads to inaccurate estimations of the β-weights. To remedy this situation it is common to center *X* and *Z* before conducting the multiplication. Centering means subtracting the mean of one entire variable from each of the single values contained. [Bühner, Ziegler 2009, p. 701ff]

When interactions between categorical (nominal) and continuous variables are examined, coding of the categorical variable becomes necessary. Multiple methods for coding exist. Dummy variable coding is regarded as the most frequently used one. [Aiken, West 1996, p. 116] In general, *k* categories are represented by *k-1* dichotomous dummy variables [Hair et al. 2010, p. 177]. The category not expressed by a dummy variable is called reference category [Hair et al. 2010, p. 177] or comparison group [Aiken, West 1996, p. 117]. In general, the value 0 is assigned to the comparison group in all dummy variables. The category which should be compared with the reference category is allotted a value of 1 in the associated dummy variable while the other, not compared groups are represented by a value of 0 in this particular dummy variable [Aiken, West 1996, p. 117]. The choice of the comparison group is arbitrary [Bühner, Ziegler 2009, p. 705]. Within this context it is also spoken of slope dummy variables, since they affect the slope of the regression line [Auer, Rottmann 2011, p. 501].

2.3.3.4 Hierarchical Regression Analysis

Basically, the hierarchical regression analysis combines several regression analyses. In this case, the independent variables are entered block by block in an order which is either adequately supported by theory or mandatory. Hereby it can be examined to what extend an additional block of independent variables improves the prediction of the dependent variable. In other words, with the help of this analysis it can be assessed how much additional variance is explained by adding a supplementary set of independent variables. It is also referred to incremental validity in this context. [Bühner, Ziegler 2009, p. 688f]

However, it is not possible to prove causalities unequivocally via regression analysis. The relationship is frequently only an assumption of the researcher. In order to test such hypothesis plausibility has to be checked additionally via knowledge beyond the borders of statistics. [Backhaus et al. 2011, p. 57]

3 Evidence of the Investigated Effects in Literature

This chapter provides a literature review on the examined effect of PO and BPM on firm performance. Several authors already addressed this topic and either predicted or discovered positive, but also negative coherences [Kohlbacher 2009, p. 13]. As a quantitative study is performed (see sub-section 4.3.1 for design decisions) this review includes such research papers which share the same understanding of PO and, therefore, operationalize PO in a similar way as it is done in this work. Based on these criteria the twelve studies briefly described on the following pages were identified[8]. However, there is no guarantee that the listing is complete. The chapter concludes with a discussion of the analyzed studies which sheds light on the reason why the two research questions stated in section 1.2 are addressed within this Master's Thesis.

3.1 The Study by Ittner and Larcker (1997)

In this cross-sectional empirical study the authors investigated the relationship between process management techniques and financial performance. Tab. 3-1 briefly summarizes the study's research design. The analysis showed rather differential results for the two examined industries. The only common finding for both industries was the positive impact of long-term partnerships with suppliers and customers on return on assets (ROA). Cycle time analysis, process capability studies or statistical process control were among those techniques whose value seemed to depend strongly on industry affiliation. According to Ittner and Larcker, these revealed differences resulted from the fact that the two compared industries were at different process management stages. Furthermore it was shown that some practices do not improve performance until others have been implemented. Several techniques even had no direct improvement effect on the financial key figures, such as the organization's commitment to continuous improvement and teamwork. The authors argued that these practices might be enablers which are required for the other techniques' success. [Ittner, Larcker 1997, p. 522ff]

Data collection via:	Survey database; mainly four-point to seven-point scales with varying anchors
Respondents:	unknown
Country/ies:	Canada, Germany, Japan, United States of America
Sample:	136 automotive organizations, 113 computer organizations
Independent variable/s:	Process focus, human resource management practices, information utilization, customer and supplier relations, organizational commitment – 14 factors in total
Dependent variable/s:	ROA, return on sales (ROS)
Analysis via:	Multiple Regression Analysis, Recursive Partitioning

Tab. 3-1: Ittner and Larcker's research design

3.2 The Study by Frei et al. (1999)

The used data were extracted from a retail banking study which aimed at investigating and understanding firm performance drivers. Tab. 3-2 on the top of the next page provides an overview of the underlying research design. One of the tested hypotheses stated that banks with better aggregate process performance are able to achieve better financial performance. Frei et al. proved that process performance is a driver of financial performance as a significant positive relation between these two variables was revealed. This relationship was independent of the firm size. [Frei et al. 1999, p. 1213ff]

[8] Licensed journals of both Graz University of Technology and University of Graz were taken into account.

Data collection via:	Multiple surveys on the basis of questionnaires
Respondents:	Most informed respondents – top managers such as head of the retail bank, top finance officer, top marketing officer, top manager responsible for technology and information systems, etc.
Country/ies:	United States of America
Sample:	44 retail banks
Independent variable/s:	Process performance – process efficiency
Dependent variable/s:	Financial performance – ROA
Analysis via:	Data Envelopment Analysis (DEA), Correlation Analysis

Tab. 3-2: Research design of Frei et al.

3.3 The Study by Forsberg, Nilsson and Antoni (1999)

This empirical study tried to find out how PO influences Swedish organizations. Basic information regarding the research design is contained in Tab. 3-3. The three authors not only discovered that the participating companies perceived a positive effect of PO on organizational performance in general, but also upon each of the single investigated dimensions. However, they revealed a significant gap between expected and perceived effects. The unreasonably high expectations are often caused by anecdotes, hype and publicity rather than solid empirical evidence. The authors state that process management is frequently described as revolutionary, easily accessible approach in literature. However, the facts (i) that PO requires changes of the way how an organization works and (ii) that these shifts are furthermore in need of a huge amount of effort, resources and time are frequently ignored. [Forsberg, Nilsson, Antoni 1999, p. 545]

Data collection via:	Questionnaire distributed at a network conference on process orientation; ten-degree scales
Respondents:	Conference participants
Country/ies:	Sweden
Sample:	90 organizations, including small consulting firms, hospitals and state-owned as well as multinational companies
Independent variable/s:	PO
Dependent variable/s:	Common language, customer focus, cooperation, big-picture view, cost reductions, time reductions, improvement learning, standardization, co-ordination
Analysis via:	Non-advances statistics – mainly arithmetic averages

Tab. 3-3: Research design of the study by Forsberg, Nilsson and Antoni

3.4 The Study by Nilsson, Johnson and Gustafsson (2001)

The authors examined how key internal quality practices (activities improving product and process quality) influence customer satisfaction and business results. One of the investigated relationships was the one between PO and customer satisfaction. A brief overview of the research design is given in Tab. 3-4 (see page 30). A positive effect of PO on customer satisfaction was discovered in both compared organizational types. The authors proved that PO has a greater positive impact on customer satisfaction for service organizations than for manufacturing organizations due to the higher visibility of the production process to service customers. The effect was not even significant for manufacturing organizations. The authors argued that in these organizations this relationship is mediated by customer orientation

because the production process is more invisible in this case. [Nilsson, Johnson, Gustafsson 2001, p. 5ff]

Data collection via:	Mail survey; items scored on ten-point scales ranging from 'completely disagree' to 'completely agree'
Respondents:	CEOs
Country/ies:	Sweden
Sample:	360 product organizations (NACE 01-44), 122 service organizations (NACE 70-99); at least 50 employees
Independent variable/s:	PO
Dependent variable/s:	Customer satisfaction
Analysis via:	Partial Least Squares (PLS)

Tab. 3-4: Research design used by Nilsson, Johnson and Gustafsson

3.5 The Study by McCormack and Johnson (2001)

McCormack and Johnson examined how PO affects interdepartmental dynamics and organizational performance. The research design is described in Tab. 3-5. Individual treatment of the single PO dimensions showed that each of them had a negative relationship with interfunctional conflicts which means that an increase of each component caused decreasing conflicts. The strongest impact on the outcome variables was caused by process management and measures. Nevertheless, all dimensions boasted significant impacts. Their empirical data furthermore supported the stated proposition that PO can help improving a company's overall business performance, interdepartmental connectedness and esprit de corps, but also reducing interfunctional conflicts. [McCormack, Johnson 2001, p. 35ff]

Data collection via:	Regular and electronic mail survey via questionnaire; five-point Likert scales ranging from 'completely disagree' to 'completely agree'
Respondents:	Key informants – 36.2% individual contributors, 30.2% managers, 19.5% senior managers, 13% senior leadership
Country/ies:	United States of America
Sample:	115 manufacturing companies – broad industrial distribution with strong concentration on electronics
Independent variable/s:	Business process orientation consisting of the dimension (i) process jobs; (ii) process management and measurement; and (iii) process view
Dependent variable/s:	Organizational performance with dimensions (i) esprit de corps and (ii) overall performance; interdepartmental dynamics with dimensions (i) interdepartmental conflict and (ii) interdepartmental connectedness
Analysis via:	Correlation Analysis, Regression Analysis

Tab. 3-5: Research design of McCormack and Johnson

3.6 The Study by Gustafsson, Nilsson and Johnson (2003)

While the authors compared manufacturing and service organizations with regard to the effect of internal quality practices on customer satisfaction and business results two years before, they put the focus solely on the service sector in this study. As can be seen in Tab. 3-6 on the following page, the research design was the same except the research sample. In general, the authors found out that the observed effect of quality practices is depending on the service provider's size. Again, a positive impact of PO on customer satisfaction was discovered in

both comparative groups of service organizations. However, the effect was not significant for small services. According to the authors, the clearly higher importance of PO in larger service organizations results from differing company characteristics. More attention must be paid for processes relevant for firm's efficiency and effectiveness from large service organizations almost by definition. In this case, a framework by which customer orientation can be built on is created by PO. In contrast, processes are not that complex in small service organizations requiring only few people in service production. Customer orientation, therefore, takes place more in a direct manner. As a consequence, it can be said that PO becomes a relevant concept when a company exceeds a certain size. [Gustafsson, Nilsson, Johnson 2003, p. 232ff]

Data collection via:	Mail survey; items scored on ten-point scales ranging from 'completely disagree' to 'completely agree'
Respondents:	CEOs
Country/ies:	Sweden
Sample:	281 service organizations (NACE 70-99); 159 small (less than 50 employees) and 122 large ones
Independent variable/s:	PO
Dependent variable/s:	Customer satisfaction
Analysis via:	PLS

Tab. 3-6: Research design of Gustafsson, Nilsson and Johnson's study

3.7 The Study by Bach and Biemann (2004)

Basically, Bach and Biemann aimed at investigating how BPM is designed, performance is defined and business processes are monitored or optimized. Information on the underlying research design can be found in Tab. 3-7. Their relationships under examination included the one between BPM and corporate success. By looking at the histograms they revealed a clear trend towards a positive or right skew. Especially process quality and customer satisfaction seemed to benefit strongly from the BPM approach. Altogether, it can be said that participating companies perceived positive contributions of BPM towards customer satisfaction, throughput time reduction, process quality, process cost reduction and delivery reliability. [Bach, Biemann 2004, p. 4ff]

Data collection via:	Mail survey with questionnaire; five-point scales ranging from 'very low' to 'very high'
Respondents:	Quality and process managers
Country/ies:	Germany
Sample:	276 companies out of the following industries: 40.7% metal working, mechanical and plant engineering; 16.3% vehicle manufacturing; 13.8% electrical and electronics; 8.9% chemistry and pharmaceutical; 5.8% plastics – 50% with more than 450 employees or a turnover of € 90 million
Independent variable/s:	BPM
Dependent variable/s:	Customer satisfaction improvement, throughput time reduction, process quality improvement, process cost reduction, delivery reliability improvement
Analysis via:	Frequency charts

Tab. 3-7: Bach and Biemann's underlying research design

3.8 The Study by Hung (2006)

The study examined the relationship between two key BPM concepts, process alignment and people involvement, and organizational performance. A short overview of the research' design is provided by Tab. 3-8. The authors proved that both concepts are positively and significantly related to organizational performance. Therefore, it can be said that there is a tendency towards better organizational performance when companies possess higher levels of aggregated horizontal structure, strategy and IT competency alignment on the one hand. On the other hand stronger leadership and top-management commitment towards core process management and the provision of employees with more authority to manage their own work leads to the same positive effect. [Hung 2006, p. 21ff]

Data collection via:	Mail survey with questionnaire; five-point Likert scales ranging from 'strongly disagree' to 'strongly agree'
Respondents:	Top executives
Country/ies:	Australia
Sample:	236 Top 1000 companies – 65.7 % manufacturing, 34.3% service
Independent variable/s:	Process alignment, people involvement
Dependent variable/s:	Organizational performance
Analysis via:	Correlation Analysis, Regression Analysis

Tab. 3-8: Research design used by Hung

3.9 The Study by Vera and Kuntz (2007)

Vera and Kuntz tried to prove that hospitals with a high degree of PO are more efficient than those with a lower degree of PO in their organizational design. More information on the methodology is provided in Tab. 3-9. The authors discovered a weak but highly significant and positive linear relationship between process-based organizational design and hospital efficiency. By looking one level lower they were, hardly surprising, able to reveal a positive impact of process management and decentralization on hospital efficiency. However, efficiency is mainly caused by such organization tools which are closely related with business process identification, analysis and optimization while decentralization measures are more likely providers of the essential incentive structure. [Vera, Kuntz 2007, p. 58ff]

Data collection via:	Database compiled by the Statistical Office of the federal state of Rheinland-Pfalz and standardized written questionnaire sent out by post; five-point scale ranging from 'not at all' to 'very high'
Respondents:	CEOs
Country/ies:	Germany (federal state of Rheinland-Pfalz)
Sample:	41 hospitals
Independent variable/s:	Process-based hospital organization with the dimensions (i) process management; and (ii) decentralization
Dependent variable/s:	Hospital efficiency
Analysis via:	DEA, Regression Analysis

Tab. 3-9: Underlying research design of Vera and Kuntz

3.10 The Study by Škrinjar, Bosilj-Vukšić and Indihar-Štemberger (2008)

This empirical investigation is mainly an alteration of the study performed by McCormack and Johnson. Information on the research design can be extracted from Tab. 3-10 on page 33.

The authors found support for their hypothesis that high levels of PO lead to better non-financial performance regarding key stakeholder satisfaction while the effect of PO on financial performance was not significant. However, due to the strong impact of non-financial performance on financial outcomes, it is argued that PO has a strong indirect effect on financial performance. The authors assume that the non-significant direct impact results from a time lag because organizational renovation and process improvement practices are time consuming. As a consequence, those efforts do not cause financial results immediately. [Škrinjar, Bosilj-Vukšić, Indihar-Štemberger 2008, p. 743ff]

Data collection via:	Survey via questionnaire; five-point Likert scales ranging from 'completely disagree' to 'completely agree'
Respondents:	CEOs or chairpersons instructed to fill it out themselves or pass it to a competent person – majority out of middle management
Country/ies:	Slovenia, Croatia
Sample:	203 Slovenian and 202 Croatian companies with more than 50 employees
Independent variable/s:	Business process orientation consisting of the dimensions (i) process view; (ii) process jobs; and (iii) process management and measurement
Dependent variable/s:	Financial and non-financial performance in terms of employee, customer and supplier satisfaction
Analysis via:	Structural Equation Modeling (SEM)

Tab. 3-10: Research design of Škrinjar, Bosilj-Vukšić and Indihar-Štemberger

3.11 The Study by Kohlbacher (2009)

This empirical study investigated the performance effects of PO on a multi-dimensional basis. The research design is summarized in Tab. 3-11 at the top of the following page. The author was not able to prove that PO impacts financial performance positively. Nevertheless, support for the other hypotheses regarding the positive impact on product quality, customer satisfaction, delivery speed, time-to-market speed and delivery reliability was found. Those effects were independent from firm size and manufacturing process type, except the one on delivery speed which seemed to be stronger for project/jobbing manufacturers. [Kohlbacher 2009, p. 134f] When the effects of specific dimensions were examined, it was found that process performance measurement, culture in line with the process approach, process-oriented organizational structure and continuous process improvement methods had a positive and significant relationship with organizational performance. Especially corporate culture seemed to play a prominent role. The lived process approach resulted in higher ROS, customer satisfaction, delivery speed and delivery reliability[9]. However, a weakly significant negative relationship between management commitment and ROS was also discovered. As it was already mentioned by Ittner and Larcker, Kohlbacher also argues that those dimensions which seemed to have no individual performance effect, might act as enablers for other PO dimensions. [Kohlbacher 2009, p. 172ff]

[9] The findings regarding the impacts of the corporate culture in line with the process approach have been published separately within the framework of the BPM 2010 Workshops [Kohlbacher, Grünwald, Kreuzer 2011, p. 16ff]. These results are more or less decoupled from Kohlbacher's dissertation [2009] and provide no new insights. Therefore, this particular paper is unquoted in this chapter's literature review.

Data collection via:	Financial statements and telephone interviews with questionnaire; six-point Likert scales ranging from ‘full disagreement’ to ‘full agreement’
Respondents:	CIOs, CEOs or quality managers
Country/ies:	Austria
Sample:	132 companies – 50.8% from machinery industry, 49.2% from metal industry – with at least 50 employees
Independent variable/s:	PO with the dimensions (i) process design and documentation; (ii) management commitment; (iii) process owner; (iv) corporate culture; (v) organizational structure; (vi) continuous process improvement; and (vii) process performance measurement
Dependent variable/s:	Firm performance with the dimensions (i) financial performance; (ii) product quality; (iii) customer satisfaction; and (iv-vi) time-based operational performance
Analysis via:	(Stepwise) Regression Analysis

Tab. 3-11: Kohlbacher's research design

3.12 The Study by Kohlbacher and Grünwald (2011)

On the basis of the data already collected within the framework of the study by Kohlbacher [2009], the authors investigated the interaction effect of the two PO key dimensions (i) process performance measurement and (ii) the process owner role. Tab. 3-12 contains the slightly changed research design compared to the study performed two years before. Neither process performance measurement nor the process owner role had individual significant effects on firm performance in the tested model without interaction term. Those impacts were independent from the firm size and industry affiliation. However, capital structure had a negative effect on the firm’s ROS. The same behavior of the control variables was also observed in the investigated interaction effect model. The authors proved that companies implementing both process performance measurement and the process owner role outperform those firms implementing these two dimensions individually. Within this context, a rather counterproductive effect of process performance measurement on firm performance was also discovered when no process owners were in place. The initiation of improvement actions on the basis of the performance metrics is essential as simple measurement alone creates only idle organizational and technical costs. [Kohlbacher, Grünwald 2011, p. 709ff]

Data collection via:	Financial statements and telephone interviews with questionnaire; six-point Likert scales ranging from ‘full disagreement’ to ‘full agreement’
Respondents:	CIOs, CEOs or quality managers
Country/ies:	Austria
Sample:	70 companies operating in machinery or metal industry with at least 50 employees
Independent variable/s:	Process owner role, process performance measurement
Dependent variable/s:	ROS
Analysis via:	Regression Analysis

Tab. 3-12: Underlying research design of the study of Kohlbacher and Grünwald

3.13 Discussion

The present review of literature resulted in 12 quantitative studies. As already mentioned, an extensive literature review was already performed by Kohlbacher [2009, p. 13]. In addition, this includes statements without direct empirical support and case studies. Although nearly three years lie in between these two research processes, it seems that not many additional quantitative inspections of this topic (sharing the same understanding) have been made until now. This deficiency was also pointed out by Vera and Kuntz [2007, p. 55]. Therefore, it can be said that there is still an obvious lack of quantitative studies examining the effects of PO. Tab. 3-13 provides a summary of the reported effects of PO in general, as the additional consideration of single dimensions would result in a rather complex overview. It should be noted that some general performance terms are used: (i) financial performance includes sales, profits and profitability; (ii) quality encompasses the quality of products, services and processes; (iii) speed stands for cycle times and responses; and (iv) organizational performance addresses multiple aspects, including organizational profitability and product/service quality. As can be seen, an increase of customer satisfaction and the improvement of financial results as well as speed are among the most often reported effects.

Study / **Effect** Improvement of (+)	Bach/Biemann (2004)	Forsberg/Nilsson/Antoni (1999)	Frei et al. (1999)	Gustafsson/Nilsson/Johnson (2003)	Hung (2006)	Ittner/Larcker (1997)	Kohlbacher (2009)	Kohlbacher/Grünwald (2011)	McCormack/Johnson (2001)	Nilsson/Johnson/Gustafsson (2001)	Škrinjar/Bosilj-Vukšić/Indihar-Štemberger (2008)	Vera/Kuntz (2007)	Sum of positive reportings
Cost/Expenses	+	+											2
Customer Satisfaction	+			+			+			+	+		5
Delivery reliability	+						+						2
Efficiency												+	1
Financial performance			+			+		+	+				4
Quality	+						+						2
Speed	+	+					+						3
Organizational performance					+								1

Tab. 3-13: Summarization of reported effects of PO

Another interesting finding is that mainly positive effects of PO were reported in the studies. This clearly supports the stated initial research hypothesis in section 1.2. The obvious positive overweight was also recognized in the extended literature review of Kohlbacher. It is argued that there is a tendency of popular press and case studies to report more likely positive effects

than none or even negative ones [Kohlbacher 2009, p. 32] which might also be related with the general desirability of positive results. There are some studies having defined PO dimensions, but not all of them investigate how these individual factors influence firm performance. In those cases, the process of analysis stops already after the strength and direction of the linear correlation has been explored or an attempt of deeper analysis is not even performed at all. Kohlbacher [2009, p. 172ff] clearly outlined that PO has a multi-dimensional nature and that some of the investigated dimensions are strong performance drivers while others act as enablers. Thus, it can be concluded that there is still much room for research regarding the nature of PO in order to obtain a better understanding of how single PO dimensions or their interaction affect organizational performance.

By looking at the investigated industries, a slight tendency towards manufacturing companies is revealed. Five of the studies concern only manufacturing companies, while four examine solely service providers. At first glance, this might not be a major difference. However, the manufacturing company-based researches are more broadly positioned than their service counterparts. Two rather holistic investigations of the service sector are taken. The two other ones are restricted to special branches (retail banks and hospitals in the concrete case). In contrast, the studies investigating the manufacturing organizations always take at least two branches into account. The assumption, namely that the remaining empirical researches involving manufacturing and service organizations would have a comparative character, is not supported. Only the research performed by Nilsson, Johnson and Gustafsson in 2001 primarily aimed at investigating differences between the manufacturing and service sector. With reference to control variables it can be said that the effects of PO are mainly tested depending on the firm size which showed to be independent except in the concrete inter-service comparison performed by Gustafsson, Nilsson and Johnson in 2003.

This Master's Thesis contributes to the mentioned limitations of former studies by respecting the multi-dimensional nature of PO. Furthermore, the study investigates the effects of PO on firm performance also as a function of industry type.

4 Research Design

This chapter approaches the research design of the Master's Thesis' empirical study. The single steps which were carried out and the underlying measurement model are explained. Furthermore, this chapter addresses potential measurement errors and how they can be or are avoided. Finally, the revised measurement model is discussed.

The concrete research object of this work is the organization. With reference to the temporal dimension of a research design, the present empirical study exhibits a cross-sectional nature. This means that the units of analysis (in this case the organizations) are studied either at one point in time or within a short time frame. The counterpart of a cross-sectional study is the so-called longitudinal study. In such a framework, a survey is repeated by using the same instruments and units of analysis at different points in time, implying that the units of analysis are followed over time. [Raithel 2006, p. 48; Seale 2004, p. 343]

The chronology of the main tasks performed in this empirical study is summarized in the following illustration (Fig. 4-1).

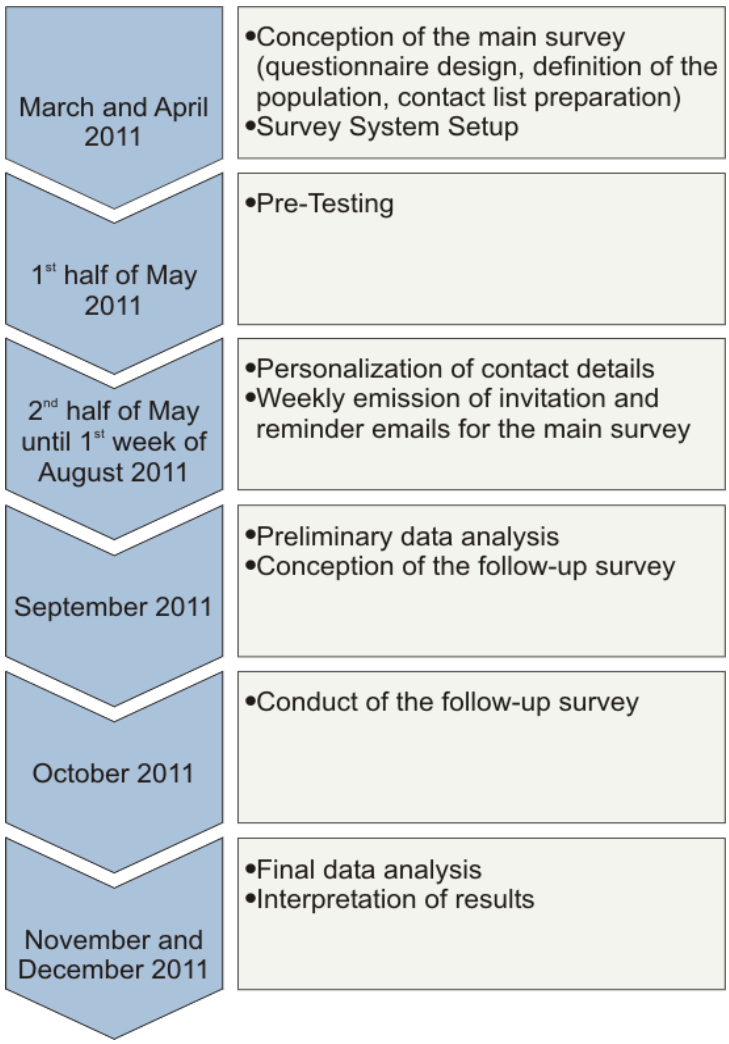

Fig. 4-1: Chronological order of the empirical study

4.1 Population

This section provides a short insight into the Austrian economic structure and briefly explains how the underlying research population is defined.

4.1.1 Austrian Economic Structure

According to Statistik Austria [2011a] there were about 300000 enterprises within the manufacturing and service sector in 2009 which employed approximately 2.7 million people. Since the year 2008 basic statistics have been made with the help of the revised industry classification ÖNACE 2008. An overview of the ÖNACE 2008 sections can be found in Appendix A. The economic sector of manufacturing comprises the sections B to F whereas the service industry includes the sections G to N and division S95 [Statistik Austria 2011b].

In today's modern economic system the service sector (or tertiary sector according to the economic three-sector theory[10] [Meffert, Bruhn 2003, p. 9]) covers the major part of the economy [Messner, Kreidl, Wala 2007, p. 12; Lovelock, Wright 2002, p. 7; Gustafsson, Johnson 2003, p. 2; Davenport, Short 1990, p. 12]. Bruhn and Meffert [2002, p. 2] describe this trend as 'march to the service society'. This development of companies towards service providers has multiple reasons. One of the most important ones is that the consumer behavior has changed dramatically within the last decades, since time has become a limited source in both the economic and private sector. Companies focus on their core competences and outsource other activities while private individuals try to optimize and make best use of their leisure time. As a consequence, this march continues with sudden speed. [Matys 2007, p. 9; Geerts, Blindenbach-Driessen, Gemmel 2010b, p. 8] This increase of the service sector's size can be observed in both developed and emerging countries [Lovelock, Wirtz 2007, p. 6]. In addition, the increasing service share of physical goods contributes to this development. Nowadays, many products cannot survive on the market anymore without accompanying services[11], [Matys 2007, p. 9].

Austria definitely seemed to be a mainly service providing state in 2009. As Fig. 4-2 on the next page shows, the ratio between manufacturers and service providers was one to four. This rate fits in with the values of Hong Kong in 2003 [Lai, Cheng 2003, p. 143]. Similarly, Statistik Austria [2011d] stated in May 2011 that the service sector has become an economic core area within the last years. Retail trade and repair of motor vehicles alone involve 24.6% of all enterprises and 23.0% of the entire working population. Nevertheless it should be noted that Austria has a predominant small-business structure. 87.1% of the enterprises within the two industries employed less than ten people. Despite this high percentage, these companies were only responsible for 16.9% of the total turnover. The other extreme is the percentage of companies with 250 employees and more. The approximately 1100 enterprises employed 33.4% of the total workforce and were responsible for 38.7% of turnover. [Statistik Austria 2011a]

[10] The employment in R&D and information processing has been increasing dramatically since the second half of the 20th century. More recently, the traditional economic sectors are extended by a fourth one. The so-called quaternary sector includes occupational groups such as software developers or web designers. In the majority of cases, these sectors provide services wherefore they can be seen as a part of the tertiary sector in the broadest sense. [Danielli, Backhaus, Laube 2009, p. 35]

[11] Simultaneously, this circumstance entails new possibilities of differentiation [Matys 2007, p. 10].

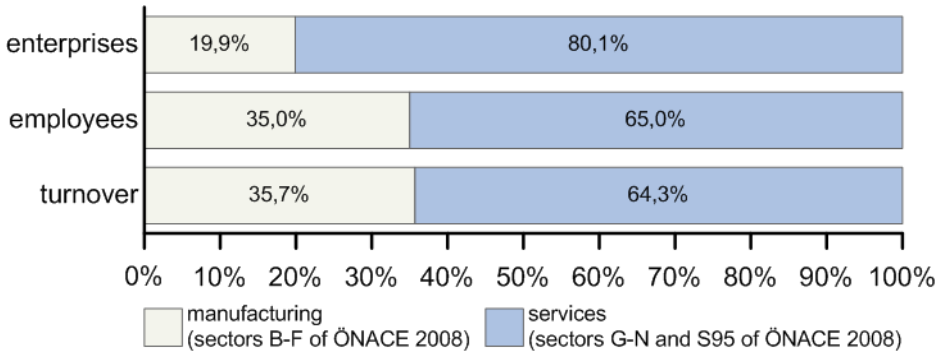

Fig. 4-2: Comparison between manufacturing and services (including trade) taken over modified from Statistik Austria [2011b]

A separate consideration of both industries shows other interesting facts for the year 2009. Manufacture of goods accounted for 42.9% of all enterprises, 65.0% of all employees and 66.1% of total turnover in the production area. The second-strongest activity area was construction with 50.6% of all enterprises and about 19.0% of turnover. A production company employed 16 people a year on average. The majority of enterprises was located within the four most populous federal states (Lower Austria, Styria, Upper Austria and Vienna). Additionally, these federal states employed the bulk of workforce in this sector and created the production values for the most part. [Statistik Austria 2011c]

Within the service sector 'retail trade and repair of motor vehicles' was the leading division and accounted for 30.6% of all enterprises, 35.4% of all employees and 51.5% of total turnover in this area. Professional, scientific and technical activities constituted 23.5% of all service enterprises, but employed only 11.7% of service workers. Financial and insurance activities obtained 16.8% of turnover, although this division involves only 2.9% of all companies and 7.3% of employees within the service sector. [Statistik Austria 2011d]

4.1.2 Definition

The definition of the population was a two-step approach. First, general properties of the population were determined. Austrian corporations or partnerships, where a corporation is the general partner, (including 'AGs', 'GmbHs' or 'GmbH & Co KGs') were defined as objects of examination. This is based on the consideration of having the possibility of using not only subjective, but also objective performance measures (reduction of single source bias, see sub-section 4.2.2). As argued by Kohlbacher [2009, p. 33], those organizations provide annual financial statements, acting as secondary source, which supports gaining concrete financial data. Furthermore, a minimum size of 50 employees was determined. This threshold was adopted from Kohlbacher's work and the gained knowledge from the study of Gustafsson, Nilsson and Johnson [2003, p. 241] who came to the conclusion that applying BPM becomes relevant not until a company reached a certain firm size.

In the next step participating ÖNACE 2008 sections were defined. This decision was made on the basis of two sources. On the one hand, the studies which were compiled within the author's Magister-Praktikum [Weitlaner 2010] were analyzed. Based on the information about the investigated industry sectors, if such detailed information was available, a rough overview of the served sections was prepared. On the other hand, a marketing data record of the Austrian company Herold[12] containing organizations, already reduced to the types of business entities defined above, with at least 50 employees out of all ÖNACE 2008 sections was used to count the potential target companies within each sector. This classification was

[12] This list was provided by *CAMPUS* 02 University of Applied Sciences.

done by using the BRANCH1 data[13]. Some slight discrepancies may exist due to the fact that some of the listed corporations exhibit a 50:50 or 25:25:25:25 sectoral distribution. On the basis of these two statistics it was decided to consider the sections C, F, G, H, J, K, M and N in the study (see Appendix A).

4.2 Potential Measurement Errors

According to Bagozzi, Yi and Phillips [1991, p. 421] it can happen that a measure "*reflects not only a theoretical concept of interest but also a measurement error*". As can be seen in Fig. 4-3, the authors differentiate between random and systematic errors on the first level which may weaken the relationships in statistical analysis or cause inference errors.

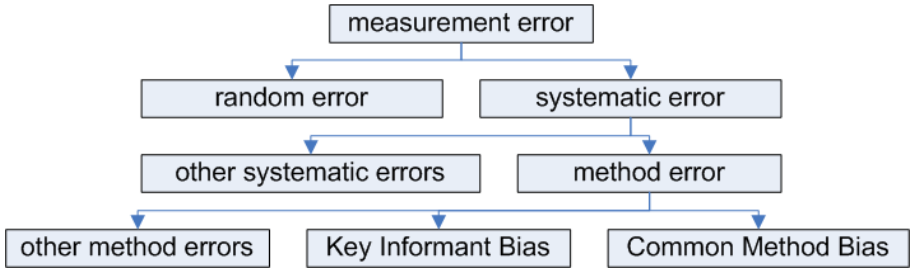

Fig. 4-3: Systematization of possible measurement errors [Söhnchen 2009, p. 138]

The random error influences the reliability of a measurement [Bagozzi, Yi, Phillips 1991, p. 421]. Reliability is defined as the instrument's degree of the measuring accuracy. Generally, it can be said that the reliability of a measured value is higher when it exhibits a smaller fault rate. [Söhnchen 2009, p. 137] However, if a measure is reliable it does not automatically mean that it is valid, too. This implies that reliability is a necessary precondition for validity, but it is not sufficient [Churchill 1979, p. 65]. Validity indicates whether a construct is able to measure a certain fact or not. It is influenced by methodical errors and represents the most important quality factor. Therefore, a high reliability is useless when the wrong facts are measured. [Söhnchen 2009, p. 137f] Occurred measurement errors are typically mentioned within the research limitations of different studies. Due to the fact that the validity of research findings is threatened by such an error, the validity of the measures has to be checked and flawless influences have to be reduced before the theory is tested [Bagozzi, Yi, Phillips 1991, p. 421].

4.2.1 Common Method Bias

The so-called common method bias (CMB) belongs to systematic measurement errors. As the name suggests, it is caused by the survey method and not by the represented measurement constructs [Podsakoff et al. 2003, p. 879]. Fig. 4-4 on the following page provides an overview of potential causes. The illustration clearly shows that the underlying causes of this bias are diverse. They are described in detail by Podsakoff et al. [2003, p. 881]. Nevertheless, these sources can account for a significant part of the total correlation between dependent and independent variables [Söhnchen 2009, p. 139].

[13] The first (primary) served ÖNACE 2008 sub-class by a company according to Herold.

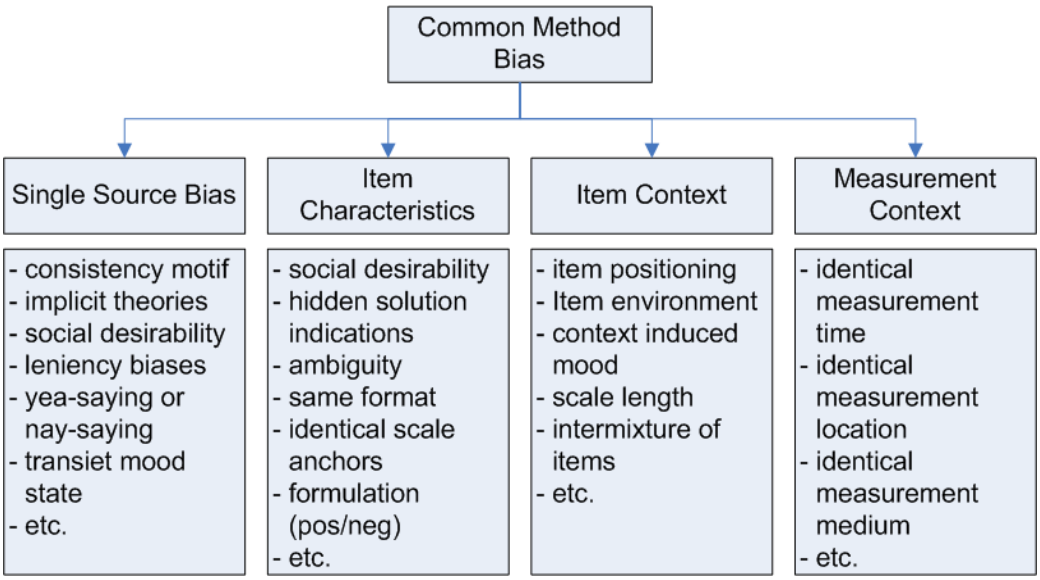

Fig. 4-4: Sources of common method bias [Söhnchen 2009, p. 141]

4.2.2 Single Source Bias

The single source bias (SSB) constitutes a special case of CMB [Avolio, Yammarino, Bass 1991, p. 572]. It originates when independent and dependent variables are evaluated by a single respondent [Podsakoff, Organ 1986, p. 533]. As already depicted in Fig. 4-4, a tendency to consistent reply, personal opinions, image cultivation, an assessment according to social desirableness or the current emotional state of the respondent can induce such a distortion [Schönbucher 2010, p. 101; Söhnchen 2009, p. 140].

However, the SSB should not be confused with the single informant bias (SIB), referred to as key informant bias in Fig. 4-3. According to Schönbucher [2010, p. 100], a discrepancy between the subjective perception of the respondent and the actual objective value is present in this case. Reasons for this phenomenon can be differences in information and perception between diverse functional areas or hierarchical levels within an enterprise because of different points of view [Ernst 2003 quoted in Schönbucher 2010, p. 100].

Söhnchen [2009, p. 140] mentions that studies with a singular measurement design are suspicious, their results must be treated with caution and furthermore they do not merit publication in the reviewer's point of view.

4.2.3 Reversed Item Bias

The Likert item format is one of the most popular response scale formats in marketing research. This format enables the survey participants to rate their agreement with the statements. [Weijters, Geuens, Schillewaert 2009, p. 2] Frequently questionnaires contain so-called reversed items. These items are related to a particular construct in the opposite direction. This means that higher levels of the construct are not indicated by higher figures, but with smaller figures [Baumgartner, Steenkamp 2001, p. 146]. Such items are included in order to (i) enhance the validity of the scale; (ii) increase the attendance of the respondents; and/or (iii) to counter the bias resulting from acquiescent responding [Herche, Engelland 1996, p. 372; Barnette 2000, p. 362; Baumgartner, Steenkamp 2001, p. 144; Weijters, Geuens, Schillewaert 2009, p. 2]. Reversed items, albeit well-intentioned, suffer from methodological problems themselves [Weijters, Geuens, Schillewaert 2009, p. 2]. This concerns internal consistency and factor structures [Barnette 2000, p. 362]. Typically, those items exhibit lower factor loadings and furthermore cause lower internal consistency [Herche, Engelland 1996,

p. 369ff]. This phenomenon is called reversed-item bias [Weijters, Geuens, Schillewaert 2009, p. 2].

4.3 Data Collection

This section summarizes the considerations which have been made in order to select a particular data collection method. Furthermore, the questionnaire design, the used sources for obtaining company details and the final implementation are described.

4.3.1 Method

To make the best possible generalization for the investigated effect, a quantitative approach was selected. A qualitative case study would not make such a generalization possible. Other facts militating against a qualitative research were that on the one hand, dealing with huge samples is a characteristic of quantitative research. On the other hand, the claim for representativeness is often not given in qualitative studies. [Hug, Poscheschnik 2010, p. 112] A look through the broad range of data collection methods suggested performing a survey due to the fact that the investigated effect cannot be observed or tested.

Each concrete method has its strengths and weaknesses which have been particularized in literature [Hug, Poscheschnik 2010, p. 86; Silverman 2010, p. 124]. Choosing a written online survey with questionnaire, more specifically a web survey, as research method was done due to various reasons [Hug, Poscheschnik 2010, p. 123; Raithel 2006, p. 66; Fricker, Schonlau 2002, p. 362ff; Raab, Unger, Unger 2009, p. 121]: (i) rather low effort regarding time and costs (such as delivery time or data entry costs); (ii) well suited for gathering a huge amount of data within a short time period; and (iii) the survey process can be governed by the system. Furthermore, web surveys are the most frequent used forms of online surveys [Welker, Wünsch 2010, p. 492]. Nevertheless, this method is, of course, accompanied by several drawbacks. Arising uncertainties and misunderstandings cannot be handled and the answering process cannot be controlled. [Hug, Poscheschnik 2010, p. 123f] Enterprises receive many enquiries of that kind. The chances that an email containing the link to the survey system falls under the restrictions of a spam filter or will be deleted as spam immediately are naturally not insignificant. [Hug, Poscheschnik 2010, p. 127] Therefore, the response rate might not be that high. Raab, Unger and Unger [2009, p. 121] assume that, in this case, the response problem is more serious compared to traditional written surveys. This fact can be rather problematic in a small country such as Austria additionally having a small-business structure. To overcome this problem, it was envisaged to make telephone calls in order to motivate companies to participate in the case of a low completion rate. As incentive, but also as little thank you, the survey participants were given the opportunity to indicate whether they wanted to receive an exclusive report of results or not.

4.3.2 Structure of the Main Questionnaire

In this context, the proposal of Bortz and Döring [2006, p. 253] to consult developed questionnaires from other authors concerning the respective questioning was adopted. As described in section 4.4, a questionnaire was designed by using mainly existing and statistically validated multi-item measures. All available statements which were formulated in English had to be translated into German. The additionally required items were directly developed in German. These two tasks were performed with care, since the choice of words has an influence on the interviewees' response behavior and therefore on the dispersion of the data [Backhaus et al. 2011, p. 336]. It was tried to keep the questions simple and comprehensible. Based on the experience made by the co-supervisor of this Master's Thesis,

conjunctions and disjunctions of multiple facts were avoided[14]. With reference to the order of the questions, those statements were put at the beginning, which were classed as being rather uncritical for a company representative to answer. Accordingly, questions regarding organizational performance built the rear part of the questionnaire. The questionnaire was refined in multiple iterations.

Considering the topics under review, all items had to be rated on a seven-point response scale. Except for the items regarding financial performance and customer satisfaction, the Likert response format anchored at both ends and center (‘absolutely no agreement’, ‘partial agreement’ and ‘full agreement’) was used. This implies that the scale is unipolar phrased [Scholl 2003, p. 165]. The financial performance’s scale anchors ranged from ‘much lower than the industry average’, over ‘industry average’, to ‘much higher than industry average’ whereas for customer satisfaction ‘much worse than competition’, ‘average’ and ‘much better than competition’ were used as anchors. All items and response scale anchors are contained in Appendix B.

Due to their quick and easy construction and administration, Likert scales are very popular in research [McDaniel, Gates 1998, p. 249] as already noted in section 4.2.3. Furthermore, respondents are typically more willing to answer subjective than objective questions. While the former perceptual measures rely on the respondents’ judgments, the latter query concrete numerical data. [Ahire, Golhar 1996, p. 5] Subjective measures are frequently used in organizational research, especially when samples are rather heterogeneous. It is preferred using respondents’ perceptions in order to gain financial data, since there might be significant differences in capital structures or accounting conventions. [Powell 1995, p. 25] Furthermore, studies have shown that subjective and objective measures are highly correlated [Powell 1992, p. 126]. Using such ratings for obtaining financial data makes sense when considering the time discrepancy which might occur when using secondary sources such as annual financial reports [Kohlbacher 2009, p. 183]. Furthermore, depending on the respondents’ position within the company, they might not have enough knowledge for providing concrete figures.

In further consequence, an online version of the questionnaire was created using a survey software called EFS Survey[15]. A personalized survey was set up in order to give only those companies and employees access via personalized web links which were included in the sample. Besides it was hereby avoided that a company takes part multiple times which would bias the results. Furthermore, the participant administration supported the storage of company basic information such as company name, contact person details, served ÖNACE sections or industry affiliation in advance. Owing to the available disposition codes it was easily possible to see which companies already participated or interrupted the answering process. This fact furthermore provided the possibility to keep an eye on the distribution between participating manufacturing and service organizations during the data collection phase, since a balanced ratio between the two groups was preferred for carrying out the subsequent analyses.

To make data provision as simple and intuitive as possible, either single response radio button lists (in the majority of cases) or text fields were put to use. Via the available routing functionality of the software, non-applicable sections or single statements were skipped

[14] Ratings cannot be made separately for each of the facts included in the question. As a consequence, respondents frequently do not know what they should select when they totally agree with the first circumstance on the one hand, but not with the second one on the other hand.

[15] The software is a product of the German company Globalpark. For further details see http://www.globalpark.de/efs-uebersicht/efs-survey.html. This software is used by the author’s employer.

according to the respondents' answers. This decision was made due to two reasons. First, it was likely that a company not using key performance indicators would always choose the option 'fully disagree' when answering a related statement. Secondly, based on this assumption, answer time for such company respondents could be saved by hiding such questions. As a consequence, two additional filter questions had to be introduced at the beginning of the questionnaire. To ensure completely filled out, questionnaires answers were marked as mandatory. Correctness of routing and usability in general were tested by the author, supervisors and friends of the author. Slight adaptations were made based on the received feedback.

The final online questionnaire consisted out of 17 pages as well as one opening and ending page each. On each page, an interrelated set of questions was displayed. Since personalized links were used, respondents had the possibility to interrupt the answering process and continue at any later stage. Fig. 4-5 shows an exemplary page of the questionnaire.

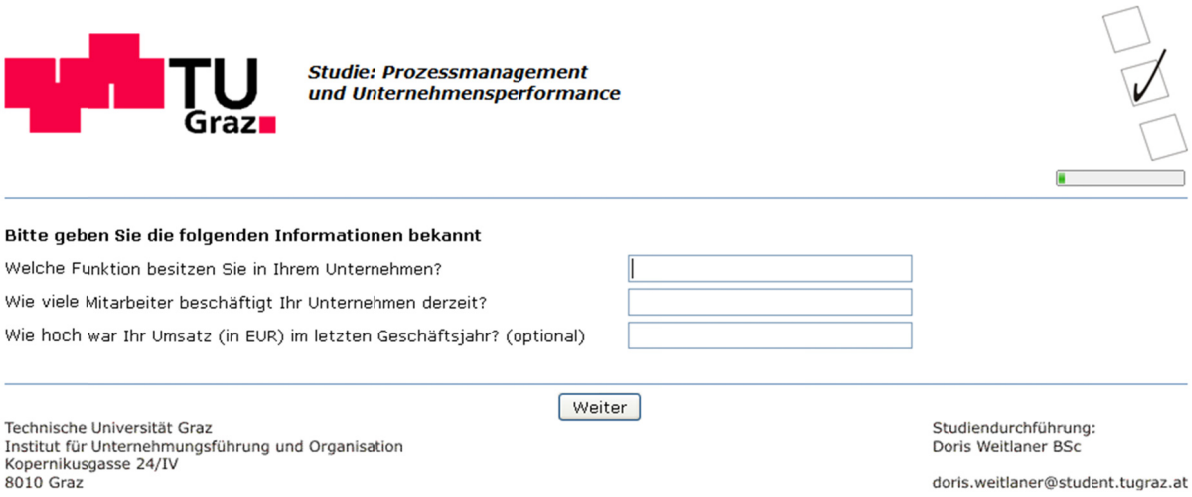

Fig. 4-5: Providing basic information online

4.3.3 Identification of Companies within the Defined Population

A list of organizations fulfilling the stated requirements of the population was constructed based on two sources: (i) the Graz University of Technology external organization record set reachable via the online system TUGonline; and (ii) marketing data of the company Herold. The focus was set on the marketing data from Herold due to the following reasons: (i) the data within the university's database seemed to be a little outdated; (ii) at that point in time no possibility was offered by the online interface to see the companies' year of foundation or the percentage distribution of served sectors per organization[16]; and (iii) the university's company classification was done according to ÖNACE 2003 instead of ÖNACE 2008.

A comparison between the already used Herold record from section 4.1.2 and a slightly sector-reduced version of the TUGonline record set with the same employee conditions showed minor and major differences. The number of employees differed in most cases because of age disparities. Basically, it was possible to merge almost four fifths, that are approximately 4800 companies, of the university data with the one of Herold. The remaining fifth was, again, merged with another available Herold list containing enterprises with a number of employees between 20 and 49. Through this step the university's record could be reduced by half once more. Especially companies accounted as having between 50 and 70

[16] It could only be assumed that the first mentioned sector represents a company's core business.

employees often fell beyond the defined threshold within the more current Herold data. Due to the fact that the available marketing data are surely not perfect, the Herold list was supplemented by those remaining companies which still existed and whose number of employees could be verified by additional sources (including company websites or databases such as FirmenABC[17] or KSV1870[18]).

After restricting the list to the defined ÖNACE sections, the company listing contained about 5000 entries in total. A look into the Austrian Structural Business Statistics of 2009 provided concrete numbers of enterprises operating within the selected sections. In this year under review, 5475 enterprises were counted. Furthermore, email addresses and websites were not available for every company contained in the listing. These observations led to the first research limitations.

4.3.4 Implementation of the Main Survey

A pilot test was conducted at the beginning of May 2011. For this purpose 500 enterprises were randomly drawn from the total sample. It has become apparent that some email addresses were invalid. This attempt resulted in 31 URL calls (response rate) and eleven completed questionnaires (completion rate) after one week. A negative aspect of both data sources was that mainly office email addresses, which are typically used and read by secretaries, were contained. The problem, thereby, is that an email request might not pass this gate within the enterprise, especially when the request is anonymously formulated and not addressed, for instance, to an executive.

Owing to these rather low rates resulting from the above mentioned problems, it was decided to send out a second wave of personalized emails which should facilitate entering the company entrance gate. Via company websites, the small-world network for professionals XING, 'whois' domain search, FirmenABC and Google, it was tried to gather concrete email addresses and/or names of people who might have a good overview of the company's processes (managing directors, head of quality management, head of IT or logistics department, etc.). 300 rehashed emails to potential contacts were sent for testing purposes, resulting in clearly better response and completion rates. Therefore, this time-consuming manual optimization was maintained. Each week 300 to 700 invitations, in addition with reminder emails in intervals of three weeks[19], were sent. Reminders were only sent to those company representatives who either interrupted the answer session or had not followed the link without giving feedback that they will not participate. Office addresses in combination with the salutation 'Dear Sir or Madam' were only used on rare occasions.

In consequence of the feedback provided by respondents in the second week, it was decided to define the item asking for the last year's revenue as optional, instead of mandatory. It seemed that although companies have to provide annual statements containing such information, they are sometimes not willing to enter it. At this point in time this fact appeared to be a proper reason why most people who started with the questionnaire already stopped at the page. However, this page collecting company and respondent basic information still had the highest drop-out rate at the end of the data collection phase. Nevertheless, given the fact that the combination of invitation and reminder emails worked well, it was possible to relinquish motivational telephone calls.

[17] http://www.firmenabc.at/
[18] http://www.ksv.at/
[19] This is in line with other studies' research designs, for instance, the one of Koberg, Detienne and Heppard [2003, p. 31].

After a three month period, data collection finished in the first week of August 2011. As can be seen in Fig. 4-6, a total of 4780 invitations were sent. 175 or 3.66% of these companies gave feedback that they were not interested, had no resources available or were not able to respond, since their company policy forbids it. Those companies were explicitly marked in order not to send them any further email requests, as already mentioned. The response rate was 27.87% and with 898 completed questionnaires a completion rate of 18.79% could be achieved. Compared to other scientific researches, the reached completion rate is slightly lower. This might result from the fact that many top managers were contacted. According to Koberg, Detienne and Heppard [2003, p. 31], the disposable time of top managers is rather limited wherefore many academic questionnaires remain uncompleted and the response rate for mail surveys addressed to top managers is, consequently, lower than for others.

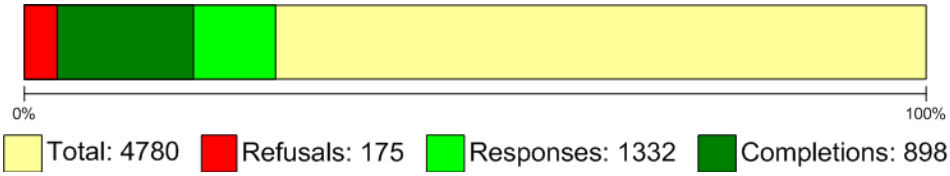

Fig. 4-6: EFS Survey field report of the main survey

4.3.5 Follow-up Survey

As dependent and independent variables were measured simultaneously and additionally by a single respondent in most cases, the study might suffer from CMB. Literature suggests separating the measurement temporally, proximally or methodologically through the usage of different response formats, media types or locations [Podsakoff et al. 2003, p. 887f]. Collecting data at two different points in time, as performed or suggested by authors such as Luria [2008, p. 50], Tekleab and Chiaburu [2011, p. 465] or Markham et al. [2010, p. 478], seemed to be the most realistic option for this Master's Thesis. Therefore, it was decided to perform a short follow-up survey in order to gain dependent data once more, but also additional descriptive information. Furthermore, this decision provided the opportunity to reformulate ambiguous statements.

Making face-to-face or telephone interviews would have been too time- and cost-consuming. It is recommended using different response scales (anchors and formats) for dependent and independent variables in order to prevent familiar check behavior [Podsakoff et al. 2003, p. 887f]. This approach was followed only to a small extent in the main survey. The follow-up survey's questionnaire was designed in such a way that each performance dimension used different response formats. The usage of secondary sources was not considered due to the reason that balance sheets and income statements typically only capture financial performance data and do not correspond with the period of data collection [Kohlbacher 2009, p. 69], as already noted. Burney, Henle and Widener [2009, p. 312], Fugate, Stank and Mentzer [2009, p. 256], Lynn and Akgün [2001, p. 383] and Keskin [2009, p. 391] consulted (at least) two different respondents with high knowledge levels to reduce SSB [Söhnchen 2009, p. 143]. However, it may be difficult to obtain company information twice. It seems reasonable to suppose that those companies will respond once more which were generally interested in the topic. Nevertheless, first descriptive statistics showed that approximately 40% of the main survey respondents were general managers. This high percentage is not surprising as it is believed that CEOs are best suited to answer surveys covering quality practices, including process orientation, and business results simultaneously when company size is not too large [Nilsson, Johnson, Gustafsson 2001, p. 23f]. Since the follow-up questionnaire mainly addressed performance issues, it was likely that these people would respond again, because the main survey's contact details were reused.

For the follow-up survey a further questionnaire was developed. A new online survey project with eleven questions on a single page, having the same look and feel as in the main survey, was created and, of course, tested. After having imported the suitable main survey contact data (see section 4.5.1 for exclusion criterions), the follow-up survey took place during the first three weeks of October 2011. The same personalized strategy was followed and reminder emails were sent after two weeks. Fig. 4-7 summarizes the success of the follow-up survey. In total 840 invitations were sent. Eleven people gave feedback that they were not willing to answer some of the questions, had no time or insufficient knowledge for answering. 71.90% of all invited companies at least looked at the questionnaire whereas finally 490 or 58.33% completed it.

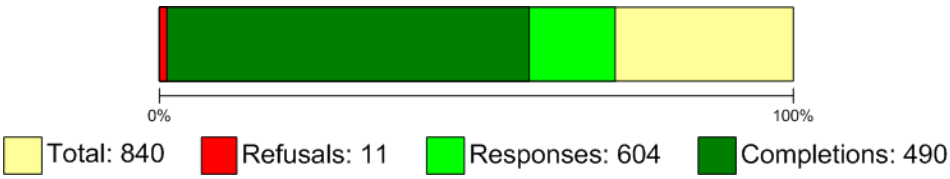

Fig. 4-7: EFS Survey field report of the follow-up survey

During this second survey phase, similar feedback was received regarding the provision of numerical data. More precisely, innovation performance was measured through the shares of turnover in the year 2010 achieved with either exploited or explored goods and services which have been launched on the market within the last three years. This time the feedback was even more surprising, since percentages are more inexact than concrete sales figures. Thus, the statement of Ahire and Golhar [1996, p. 5] that people are more willing to answer subjective than objective questions, is supported once again. Nevertheless, the approach was retained, since it seemed to be the best way to gain reliable data on innovation performance with the least possible number of items.

4.4 Measurement Model

The construction of such a model is required because it contains assumptions (frequently hypothesized) regarding correlations which should be examined within the evaluation process [Mayer 2008, p. 68]. This means that the present study's research questions, derived from the working hypothesis and the literature review, need to be mapped. Within theories, correlations in the real world are formulated on the basis of theoretical concepts. However, these concepts are typically not directly measurable wherefore they need to be operationalized. [Mayer 2008, p. 72] Operationalizing a theoretical concept signifies instructing how observable facts can be assigned to objects with certain characteristics that the theoretical concept denotes [Schnell, Hill, Esser 2008, p. 129f]. Characteristics of an object with more than one expression are referred to as variables (= characteristic dimensions) and can have different levels of measurement. When it is possible to perceive variables expressions, the variables are termed manifest. Variables, whose expressions can only be observed indirectly, are called latent. Indicators or manifest variables are visible realizations of latent variables. For one and the same latent variable ordinarily many characteristics exist which denote the concept. Especially when indicators can be seen as independent measures of the same object, selecting multiple indicators is useful, since their combination can reduce errors which occur randomly during measurement. Items are understood in different ways. They can be indicators formulated as questions or statements. [Mayer 2008, p. 73ff] In contrast, Diekmann [2005, p. 210] or Scholl [2003, p. 141] regard items together with their response scales as indicators. Scales, finally, can be seen as assignment rules by which observed expressions of a characteristic are assigned to a figure. [Mayer 2008, p. 69f]

The path from the definition towards the measurement instrument is depicted in Fig. 4-8 using customer satisfaction as an independent example. The repatriation was already broached in section 2.3.2 which suggests that there is a circular relationship between theory and empiricism [Scholl 2003, p. 140].

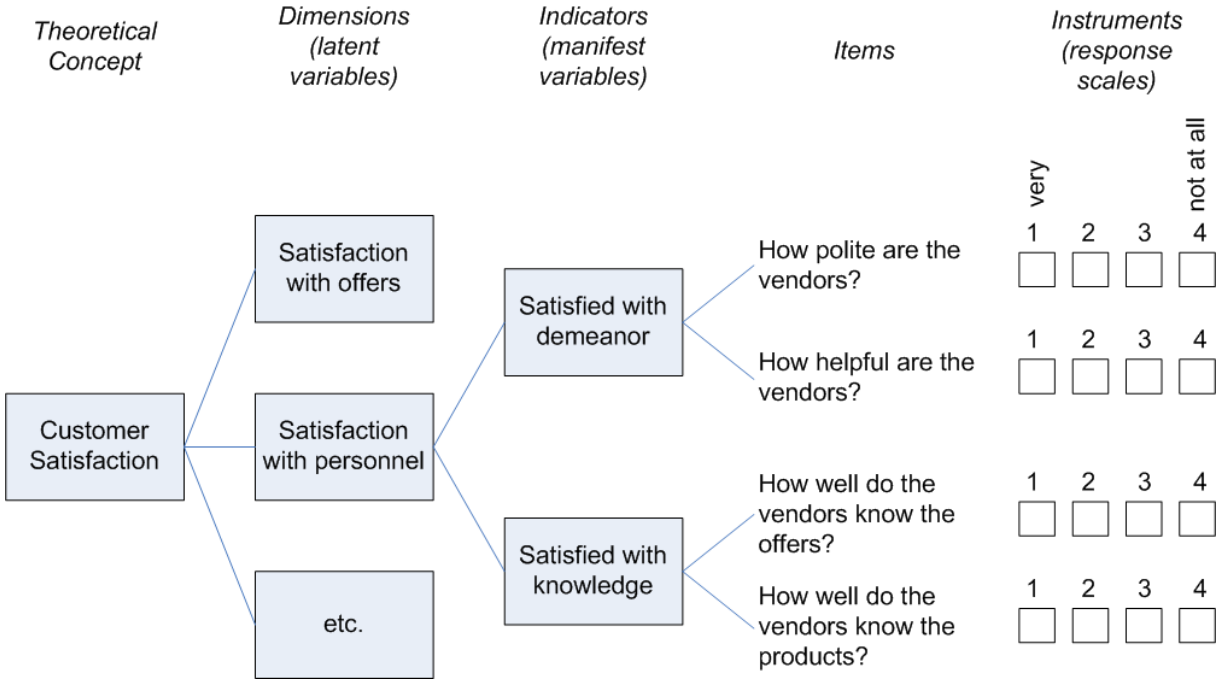

Fig. 4-8: From the theoretical concept to the measurement instrument [Mayer 2008, p. 79]

Fig. 4-9 shows the simplified conceptual model of the present study. The model is detailing Fig. 1-2 (on page 3) and provides an overview of the relationships to be investigated. How the concepts of PO, firm performance and environmental conditions are operationalized is described on the following pages.

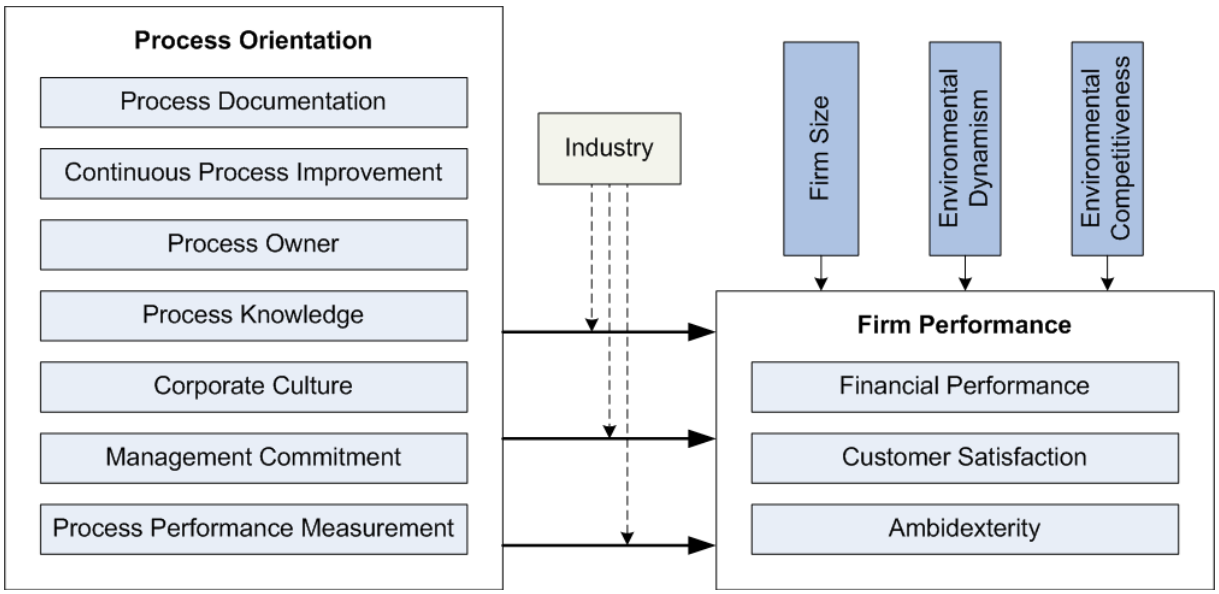

Fig. 4-9: Conceptual model

4.4.1 Process Orientation

As already mentioned in the PO overview (section 2.1.3.3), a company exhibits always a certain degree of PO [Vera, Kuntz 2007, p. 56]. The underlying measurement model, depicted

in Fig. 4-9, of this Master's Thesis encompasses seven dimensions on which a finer point is put on the next pages.

4.4.1.1 Process Documentation

Process documentation means identifying and describing relevant business processes [Gadatsch 2008, p. 5]. However, their identification and analysis constitute a difficult challenge, since processes are frequently unknown quantities and, consequently, unnamed. Furthermore, the processes' representation within organizational charts and the definition of boundaries are often missing. [Nickols 1998, p. 16ff; Kiraka, Manning 2005, p. 289] Process documentation comprises all documents which are created in the framework of process design. Those documents are used for process-internal and external communication, process coordination, analyses, assessments, reviews and improvements, audits and certifications, inducing new employees and training of people involved in the process. [Schmelzer, Sesselmann 2006, p. 125] A well-specified process design or rather well-defined processes are essential because the people who perform the process need to know what and when they have to do what [Hammer 2007b, p. 114]. By adhering to the process design the organization can be kept running smoothly because this ensures consistency in today's world of a constantly changing workforce [Smith 2007, p. 9f]. According to Heberling [2011, p. 71], documenting actions in terms of process description and modeling as well as complying with what has been documented are necessary preconditions for lived process management. However, it is also important to take the recipients into account which should be informed. This implies that a suitable form of representation should be chosen depending on the respective clientele. [Meister, Meister 2010, p. 69]

Process documentation should be appropriate; not everything that is possible, but what is necessary should be described and documented. Each documentation leads to administration, including disclosure and maintenance – in further consequence also to undesired bureaucracy. Too much documentation can hamper searching and finding new and creative solutions. [Garscha 2002, p. 148] However, it is crucial to keep in mind that changes of existing documents create an effort as well [Schmelzer, Sesselmann 2006, p. 126]. Without documentation, however, redundancies become more prominent within a system and the wheel is often reinvented because nobody knows that appropriate and proved courses of the procedure exist. The challenge is to find the right balance. [Garscha 2002, p. 148f] The used media for process documentations depend on various circumstances, such as the business unit's size, business process complexity, legal requirements, the process employees' experience or the degree of automation. [Schmelzer, Sesselmann 2006, p. 126] In this context, it is worth noting that looking at process management only from the IT perspective can be counterproductive. The determination of the design of processes by software is associated with considerable risks. Frequently, the affected persons' rate of acceptance regarding IT-driven processes is rather low and IT standards do not match with concrete business demands. [Hiller, Minar-Hödel, Zahradnik 2010, p. 19]

The topmost documentation level is built by the process map – also known as enterprise process model [Hammer 2007b, p. 120], enterprise process map [Gardner 2004, p. 78] or macro design [Suter 2004, p. 26] – providing a high-level systems view [Gardner 2004, p. 78]. It gives an overview of the business processes evident within an organization and shows information, goods and services as well as interfaces between business processes, sub-processes and customers. [Suter 2004, p. 26; Schmelzer, Sesselmann 2006, p. 125] Therefore, it can be said that process models try to provide a basic understanding of the essential business processes, their relations and importance within the company [Bergsmann, Grabek,

Brenner 2005, p. 50]. However, having the best process model alone is no use; it must also be utilized. One of the triggers for the further development of processes is a discovered deviation from the model. This initiates continuous process improvement (see the subsequent section 4.4.1.2) and redesign. [Hiller, Minar-Hödel, Zahradnik 2010, p. 19] People will stop using the documentation when changes in the process design do not result in an update of the associated documentation. Therefore, documentation of business processes is seen as useless to a great extent when updates are missing. [Kohlbacher 2009, p. 38] The indicators to measure the degree of a firm's process documentation were selected from Kohlbacher's process design and documentation construct [Kohlbacher 2009, p. 38ff].

4.4.1.2 Continuous Process Improvement

Ahmed, Zairi and Loh [1999, p. 426] state that companies are aware of the importance of continuous improvement. However, only few of those enterprises who try to do it actually succeed. Continuous improvement is defined as "*a systematic effort to seek out and apply new ways of doing work i.e. actively and repeatedly making process improvements*" [Anand et al. 2009, p. 444]. With the help of continuous improvement, small wins can be achieved whose accumulation leads to increased performance [Cole 2001, p. 8; Bessant, Francis 1999, p. 1116]. Consequently, continuous process improvement refers to the processes' sustained incremental improvements [Bessant, Francis 1999, p. 1106]. The continuous improvement of a process is viewed as characteristic of lived process management [Heberling 2011, p. 71].

Within firms which emphasize continuous improvement, existing processes' performance is regarded as moving target and is being tested constantly for improvement opportunities [Peng, Schroeder, Shah 2008, p. 736]. This means that the state of self-satisfaction should never be reached. Instead, everything which has been reached should continually be questioned because who stops becoming better stops being good [Wagner, Käfer 2008, p. 239]. Process management or a shift of emphasis towards processes should therefore not be seen as a one-time activity [Hammer 1997, p. 17] which governs business processes within defined parameters [Hinterhuber, Handlbauer, Matzler 1997, p. 160]. In such a situation a company would overlook the changing needs of the business environment [Hammer 1997, p. 17]. For this very reason it is crucial to improve processes continuously with the result that products and services meet the changing customer expectations. In order to be amongst the winners, an enterprise must be quicker and better in learning and innovating than their competitors. It is not only expected from the employees that they handle their tasks efficiently; they also need to be process improvers. [Hinterhuber, Handlbauer, Matzler 1997, p. 160] However, this requires the establishment of "*an operating culture that views continuous improvement as a natural and necessary component of organizational life and recognizes process as a key lever for sustaining and improving performance*". Within such a culture, improvement responsibility is shared and the activity itself is seen as a natural and permanent event. [Gardner 2004, p. 161]

Performance leaps resulting from process renewal should be consolidated, stabilized and expanded through continuous improvements. Achieving stability is not enough because it can be seen as regression when obtained results are not improved continuously. [Schmelzer, Sesselmann 2006, p. 339] Nevertheless, this activity requires the employee's innovation capability [Meister, Meister 2010, p. 86] and skills regarding change management and change implementation [Hammer 2007b, p. 117]. In general, business process improvement initiatives aim at increasing business processes' efficiency, effectiveness and flexibility. This is done via (i) the minimization of waste[20]; (ii) variance reduction among interdependent

[20] Including scrap, reworking or returned goods.

activities; and (iii) the elimination of redundancy. [Bhatt, Troutt 2005, p. 535] Simultaneously, such initiatives help enhancing the organization's ability to make cohesive and quick process changes in order to improve performance, mostly unobservable from outside the company [Morita 2005, p. 70]. Hence, such initiatives can serve as a dynamic capability for the organization [Anand et al. 2009, p. 445].

The knowledge about and the usage of process improvement methodologies – including KAIZEN, Six Sigma, Lean Sigma, etc. – are required in order to improve business process performance [Kohlbacher 2009, p. 52]. The improvement methodology of those methods forces organizational learning and the expansion of the knowledgebase. Employees are able to discover and eliminate weak points on their own. Quick and flexible action is given a high status because a fast disposal of weak points results in quickly available experiences about the success of implemented measures. A learning effect is caused by each of such back couplings. [Schmelzer, Sesselmann 2006, p. 348] The measurement construct is composed of two items from Kohlbacher [2009, p. 51f] and Peng, Schroeder and Shah [2008, p. 745] each.

4.4.1.3 Process Owner

Within function-oriented organizational structures process steps are carried out by different specialists in various organizational units. As a consequence, responsibility is fragmented and many interfaces are created which further lead to errors and misunderstandings at the point of exchanging partial performance between single areas of responsibility. To avoid these problems it is not only essential to reduce the number of involved locations within the process, but also to introduce a unit of continuous responsibility which guides and monitors the process from the beginning to the end which is called process owner. This guarantees efficient cross-activity coordination. [Schantin 2004, p. 49f] The existence of a process owner (i) is an integral component of BPM [Bach, Biemann 2004, p. 22]; (ii) is the most visible difference between a process enterprise and a traditional organization [Hammer, Stanton 1999, p. 3]; and (iii) also constitutes an early competitive advantage [Merrill 2009, p. 119]. Already at the end of the 1990s it was stated that process ownership was once the most overlooked part of quality [Merrill 1997, p. 26] which was further underlined by the following implication [Merrill 2009, p. 119]: Internal customers and suppliers do not talk to each other when processes are not clearly owned. This results in missing agreements on requirements and further in missing delivery of quality which is in line with the already mentioned problematic.

Especially in the German literature, the term process owner is used in an inconsistent way. This circumstance is mainly caused by different translations. Frequently the German term 'Prozessverantwortlicher' is considered as synonym for a process owner [Fischermanns 2006, p. 339]. This aggravates the definition of the process owner and leads, simultaneously, to confusion because the roles of the process owner and the person in charge of the process actually have different meanings [Neumann, Probst, Wernsmann 2008, p. 311]. However, numerous other synonyms can be found. This work understands the process owner as described below.

A process owner is an "*individual concerned with assuring not the performance of a department's tasks but the successful realization of a complete end-to-end process*" [Hammer 1997, p. 75]. This end-to-end responsibility can be seen as common denominator of the majority of definition attempts (see Osterloh and Frost [2003, p. 116], Hiller, Minar-Hödel and Zahradnik [2010, p. 20], Suter [2004, p. 90] or Komus [2011, p. 35]). The process owner has to create and maintain process design [Hinterhuber, Handlbauer, Matzler 1997, p. 155; Hammer 1997, p. 77; Gardner 2004, p. 55] which also involves documentation [Hammer

1997, p. 77; Heberling 2011, p. 70]. Furthermore, the owner is not only responsible for individual process control, including the usage of resources, cost management and investments, but also for process results [von Eiff 2003, p. 18]. The process owner's tasks include the leadership and training of the employees executing the process [Hammer 1997, p. 77; Wagner, Käfer 2008, p. 21; Schmelzer, Sesselmann 2006, p. 138]. As already noted, process improvement is an essential activity within a process-centered organization [Hammer 1997, p. 80]. Due to the fact that the process owners are responsible for the process goal adherence, the belonging framework of continuous process improvement and optimization should also be a part of their duties [Wagner, Käfer 2008, p. 87; Schmelzer, Sesselmann 2006, p. 138]. However, process owners must have the authority to take all necessary measures accompanied with their tasks [Hinterhuber, Handlbauer, Matzler 1997, p. 155; Schmelzer, Sesselmann 2006, p. 139]. The indicators used to measure this PO dimension were adopted from Kohlbacher [2009, p. 43f].

4.4.1.4 Process Knowledge

PO requires everyone's process awareness and understanding of importance. Regardless of the position, whether executive or simple worker, processes must be recognized and named. Furthermore, their inputs, outputs and relationships have to be known and understood. This shift changes mainly people's way of thinking rather than performed tasks. [Hammer 1997, p. 14] Process knowledge is defined as knowledge about procedures and coherences within an enterprise [Deking 2003, p. 36]. According to Ungan [2006b, p. 136], knowledge about processes is covered by two types of knowledge, namely procedural (know-how) and descriptive knowledge (information). The former implies knowing how to do something, while the latter implies knowing what something means. 'Knowing how' is therefore comparable with a recipe explaining the steps required to produce the desired end – a description of or simply a process. In contrast, the listing of ingredients contains the information. [Kogut, Zander 1992, p. 386f] Taking Wördenweber and Wickord's [2008, p. 32] multi-dimensional view of knowledge into account, it is suggested that process knowledge has a rather explicit character. This property signifies that it can be codified and in further consequence transmitted in formal, systematic language [Nonaka 1994, p. 16].

Typically it is the case that people are unaware of existing processes although they are evident in each company. From a common employee's perspective, the reasons for this circumstance include their limited view on the bottom line of the organization which only involves the task they perform in a specialized way [Hammer 1997, p. 10]. Despite the fact that processes are the "*heart of the entire enterprise*", even managers are frequently unaware of their performance while they know everything about task and department performance [Hammer 1997, p. 11]. Managers do not have to understand each process' complexity. They need to know and understand the company's inner workings in order to allocate resources and make strategic decisions properly. However, executives often lack needed process knowledge due to different reasons, including time or disinterest. Competitive disadvantages – which might be even significant – result from this deficiency. [Smith 2007, p. 10]

Employees or rather the process performers need to have adequate process knowledge in order to implement the design [Hammer 2007b, p. 114]. In this way they can successfully cope with the requirements of process-oriented structures on the one hand, and are able to take over responsibility independently on the other hand [Fahr 2009, p. 306]. Process knowledge enables employees to see their activities in the context of the overall process they work in [Bergmann, Crespo 2009, p. 112]. As process-oriented organizations aim at satisfying both external and internal customers, it is important that process performers know their own

business process' customers, but also suppliers and related expectations [Hammer 2007b, p. 114]. Both the ability of employees to describe the overall process flow and their knowledge of how customers, other employees and the process' performance are affected by their work are generally considered to be crucial [Hammer 2007b, p. 116].

However, parts of the knowledge about procedures and processes within an enterprise are tacit (such as experience [Wördenweber, Wickord 2008, p. 32]). Hence, this knowledge is captured continuously and described clearly as well as traceably in a rare number of cases. As a result, process knowledge is not entirely codified and put into writing meaning that it is also anchored in the heads of the performers. [Schaal 2010, p. 70] Nevertheless, process knowledge has to reach the process performers in some way [Wallmüller 2007, p. 8]. Owing to its partly explicit nature, this knowledge can be transferred with the help of concrete documentation and modeling, for instance, by using enterprise process models providing an overview of corporate processes and their dependencies. However, this mapped knowledge is rather useless if performers are unable to understand it. With exception of one item which was adopted from the work of Kohlbacher [2009, p. 51] the underlying measurement construct of this PO dimension was newly developed.

4.4.1.5 Corporate Culture

The changing business environment influences corporate culture. In a process-centered organization the customers have to be satisfied first and no longer the investors. This fact requires cultural adjustments because customers are interested in results which are produced by processes incorporated in a process-centered organization. [Hammer 1997, p. 156] Consequently, the customer should be in the focus of the employees' fundamental orientation [Becker, Kahn 2008, p. 10]. Generally it can be said that many well-defined strategies fail in practice because they do not coincide with the prevalent corporate culture. Corporate culture is the entirety of all value propositions, traditions, lores, myths, norms and mindsets within a company which conveys employees the meaning and direction for their behavior. [Hinterhuber 1997a, p. 49] Corporate culture is an essential success factor for the survival of a process-oriented organization and for BPM in general [Komus 2011, p. 37]. This results from the fact that people and processes must combine in order to produce output which underlines the importance of cultural fit [Armistead, Machin 1997, p. 891]. Strategies and structures alone are insufficient because the existing norms, traditions, myths and moral concepts affect several organizational activities. Process goals can be reached simpler and better by employees when a well-developed process culture is evident. The establishment of such a positive and supportive culture is a long lasting procedure. Its destruction, however, can happen within a short time. [Hiller, Minar-Hödel, Zahradnik 2010, p. 40] It is characterized by the vision and the role model function of the management [Hinterhuber 1997a, p. 49]. Therefore, it is necessary that visions, strategic guidelines and operative objectives are transferred to all employees via suitable communication and further training (see section 4.4.1.6).

A change towards PO is only possible within an enterprise when its culture emphasizes the valuation of its customers, teamwork, personal accountability and the willingness to change [Hammer 2007b, p. 115]. Komus [2011, p. 38] suggests that a culture of change contributes positively to the implementation of BPM. On account of this, Hammer [2007b, p. 121] states that the highest cultural capability level is achieved when the following aspects are evident within a company: (i) teamwork (also involving customers and suppliers) is taken for granted; (ii) serving customers and achieving good performance is part of the employees' mission; and (iii) employees are aware of the inevitability of change and see it as natural phenomenon.

Teamwork – the horizontal collaboration of all participants [Becker, Kahn 2008, p. 9] – is a fundamental aspect of process organizations. It supports the extension of the employees' radius of operation in terms of planning, controlling and executing. Additionally, employees performing particular activities gain decision-making power, additional responsibilities and greater room for maneuver through job enrichment and enlargement. Altogether, these facts lead to increased senses of achievement and motivation as well as decreasing absence rates. [Meister, Meister 2010, p. 80f; Becker, Kahn 2008, p. 10] Another crucial point is that employees should have a good overview of the connections within the whole process which can also be achieved by teamwork. In this way, employees are capable of realizing the importance of single activities and of providing suggestions for optimizations in the whole process context. The participation of process teams in decision-making and target-setting increases employees' engagement to reach the defined process goals and consider them as their own in order to enhance the organization's performance [Meister, Meister 2010, p. 82].

A company's deliberately living of the process-oriented organizational design helps achieving an essential competitive advantage due to its consistent and consequent assembly. [Schrammel 2005, p. 1] Living the process approach is one of the key factors for obtaining high firm performance [Kohlbacher 2009, p. 181]. The items to operationalize corporate culture were mainly adopted from Kohlbacher [2009, p. 47ff] and extended by three self-developed ones.

4.4.1.6 Management Commitment

The construction and maintenance of a process-oriented organization requires the interaction of strategy, structure and culture. PO starts at the top-management level. It must be anchored in the mission statement or strategic principles in order to build the starting basis for structural and cultural measures. [Hiller, Minar-Hödel, Zahradnik 2010, p. 37] Senior executive support rates among enterprise-wide capabilities [Hammer 2007b, p. 112]. Management commitment means motivating, inspiring and supporting subordinates and therefore acting as a kind of role model [Lok et al. 2005, p. 1362]. In the context of process management this implies that those executives should support the focus on processes [Hammer 2007b, p. 112]. According to Hinterhuber, Handlbauer and Matzler [1997, p. 148], full support for process management from the management is one of the success factors for managing core processes. Management commitment is also seen as an essential driver of the creation of values, goals and customer satisfying systems within the framework of quality management [Ahire, Golhar, Waller 1996, p. 27].

High-performance processes can only be developed when the company has an adequate supportive environment [Hammer 2007b, p. 115]. As a result, cross-functional and cross-hierarchical thinking of the management and fulfilling a role model function constitute requirements for a successful process management. Changes in the managers' attitudes and mentalities are crucial for the transition from functional orientation to PO. This includes all levels of responsibility, all functional areas and regional units. [Hinterhuber, Handlbauer, Matzler 1997, p. 150] If they do not set their employees an example of holistic cross-departmental thinking and acting towards customer satisfaction, these employees will, figuratively speaking, not jump on the bandwagon. [Hinterhuber, Handlbauer, Matzler 1997, p. 150] Therefore, missing management commitment towards the process program or its insufficient traceability involve the danger that initiated activities are interpreted as pseudo activities which has counter-productive effects on employees' motivation and engagement [Garscha 2002, p. 154]. It was shown in different studies that one of the greatest impediments of implementing BPM is missing support of the top-management [Komus 2011, p. 36;

Neubauer 2009, p. 170]. Bach and Biemann [2004, p. 21] recommend not to introduce BPM when top-management commitment is missing. According to Hammer [2007b, p. 121], a high level of management commitment is characterized through the following facts: (i) senior executives see their work in process terms and perceive BPM as a way of business management rather than as a single project; (ii) there is great enthusiasm for BPM among all people in the enterprise who play leadership roles in process efforts simultaneously; (iii) all senior executives perform their own work, strategic planning and the development of new business opportunities on the basis of processes; and (iv) leadership is done through vision and influence and not by following a command and control principle. Ahire, Golhar and Waller [1996, p. 27] argue that management commitment should not only be demonstrated by prioritization – in this case of processes – but also by the provision of adequate resources (especially human and financial ones) in order to implement efforts.

A company should also have employed a Chief Process Officer (CPO) who has central responsibility for BPM [Hiller, Minar-Hödel, Zahradnik 2010, p. 40]. This role and suitable staffing is seen as key to a functioning process management system [Fischermanns 2006, p. 441]. The CPO's main task is the overall alignment, standardization, optimization and further development of BPM within the whole enterprise. In order to align single business unit's BPM-systems and to further develop them in common as well as to guarantee the integration into an enterprise-wide process and management system, cross-departmental and cross-process coordination is required. [Schmelzer, Sesselmann 2006, p. 133] The items to measure management commitment towards the process program were adopted from Kohlbacher [2009, p. 41f] and extended by one used in the work of Lok et al. [2005, p. 1367].

4.4.1.7 Process Performance Measurement

Traditional accounting methods do not provide information about the costs which emerge within a whole end-to-end business process [Gardner 2004, p. 106] and appropriate results concerning the measurement of actually realized optimization potentials [Becker, Kahn 2008, p. 12]. Putting the focus of measurement on processes rather than on functions supports creating alignment and a common focus across separate organizational units [Hammer 2007a, p. 25]. Through process performance measurement, problems can be recognized. Hence, adequate corrective actions can be taken in order to prevent these problems from escalating. [Kueng 2000, p. 67] For this purpose, process performance indicators need to be developed [Hammer 1997, p. 16].

This requires meaningful determined measurands for each business process [Wagner, Käfer 2008, p. 88] which can be a challenge [Fischermanns 2006, p. 25]. Quantifiability of a characteristic is the basic prerequisite for its measurement [Wagner, Käfer 2008, p. 86]. These measures are typically derived from customer expectations and requirements, but also take the needs of the company into account [Hammer 1997, p. 16]. In any case, those measurands should be chosen carefully [Hammer 2007a, p. 25]. This is part of the process owners' area of responsibility [Hinterhuber, Handlbauer, Matzler 1997, p. 155], since they are the process performance measurement's 'customers' [Nenadál 2008, p. 463]. Their practical application to the business process results in process performance indicators [Wagner, Käfer 2008, p. 88]. In this context, it is suggested following the motto 'plan only what you can also check' [Fischermanns 2006, p. 25]. Typically, a process has five to seven performance indicators. Using or defining too many would lead to dependencies due to redundancy; with a too small number some design, control or influential factors might be overlooked. [Hiller, Minar-Hödel, Zahradnik 2010, p. 113] However, process performance measurement alone is not enough; an organizational culture in which the metrics are used for continuous performance improvement

must be evident as well [Hammer 2007a, p. 25]. Process performance indicators act as measure for improvement, but can also be used for determining whether measures have been implemented effectively and goals have been reached [Wagner, Käfer 2008, p. 88]. Measures are useless when they are not communicated and not used by everyone involved in the process. [Hammer 1997, p. 16] This simultaneously implies that performance indicators' underlying measurands must be directly influenceable by these people [Wagner, Käfer 2008, p. 86].

Beside process performance indicators, ABC also supports the control of performance processes [Osterloh, Frost 2003, p. 226f]. ABC is a consequent continuation of the PO principle within accounting. In contrast to the traditional vertical cost center accounting, process costs are gathered along the business processes horizontally. In this context, costs are assigned source-specifically [Meister, Meister 2010, p. 74] according to their contribution to the business process. [Hinterhuber 1997b, p. 118] Nevertheless, it is important to measure the right things in the right way [Hammer 2007, p. 25]. On this account, measuring a process just for measurement's sake is a motto which should not be followed [Davenport, Short 1990, p. 16]. Operationalization is done on the basis of five indicators determined by Kohlbacher [2009, p. 44ff].

4.4.2 Firm Performance

Performance measurement can be done in multiple ways. Fig. 4-10 shows a classification scheme originally developed for the measurement of business economic performance. However, this scheme can be adopted as it stands for the performance dimensions in general. The two underlying issues are the data source on the one hand, and the mode of performance assessment on the other hand, resulting in four different measurement approaches. Nevertheless, none of the cells are "*intrinsically superior to the others in terms of consistently providing valid and reliable performance measures*" [Venkatraman, Ramanujam 1987, p. 110].

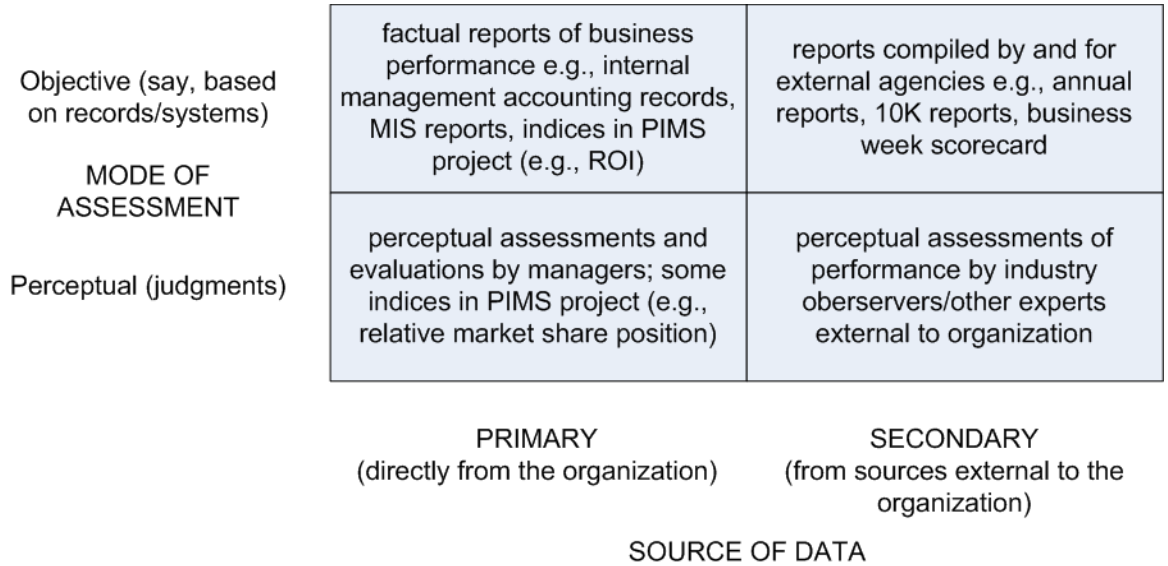

Fig. 4-10: Measurement of business economic performance: a classification scheme [Venkatraman, Ramanujam 1987, p. 110]

Due to the fact that the empirical study of Kohlbacher [2009, p. 33] focused on the metal and machinery industry, the used constructs to operationalize firm performance might not be suitable for the service sector. As already mentioned, different studies involving the measurement of firm performance as dependent variable with focused attention on service

providers were collected for this purpose in an earlier work of the author [Weitlaner 2010]. Care was taken in the selection of firm performance items to ensure that primarily such items were chosen which were already applied in both industries.

There is still a debate regarding the best and/or sufficient measures of organizational performance [Carton, Hofer 2006, p. 1]. Firm performance also exhibits a multi-dimensional nature [Carton, Hofer 2006, p. 7; Kueng 2000, p. 72]. Andrews, Boyne and Walker [2006, p. 14] state that organizational performance is multifaceted because an organization has to address a broad range of sometimes conflicting goals. On this account, Kueng [2000, p. 72] states that gathering and assessing performance via a single indicator is impossible, since there are too many contributing factors. The complexity of this phenomenon was underlined, on the one hand, in a study mentioned by Carton and Hofer [2006, p. viii] which identified 133 different measures of overall organizational performance within five different journals between July 1996 and June 2001 and on the other hand, in the author's preparatory work. About twelve different performance dimensions were identified in the latter case [Weitlaner 2010, p. 54]. The consideration of all these dimensions would go beyond the scope of this work. However, it would also scare the respondents off because even when measuring each dimension with a single item only, the resulting questionnaire would be too long. This suggests the limitation of investigated dimensions. Based on the performed literature reviews, dimensions of interest were identified. Therefore, firm performance is reflected by three dimensions: (i) financial performance; (ii) customer satisfaction; and (iii) ambidexterity.

4.4.2.1 Financial Performance

In contrast to public organizations, financial results play a crucial role for private ones [Andrews, Boyne, Walker 2006, p. 18]. This statement finds support in literature. A research showed that, in general, the majority of all conducted studies concerning performance influences deal with relationships between certain factors and the company's financial outcomes [Weitlaner 2010, p. 54]. Owing to the meaningfulness of this performance dimension a huge amount of different constructs with various degrees of detail exist. The items to operationalize financial performance in the main survey were adopted from Das and Joshi [2007, p. 658] while the follow-up survey applied the ones of Kaynak [2003, p. 431f].

4.4.2.2 Customer Satisfaction

"*Trying to keep my customers satisfied*" was a central message of one of Simon and Garfunkel's songs recorded in November 1969 [Sony Music Entertainment 2001, p. 63ff]. Customer satisfaction is basically an operational measure [Carton, Hofer 2006, p. 75] of firm performance and one of the most difficult factors to ascertain [Gladen 2005, p. 326]. This concept provides information on the extent to which an organization is able to meet its customer's requirements [Hill, Roche, Allen 2007, p. 39]. Customer Satisfaction is seen as one of the starting points in order to differentiate a company from others [Gillespie et al. 2008, p. 118]. While products were in the focus of this indicator in the past, a change of emphasis towards services and elements of product or service experiences has happened. The measurement of customer satisfaction is necessary because customer's behavior is driven by their attitudes. Hence, it can be seen as a key lead indicator for customer's prospective behavior and a company's future performance. [Hill, Roche, Allen 2007, p. 31f] A direct measurement of customer satisfaction would be preferable. However, this approach is impractical in this particular context. Studies conducted within service industry have shown a high correlation between internal and external measures of customer data [Soteriou, Zenios 1999; Schneider, Bowen 1985]. Soteriou and Zenios [1999, p. 1232f] discovered that internal and external customer measures are only slightly different. As a consequence, these

distinctions have not caused any significant changes in their tested model. According to the authors, external measures enable fine-tuning. The customer satisfaction construct used in the main survey was adopted from the work of Schilke, Reimann and Thomas [2009, p. 40], as customers is assigned a central role in PO. The follow-up survey adopted the two items used by Nilsson, Johnson and Gustafsson [2001, p. 15].

4.4.2.3 Ambidexterity

Innovation is an essential competitive factor in both the manufacturing and the service industry [Leskiewicz Sandvik, Sandvik 2003, p. 355]. Especially when these companies operate in a fast changing market with additionally fast changing technology it is important for them to make things happen – they have to innovate [Johne 1999, p. 203] because the competition will be won rather by smoking heads than by smoking chimneys [Eberl, Puma 2007, p. 12]. The notion of ambidexterity is getting increasingly popular [Raisch, Birkinshaw 2008, p. 375] in this context. As the name suggests, it refers to the ability of doing two dissimilar things [Gibson, Birkinshaw 2004, p. 210]. Within this work ambidexterity is understood as a company's ability to simultaneously pursue exploitative and explorative innovation. Exploitative innovations refer to relatively small adjustments of already existing products [Raisch, Birkinshaw 2008, p. 379], including improved or less expensive variants and new functions or features [Meyer 2011, p. 10]. They occur frequently and are typically associated with rather less effort. Since products are often changed incrementally, it is also spoken of incremental innovations. Such small changes do not overstrain the market or the company itself wherefore exploitative innovators stay on the safe side. [Wördenweber, Wickord 2008, p. 12]. Explorative innovations represent significant changes resulting in entirely new products [Raisch, Birkinshaw 2008, p. 379]. These innovations are usually associated with higher levels of risk and investments. However, if successful, these innovations can result in clearly higher profits and reform the market. [Wördenweber, Wickord 2008, p. 12] The subdivision into exploitation and exploration originates from the innovation's familiarity with the organization's existing knowledge [Azadegan, Wagner 2011, p. 57]. The idea of balancing the area of tension between exploration and exploitation [Cao, Simsek, Zhang 2010, p. 1272] is crucial due to the fact that neither exploration nor exploitation alone can ensure the firm's ability to compete successfully and in further consequence its survival in the long run [Raisch, Birkinshaw 2008, p. 392]. The items of this construct were adopted from Jansen, Van den Bosch and Volberda [2006, p. 1672], whereby some items were removed and additional ones defined. In this case a two-step approach for developing a measure for organizational ambidexterity, already applied by Jansen, Van den Bosch and Volberda [2005] and Jansen et al. [2008] which involved the majority of the utilized items contained in the main survey, was followed. In contrast, the follow-up survey made use of the turnover's composition [Faems, Van Looy, Debackere 2005, p. 242].

The main survey also contained a measure of process innovation adopted from the work of Das and Joshi [2007, p. 658]. This performance dimension was not considered in the follow-up survey in order to keep the number of items low.

4.4.3 Environmental Conditions

Strategic management puts the emphasis, besides other factors, on the company's competitive environment [Jansen, Van den Bosch, Volberda 2006, p. 1662]. Organizations typically interact with various environments. Gilley, McGee and Rasheed [2004, p. 120] state that in the past five centuries, research dealing with the impact of the organizational environment on organizational strategies, structures, processes and outcomes has been made on a large scale. According to Tosi and Slocum [1984, p. 14f] investigating the relation between environment

and organization is too superficial. Considering environmental and organizational sectors is necessary because the factors interact with each other in various ways. Therefore, the roles of the two aspects environmental dynamism and environmental competitiveness are investigated in this study. Dynamism is defined as the rate of environmental change; although uncertainty plays a role in this context as well [Dess, Beard 1984, p. 56]. Characteristics of such an environment are technological changes, customer preference variations and fluctuating product demands or material supplies [Jansen, Van den Bosch, Volberda 2006, p. 1664]. Usually companies are embedded in an environment which is characterized as being rather dynamic [Wördenweber, Wickord 2008, p. 7]. Hill and Matusik [1998, p. 689] define environmental competitiveness as the "*extent to which the environment is characterized by extreme competition, based on cost pressures and the value of flexibility in responding*". The items used to measure the two constructs were taken in reduced amount from the work of Jansen, Van den Bosch and Volberda [2006, p. 1672].

A list of all referred items is provided in Appendix B.

4.5 Data Pre-Processing

Within this section the data pre-processing procedure is described. The data pre-processing steps described below were partially performed for both, the large record set resulting from the main survey and the smaller set retrieved from the follow-up survey. Since preliminary analyses were conducted with the main survey data, their pre-processing was inevitable. Furthermore, the main data are used for constructing the adjusted measurement model which will be described in detail in the subsequent section 4.6. For these purposes, the data collected were exported as Excel files from EFS Survey. The two files resulting from the main and follow-up survey have been merged on the basis of the commercial register numbers contained in EFS projects' participant data. The statistical analyses were carried out with the help of IBM SPSS Statistics 19.

4.5.1 Removal of Inappropriate Companies

First of all, the consistency with the population's definition was checked after the main survey. Due to the fact that the workforce varies over time, respondents had to provide their current number of employees. As a result, those enterprises were excluded from further analysis which fell below the threshold of 50 employees. This reduced the sample by 42 companies. When data is gathered by researchers in person, they have the possibility to receive a picture of the respondent's ability to answer the questionnaire whereas this possibility does not exist in the case of web surveys. However, the questionnaire contained an item at its end which asked to rate the respondent's knowledge on a five-point scale ranging from insufficient to sufficient. In further consequence, another 16 companies were excluded from further analysis whenever the respondent indicated to have a knowledge level below '3'.

4.5.2 Completion of ÖNACE Codes and Further Classification

This step was necessary because the primary company contact list was expanded by entries from the author's university database and was also performed after the main survey finished. The industry classification within this database was done according to the ÖNACE 2003 standard, as already mentioned. A direct conversion to ÖNACE 2008 was only possible in a rare number of cases. Therefore, the more up-to-date Herold online database MDOnline[21] was consulted in order to identify missing codes and classify the companies according to the indicated sector weighting.

[21] http://marketingdaten.herold.at/mdonline/

The decision how to categorize manufacturing and service organizations was not made frivolously. Even for entrepreneurs it is sometimes hard to define to which extent a delivered product is a good and/or a service. This results from the fact that frequently combinations of goods and services are offered. Fig. 4-11 shows the goods-to-services continuum of Gustafsson and Johnson.

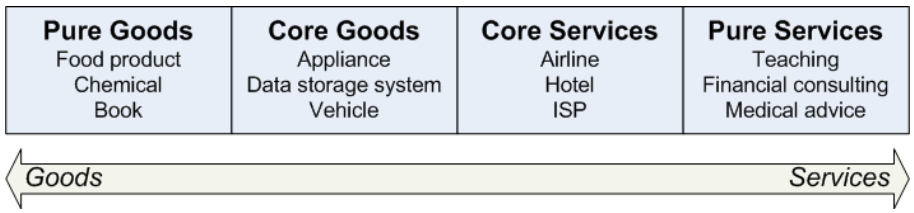

Fig. 4-11: Goods-to-services continuum [Gustafsson, Johnson 2003, p. 7]

Manufacturers of pure goods offer tangible products. Their production (in a factory), packaging or inventory takes place before the customer becomes involved. In contrast, core good providers expand their product offerings by significant service components. For core service providers, the main reason for being is the provided service. However, these services require the integration of some significant tangible elements into the service process. Finally, pure services provide products with the highest degree of intangibility. [Gustafsson, Johnson 2003, p. 7f]

Since the definition of the population was done on the basis of the ÖNACE data, using it for the purpose of classification was a rather logical consequence. Following the idea of Gustafsson and Johnson would have caused too many groups. The Herold data source included a company's served ÖNACE 2008 sub-classes only up to the first three entries. This fact significantly restricted the classification possibilities. For monitoring the distribution during the survey phases, companies were divided into predominantly manufacturers and service providers. The only reasonable alternative would have been to categorize the companies according to their indicated first ÖNACE 2008 branch code leading, however, to the same problems as discussed in section 4.1.2. A comparison between pure manufacturing and service organizations would have resulted in (i) a smaller sample size; and (ii) inaccuracies, since companies serve not uncommonly more than the three indicated ÖNACE 2008 sub-classes (the declared and summed up industry weighting has not reached the full 100%). As a consequence, the original classification was retained.

4.5.3 Corrective Actions Regarding Single Data Sets

Due to received feedback from some respondents, it was required to adjust single data sets. Reasons included wrongly indicated numbers of employees or turnover, but also appeals for excluding a section from the analysis because the respondent selected only a score to continue with the questionnaire. After the follow-up survey even whole data sets had to be removed because respondents told that they filled out the questionnaire entirely fictitious.

4.5.4 Uniform Formatting of Responses

A high effort is required when open-ended questions need to be analyzed [Raithel 2006, p. 67]. In this study comparable problems resulted from the items concerning the workforce, turnover and respondent's function within the enterprise contained in the main survey. The shares of sales, time periods and, again, workforce estimations contained in the follow-up survey were other problem areas. Above all, the respondent's function field contained many typos and abbreviations which needed to be corrected and unified. EFS Survey supports plausibility checks of provided inputs. However, the received feedback (even phone calls) in

the main survey phase has shown that respondents often become annoyed of the notifications (especially regarding input formats) or even confused and frustrated. Hence, the usage of this feature was limited (some simple checks for numerical inputs without length restrictions) as these questions were largely not required for answering the research questions. In general, this called for the transformation of the mentioned inputs.

4.5.5 Additional Plausibility Checks

In contrast to a written online survey, face-to-face interviews offer the advantage of handling spurious or contradictory information immediately. Owing to the problems mentioned above, various plausibility checks which mainly dealt with provided workforce data needed to be performed. These tests included the exposure of discrepancies (i) between the indicated number of employees appointed for process management and the total number of employees; (ii) between the corrected number of process management employees and the former figures; and (iii) regarding the summed shares of turnover. As a consequence, those companies were excluded whose composition of last year's turnover was impossible (exceeded the maximum of 100%). The comparison of the indicated numbers of process management workforce in the first and second survey phase resulted in interesting findings. It turned out that several respondents used this opportunity not only to correct this number of interest, but also the total amount of employees. This was an explanation for some of the huge increases in this context, since it was assumed that the reformulation of the statement would result mainly in equal or lower numbers. Again, the plausibility of the new workforce figures were verified using the sources mentioned in section 4.3.3.

4.5.6 Recoding of Items

Three questionnaire items, namely the employees' attitude towards change (ATT_CHNG), the extent of last year's changes within the industry (ANN_CHAN) and one ambidexterity item, originating from the main survey were negatively formulated. This means that a rate of '7' does not indicate a high degree of the examined construct, but rather a low one. Before performing analyses or when calculating summated scales [Hair et al. 2010, p. 126], such reversed items need to be recoded in order that the construct has a single polarity. For example, performing a factor analysis without recoding such an item could lead to the fact that this item's factor loading has a sign opposite to the one of the other item's loadings contained in the construct [O'Rourke, Hatcher, Stepanski 2005, p. 465].

4.5.7 Analysis of Missing Item Values

After performing the above steps 840 organizations from the main survey and, finally, 483 companies taking part in the follow-up survey remained. Since missing data need to be identified and properly handled, a missing value analysis was performed. Within this sub-section, the results from the analysis performed with the smaller data sample are reported. As can be seen in the column headed 'Follow-Up Survey' in Tab. C-1 in the appendix, 18 items had missing values with an extent ranging from 4.35% to 14.49%. However, this missing data are ignorable, as they are part of the research design [Hair et al. 2010, p. 44] and caused by the skipping functionality described in section 4.3.2. In this case, researchers can accommodate the missing data by their own means into the analysis [Hair et al. 2010, p. 46]. Based on the skipping assumptions it was decided to replace the missing values of the three original constructs (i) management commitment; (ii) process owner role; and (iii) process performance measurement by '1'. The remaining five items regarding process knowledge and corporate culture missed not more than 6% of their values which is an extent making the use of any imputation method possible without biasing the results [Hair et al. 2010, p. 48]. Mean substitution was chosen because it is most suitable for dealing with relatively low levels of

missing data on the one hand, and due to the fact that it is frequently used in practice [Hair et al. 2010, p. 53ff] on the other hand.

4.5.8 Testing for the Presence of Biases

A reversed-item is contained in the a priori measurement construct of the culture in line with the process approach (employees' attitude towards change or ATT_CHNG for short). Tab. 4-1 contains the correlation coefficients of the construct's items.

		1	2	3	*4*	5	6	7	8
1	TEAMW	1							
2	CUST_FOC	0.668**	1						
3	CHARGE	0.500**	0.632**	1					
4	*ATT_CHNG*	*0.293***	*0.356***	*0.421***	*1*				
5	LANG	0.179**	0.214**	0.368**	*0.198***	1			
6	EXCEL	0.461**	0.518**	0.491**	*0.372***	0.392**	1		
7	LIVE_EMP	0.495**	0.525**	0.568**	*0.428***	0.404**	0.548**	1	
8	LIVE_MGMT	0.503**	0.551**	0.528**	*0.385***	0.338**	0.491**	0.736**	1

Notes: **Correlation is significant at the 0.01 level (2-tailed). n = 483. Teamwork is a matter of course (TEAMW), customer-focused attitude of employees (CUST_FOC), employees feel accountable for process results (CHARGE), employees' attitude towards change (ATT_CHNG), employees' usage process language (LANG), employees strive to simplify their workflows and to increase output quality (EXCEL), defined/documented processes are lived by employees (LIVE_EMP), defined/documented processes are lived by the management (LIVE_MGMT).

Tab. 4-1: Pearson correlation of the items within the corporate culture construct

Compared to the other items measuring this specific PO dimension (except the one referring to the employees' usage of process language or LANG for short), the item of interest exhibits lower coefficients in total. This leads not only to the conclusion that LANG does not seem to fit in well with the cultural measure, but also that ATT_CHNG was partially not interpreted in the right way or simply not recognized. The extent of last year's changes within the industry (ANN_CHAN) is the second reversed-item in the a priori measurement model. Tab. 4-2 shows the Pearson product-moment correlation coefficients of the items contained in the environmental dynamism's item set.

		1	2	*3*	4
1	CUST_REQ	1			
2	IND_CHAN	0.622**	1		
3	*ANN_CHAN*	*0.406***	*0.656***	*1*	
4	RAN_CHAN	0.572**	0.724**	*0.568***	1

Notes: **Correlation is significant at the 0.01 level (2-tailed). n = 483. Regular customer demands for new products/services (CUST_REQ), continuous change in industry (IND_CHAN), extent of last year's changes within the industry (ANN_CHAN), frequent changes in the volume of products/services to be delivered (RAN_CHAN).

Tab. 4-2: Pearson correlation of the items contained in the environmental dynamism construct

Reversed-item bias does not seem to be a problem in this case. The item's correlation coefficients cannot be classified as significantly lower compared to the others. Therefore, it might be assumed that respondents are more attentive when the number of asked questions at a time or on a single page of the online questionnaire in the concrete case is at a lower level. The ambidexterity item's situation is not of interest, since the performance measures from the main survey are replaced by the ones from the follow-up survey in the final analysis.

In order to verify whether a CMB is truly not present in the data, the post hoc Harman's single factor test is conducted. This statistical remedy is one of the most widespread methods to address the CMB issue and aims at determining the number of factors required to account for the variance in the variables of interest on the basis of an unrotated factor analysis. It is basically supposed that either a single factor or a general factor accounting for the majority of the data's covariance will be extracted if CMB is present. [Podsakoff, Organ 1986, p. 536; Podsakoff et al. 2003, p. 889] Harman's single factor test is applied on the present data (50 items = 35 PO items + 7 environmental items + 8 performance items) gained from the 483 companies by using principal component analysis. The performed analysis, whose results are partially contained in Tab. 4-3, reveals that twelve factors with an eigenvalue greater than 1.0 are retained explaining 71.86% of the total variance spanned by the variables of interest.

	Rotation Sums of Squared Loadings		
Factor	**Total**	**% of Variance**	**Cumulative %**
1	15.502	31.004	31.004
2	3.191	6.381	37.385
3	3.031	6.062	43.447
4	2.655	5.309	48.756
5	2.055	4.109	52.865
6	1.846	3.693	56.558
7	1.563	3.125	59.683
8	1.478	2.956	62.639
9	1.357	2.714	65.353
10	1.167	2.334	67.688
11	1.068	2.135	69.823
12	1.020	2.040	71.862

Tab. 4-3: Results of Harman's single factor test

The general factor accounts for 31.00% of variance. Based on this finding it could be said that CMB is not a major problem in this study. It is assumed that the clearly higher percentage of explained variance compared to the remaining eleven factors is caused by the fact that two thirds of the total amount of items belong to the independent PO construct and its dimensions.

4.6 Revised Measurement Model

In section 4.4, the conceptual model of this study was presented. Before the research questions can be answered, it has to be ensured that the single construct's dimensions are (i) unidimensional; (ii) reliable; and (iii) valid. These are the requirements for calculating summated scales on the basis of the data which are retained after executing the pre-processing steps described above. Summated scales represent composite measures which combine several individual variables. [Hair et al. 2010, p. 124]

4.6.1 Transforming an A Priori Model into a Revised Model

Literature suggests performing factor analysis (either exploratory or confirmatory) to assess unidimensionality [Hair et al. 2010, p. 125]. Unidimensionality means that all items load highly on a single factor. As already mentioned in section 2.3.2, EFA is applied. The analyses are carried out using the parameters stated by Kohlbacher [2009, p. 137]:

- Method: principal components
- Criterion for the number of factors to extract: Kaiser criterion
- Rotation method: VARIMAX

Reliability (already referred to in section 4.2) is defined as the "*degree of consistency between multiple measurements of a variable*". Internal consistency is a commonly used reliability measure. [Hair et al. 2010, p. 125] It assesses how well an instrument's items fit together [Pett, Lackey, Sullivan 2003, p. 175] which implies that the set of items building the summated scale "*should be consistent in what they indicate about the characteristic*" [Malhotra 2004, p. 268]. Starting the validation process with the assessment of unidemensionality makes sense, since internal consistency is not a sufficient condition for unidimensionality wherefore researchers should put more emphasis on the latter characteristic [Clark, Watson 1995, p. 315f]. The most important measure in this context is Cronbach's coefficient alpha (α) [Hair et al. 2010, p. 125; Pett, Lackey, Sullivan 2003, p. 185]. This coefficient is used to assess the reliability of the retained dimensions. The estimator can take on any value between 0 and 1 [Malhotra 2004, p. 268]. Due to the fact that literature does not agree on a common minimum level, this work follows Hair et al. [2010, p. 127] and Malhotra [2004, p. 268] who state that satisfactory internal consistency reliability requires at least a value of 0.6. Cronbach's alpha constitutes a conservative estimator wherefore it is viewed as a high threshold for the measurement concept's acceptance [Vera, Kuntz 2007, p. 61].

When the retained dimensions (latent factors) fulfill the reliability requirements, their validity needs to be checked before the summated scale can be calculated [Hair et al. 2010, p. 125]. Validity, as a repetition, is the extent to which a scale measures what it should measure (construct of interest) and pretends to measure respectively [Bortz, Döring 2006, p. 200]. According to Kohlbacher [2009, p. 144] as well as Clark and Watson [1995, p. 317], a construct is sufficiently valid if none of the items loads greater than 0.5 on more than one single factor.

Separate analyses are performed for the PO, environmental and firm performance variables. The results are presented and discussed below.

4.6.2 Dimensions of Process Orientation

PO exhibits a multiple nature. Consequently, each of its dimensions should be mirrored by a separate factor. [Hair et al. 2010, p. 125]. It is decided to perform the analysis with the entire usable sample resulting from the main survey, since it is assumed that larger sample sizes increase reliability (see the discussion in [Field, Miles 2010, p. 559]). With a total of 840 usable questionnaires resulting from the main survey the preconditions regarding sample size can be met easily. As the PO construct consisted out of 35 indicators, a minimum of 175 companies is required.

Instead of examining the correlation matrix visually, this work relies on the Bartlett test of sphericity and the MSA. These two statistical test criteria have also been used by Kohlbacher [2009, p. 137] as well as Vera and Kuntz [2007, p. 61]. Bartlett's test confirms with $p<0.000$ that sufficient correlation between the items exists[22]. The overall MSA value accounts for 0.954, which is clearly above the recommended minimum level of 0.5 and can be classified as a 'marvelous' result. Both approaches therefore strongly justify the application of the factor analysis. As suggested in literature, the single variables' MSA values are calculated additionally. None of the items fall beyond the threshold of 0.5; more precisely, the lowest MSA value achieved by one of the PO items is 0.906, indicating that all values are 'marvelous' and, in further consequence, all items are included in the factor analysis.

[22] Note that a test on normal distribution has not yet taken place.

The initial factor analysis results in seven factors with eigenvalues greater than the 1.0 cutoff. The retained factors account for 70.56% of the total variance in the data. With only one exception, each factor clearly pertained one of the described dimensions in section 4.4.1. Although this initial solution can be seen as an overall good result, it is accompanied by low communalities and interpretation difficulties. Based on the suggested remedies by Hair et al. [2010, p. 119f], firstly, one item (employees' knowledge about the process owners' tasks, responsibility and competence or KN_OWN for short) is deleted because its factor loading is not practically significant, meaning that the loading is not equal or greater than ±0.5. Secondly, another item (employees' attitude towards change or ATT_CHNG) is dismissed, as its communality is less than 0.5, indicating insufficient explanation. Keeping in mind the problematic nature of this item regarding reversed-item bias, the item's deletion is further justified. Thirdly, as the items referring to the existence of process owners for each business process (PO_EX) and the employees' usage process language (LANG) are difficult to interpret within their factors, they are deleted too. This led to an intermediary solution. Owing to the wish of separating the factor representing now a mixture of the entire process documentation and some continuous process improvement items on the one hand, and arising cross-loadings on the other hand, two further items (existence of a company process model or MACROM and defined/documented processes are lived by employees or LIVE_EMP respectively) are deleted. This results in the final factor solution reported in Tab. 4-4 on the following page, containing six factors with eigenvalues greater than 1.0. It accounts for 70.72% of the total variance in the data spanned by the remaining 29 PO items.

Altogether, it can be said that this solution is satisfactory. All communalities are above the 0.5 level and the factor solution can be interpreted quite easily. The indicated cross-loading of the CI_METH item (use of continuous process improvement methodologies) is ignorable. Its loading on factor six is over 0.5 in contrast to the load on factor one which is below the mentioned threshold. It is assumed that this loading occurs from the fact that continuous process improvement methods typically utilize process performance measures. Nevertheless, this item is theoretically founded within the continuous process improvement dimension (factor six). The fusion of the dimensions process documentation and process knowledge is explained based on the following considerations regarding the documentation-knowledge-relationship. Processes must be learned and experienced [Wallmüller 2007, p. 8]. Learning is comparable with the internalization component within Nonaka's SECI model [Nonaka 1994, p. 19]. This means incorporating explicit (or codified) knowledge into a person's implicit knowledge base. The internalization is supported by concrete recoding of explicit knowledge, for instance, in the form of (process) documentation. This concretely formalized knowledge usually represents the implicit knowledge of a person, occasionally in terms of abstract (process) models. This key process within the spiral model is called externalization. The available documentation makes explicit knowledge easily transferable to and accessible for other employees within the company. Thus, these people can indirectly relate to experiences made by others. [Nonaka, Takeuchi 1995, p. 64ff] The creation of knowledge bases was also discussed in the knowledge cycle of Probst, Raub and Romhardt. Alongside incentive systems or subsequent regulations, knowledge explication and documentation are a key part of the knowledge building block named knowledge conservation. This retention within the cycle helps to protect against the loss of acquired and developed knowledge. Through this approach workflows are kept running continually and the same experiences do not have to be made all over again. Targeted creation of reports, documentations, minutes etc. plays its part in making knowledge available permanently within an enterprise. Nevertheless, their proper storage and the continuous updating of the constructed organizational knowledge base have to be kept in mind. [Probst, Raub, Romhardt 2006, p. 193ff]

	Component (Factor)						
	1	**2**	**3**	**4**	**5**	**6**	**Communality**
PPM_DEF	0.809						0.826
PPM_PRES	0.807						0.824
PPM_DRV	0.793						0.839
PPM_ACT	0.760						0.814
ABCOST	0.691						0.595
KN_MOD		0.764					0.712
KN_CUSUP		0.716					0.682
KN_MAP		0.695					0.704
KN_PR		0.669					0.651
CUSTSUPP		0.589					0.643
DOCUSE		0.579					0.639
DOC		0.561					0.634
MC_BEH			0.808				0.857
MC_CPO			0.784				0.767
MC_AW			0.769				0.831
MC_RES			0.711				0.732
CUST_FOC				0.820			0.740
TEAMW				0.763			0.638
CHARGE				0.682			0.637
EXCEL				0.642			0.582
LIVE_MGMT				0.517			0.584
PO_BUD					0.837		0.785
PO_STAFF					0.834		0.779
PO_MNGR					0.682		0.717
PO_ACT					0.603		0.722
CI_STR						0.679	0.737
CI_BEL						0.656	0.660
CI_METH	0.474					0.570	0.611
CI_EXP						0.527	0.567

Notes: In order to simplify the table, factor loadings less than 0.4 are suppressed and variables are sorted by their factor loadings. Existence of process performance indicators for all processes (PPM_DEF), regular presentation of process performance indicators to process performers (PPM_PRES), derivation of process performance indicators from business goals and/or (internal) customer expectations (PPM_DRV), action initiation if process performance is poor (PPM_ACT), use of activity-based costing for all processes (ABCOST), employees' ability to describe the company process model effortlessly (KN_MOD), employees' ability to accurately reflect their business process' customers and suppliers (KN_CUSUP), workers' knowledge towards how processes are executed (KN_MAP), employees' understanding of defined processes regarding content and form of expression (KN_PR), clear definition of internal/external customers/suppliers for all processes (CUSTSUPP), update of process documentation in the case of changes (DOCUSE), documentation of all business processes (DOC), active engagement of the executive board in the process program (MC_BEH), an executive board member has taken responsibility and leadership of the process program (MC_CPO), management's perception of process management as a way of managing the business (MC_AW), management's provision of adequate resources to improve core processes (MC_RES), customer-focused attitude of employees (CUST_FOC), teamwork is a matter of course (TEAMW), employees feel accountable for process results (CHARGE), employees strive to simplify their workflows and to increase output quality (EXCEL), defined/documented processes are lived by the management (LIVE_MGMT), responsibility of process owners for budget (PO_BUD), process owners' influence on personnel decisions (PO_STAFF), process owners are experienced managers (PO_MNGR), process owners' responsibility for continuous process improvement and its proactive execution (PO_ACT), striving for continuous process improvement (CI_STR), belief in the perpetual nature of continuous process improvement (CI_BEL), use of continuous process improvement methodologies (CI_METH), existence of a process redesign, and change management expert cadre (CI_EXP).

Tab. 4-4: VARIMAX rotated component matrix of the final factor analysis solution

Since this factor solution can be considered as unidimensional, the next step is to assess the reliability of the factors. The calculated coefficients can be found in Tab. 4-5.

Factor (PO dimension)	α
Factor 1: Process performance measurement (PODIM_PPM)	0.933
Factor 2: Process knowledge and documentation (PODIM_KNDOC)	0.890
Factor 3: Management Commitment (PODIM_MGMTCOM)	0.923
Factor 4: Culture (PODIM_CUL)	0.844
Factor 5: Process owner (PODIM_OWN)	0.869
Factor 6: Continuous Process Improvement (PODIM_CONTIMP)	0.731

Tab. 4-5: Reliability assessment of the finally retained PO dimensions using Cronbach's alpha

As can be seen in the table, all calculated Cronbach alpha coefficients are well above the suggested minimum value. As the PO dimensions fulfill the reliability requirements, finally their validity needs to be checked. Due to the fact that each of the entire 29 PO items only load on a single factor significantly (factor loading greater than 0.5), construct validity is supported.

4.6.3 Environmental Conditions

As in the case of the PO items, the factor analysis for control variables is performed with the main survey record composing of 840 companies. The sample size is clearly above the required amount of 35 (7 items times 5) or 50 observations. Bartlett's test confirms at a significance level of 0% ($p<0.000$) that sufficient correlation between the items exists. The overall MSA value accounts for 0.759, which is perspicuously above the minimum level of 0.5 and can be classified as a 'middling' result. Both approaches therefore justify the application of the factor analysis. Since none of the seven items has an MSA value below 0.5, all of them are included in the following factor analysis.

The performed VARIMAX rotated factor analysis retains two factors with eigenvalues greater than the 1.0 cutoff which can be seen in Tab. 4-6. These factors account for 70.66% of the total variance in the data spanned by the initial seven items. Since no problems regarding communalities, cross-loadings or interpretation are evident, this solution can be seen as overall satisfactory result.

	Components (Factors)		
	1	2	Communality
IND_CHAN	0.888		0.852
RAN_CHAN	0.829		0.822
ANN_CHAN	0.757		0.827
CUST_REQ	0.740		0.759
COMP_INT		0.886	0.721
COMPET		0.885	0.663
PRICE		0.816	0.650

Notes: In order to simplify the table, factor loadings less than 0.4 are suppressed and variables are sorted by their factor loadings. Continuous change in industry (IND_CHAN), frequent changes in the volume of products/services to be delivered (RAN_CHAN), extent of last year's changes within the industry (ANN_CHAN), regular customer demands for new products/services (CUST_REQ), intense competition on the local market (COMP_INT), existence of strong competitors (COMPET), price fight represents a market's hallmark (PRICE).

Tab. 4-6: VARIMAX rotated component matrix of the moderating items' final factor analysis solution

As Tab. 4-7 shows, the calculated alpha coefficients ensure the reliability of the two dimensions. Furthermore, construct validity is supported, since each of the items achieves only a single factor loading greater than the specified 0.5 threshold.

Factor (Environmental dimension)	α
Factor 1: Environmental Dynamism (DYNAMISM)	0.825
Factor 2: Environmental Competitiveness (COMPETITION)	0.833

Tab. 4-7: Reliability assessment of the retained environmental factors using Cronbach's alpha

4.6.4 Firm Performance

As the firm performance variables have been newly retrieved in the follow-up survey, this factor analysis is based on the sample size of 483. Nevertheless, this is an amount well above the at least required 40 (8 items times 5) or better 50. Once more, Bartlett's test confirms with $p<0.000$ that sufficient correlation between the items exists. The overall MSA value accounts for 0.768 which is clearly above the recommended minimum level of 0.5 and can be classified as a 'middling' result. Both approaches therefore justify the application of the factor analysis. Furthermore, none of the eight items need to be removed from analysis, as none of their individual MSA values fall beyond the 0.5 threshold.

The performed VARIMAX rotated factor analysis results in three factors with eigenvalues greater than the 1.0 cutoff. The retained factors account for 70.24% of the total variance in the data. This solution can be seen as an overall good result, as the three investigated performance dimensions are well reflected. However, one item's communality (EBIT margin, compared to competitors or EBITM for short) does not achieve the desired 0.5 level and is removed. This resulted in the final factor analysis solution reported in Tab. 4-8, again, containing three factors with eigenvalues greater than 1.0 which account for 75.64% of the total variance in the data spanned by the remaining seven items.

	Component (Factor)			
	1	2	3	Communality
MSHARE_GR	0.918			0.852
SALES_GR	0.900			0.822
MSHARE	0.898			0.827
CUST_COMPL		0.871		0.759
CUST_SAT		0.826		0.721
POS_EXPLOR			0.812	0.663
POS_EXPLOI			0.800	0.650

Notes: In order to simplify the table, factor loadings less than 0.4 are suppressed and variables are sorted by their factor loadings. Market share growth, compared to competitors (MSHARE_GR), sales growth, compared to competitors (SALES_GR), market share, compared to competitors (MSHARE), reduction of customer complaints within the last three years (CUST_COMPL), increase of customer satisfaction within the last three years (CUST_SAT), explorative innovation, measured by achieved sales shares (POS_EXPLOR), exploitative innovation, measured by achieved sales shares (POS_EXPLOI).

Tab. 4-8: VARIMAX rotated component matrix of the dependent items' final factor analysis solution

Due to the fact that all communalities are above the 0.5 level, no cross-references occur and the factor solution is easily interpretable, the solution can be considered as satisfactory. Tab. 4-9 on the top of the next page contains the calculated alpha coefficients.

Factor (Firm performance dimension)	α
Factor 1: Financial and market performance (FPDIM_FINMKT)	0.900
Factor 2: Customer satisfaction (FPDIM_CUST)	0.635
Factor 3: Ambidexterity (FPDIM_ABMI)	0.453

Tab. 4-9: Reliability assessment of the finally retained dependent factors using Cronbach's alpha

The coefficient of ambidexterity is below the suggested minimum value 0.6. As both items are needed in order to build the construct, Cronbach's alpha cannot be improved by removing one item. However, as in the case of Kohlbacher's study [2009, p. 72], the construct is retained, but interpretation needs to be done with caution. As can be seen in Tab. 4-8, all items are loading greater than 0.5 only on a single factor. Thus, construct validity is supported.

4.6.5 Calculation of Summated Scales

After the satisfactory assessment of unidimensionality, reliability and validity, the summated scales of the independent, dependent and moderating variables can be calculated. With exception of the ambidexterity scale (FPDIM_AMBI), this work follows the most common calculation approach which means taking the unweighted arithmetic mean of each dimension's item scores [Hair et al. 2010, p. 126].

Since ambidexterity is defined as the ability of pursuing both exploitative and explorative innovation, the simple averaging calculation is not the right choice. This kind of calculation leads to values greater than zero even if a company pursues one type of innovation solely. For that reason, ambidexterity is calculated by multiplying the share of shares attributed to exploitative innovations by the sales share attributed to explorative innovation.

As revealed above, the internal consistency of the ambidexterity construct is less than desirable. On this account it is decided to investigate the PO dimensions' effects on a firm's exploitative and explorative innovation performance additionally. Thus, these two performance variables represent single-item measures.

4.6.6 Overview of the Final Model

Fig. 4-12 on page 70 shows the adjusted and finally used measurement model bringing together the research questions and operationalized constructs. In this context, PO is the study's independent variable which is composed of the six extracted dimensions resulted from the factor analysis described in section 4.6.2. Financial performance, customer satisfaction, ambidexterity, exploitative and explorative innovation represent the five dependent variables. The model includes furthermore industry affiliation as moderator in order to examine whether the investigated effects are dependent on this factor.

However, before the relationships of interest are assessed, other drivers of firm performance need to be controlled [Frei et al. 1999, p. 1217]. Therefore, three control variables are included in the model in order to eliminate possible alternative explanations and, thus, enhance the fidelity [Chari, Devaraj, David 2008, p. 229] with which the relationships between the single PO dimensions and organizational performance are examined. These variables are not of primary research interest.

Since firm size is associated with economies of scale [Hitt, Hoskisson, Kim 1997, p. 781], it is expected to be positively related with firm performance [Chari, Devaraj, David 2008, p. 229]. Additionally, Jansen, Van den Bosch and Volberda [2005, p. 354; 2006, p. 1667] argue that although larger units might have more resources available for innovation, they may

not be flexible enough to explore. This is also in line with the considerations made by Benner and Tushman [2002, p. 688] regarding innovation and certification activities in small vs. large firms. Furthermore, the literature review performed by Becheikh, Landry and Amara [2006, p. 652] revealed that more than half of the included studies regard firm size as an explanatory variable for the innovation behavior of manufacturing companies. In this Master's Thesis, firm size is expressed by the total number of employees. This is in line with the studies of authors such as Ittner and Larcker [1997, p. 525], Morgan, Vorhies and Mason [2009, p. 912], Stam and Elfring [2008, p. 103], Jansen, Van den Bosch and Volberda [2005, p. 357; 2006, p. 1667], Koberg, Detienne and Heppard [2003, p. 33], Geerts, Blindenbach-Driessen, Gemmel [2010b, p. 16], de Visser et al. [2010, p. 294] and Kohlbacher [2009, p. 58].

Enterprises are challenged by their environment to constantly keep improving themselves [Wördenweber, Wickord 2008, p. 10]. Hence, environmental dynamism and environmental competitiveness are controlled, since companies are typically forced to innovate in order to sustain in fast changing, instable or very competitive markets [Johne 1999, p. 203; Klausegger, Salzberger 2004, p. 434; Stauss, Bruhn 2004, p. 5]. Furthermore, the results of Geerts, Blindenbach-Driessen and Gemmel [2010b, p. 23; 2010b, p. 31] point out that ambidexterity is not only more likely employed in larger companies, but also when environments are characterized as highly competitive.

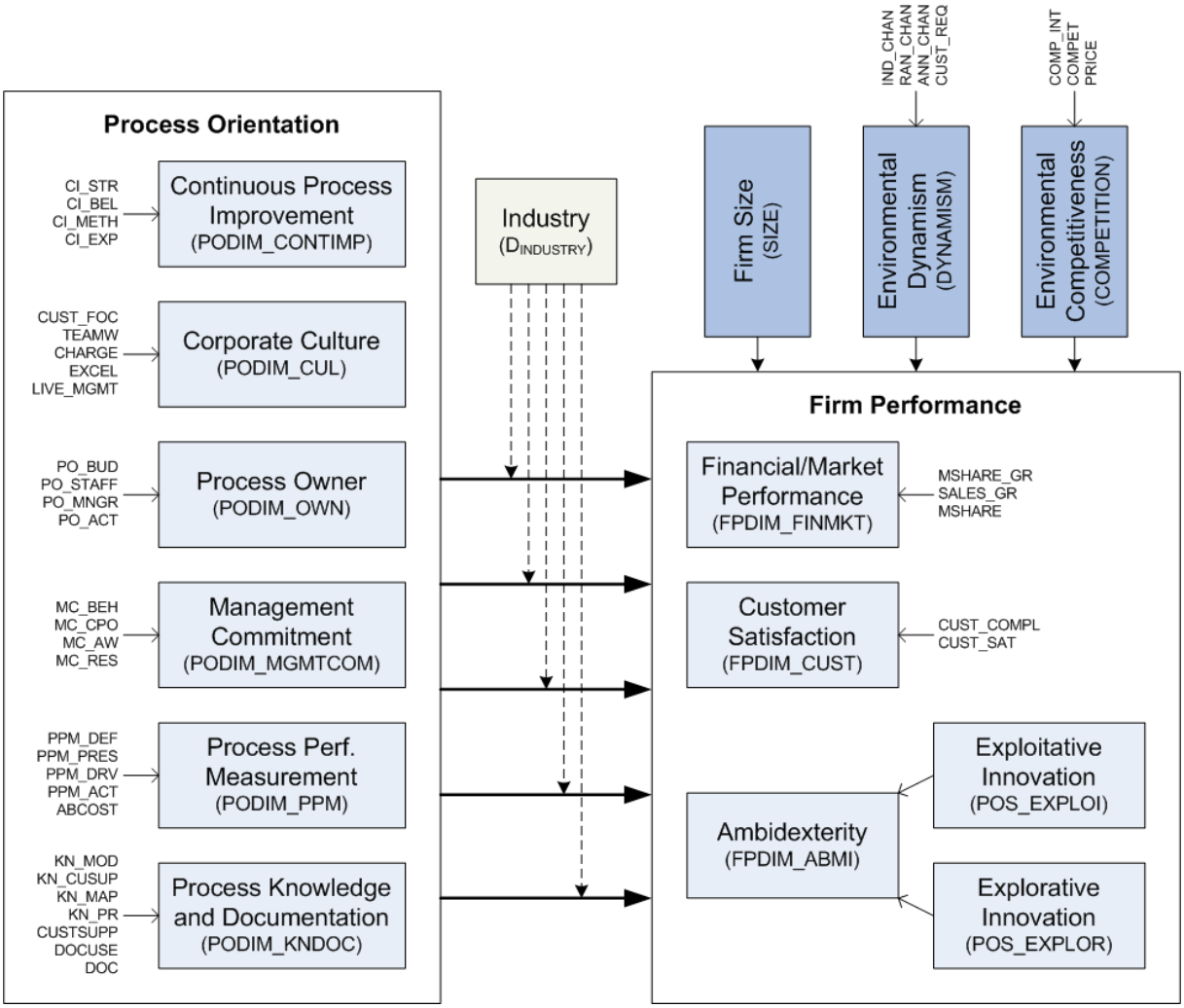

Fig. 4-12: Final revised measurement model

5 Analysis of Data and Interpretation of Results

Within this chapter the research questions are addressed. First of all, descriptive statistics of both the sample and the variables of interest are presented. Furthermore, the results of the conducted regression analyses are described and interpreted. The chapter ends with a summarization of the revealed significant effects.

5.1 Descriptive Statistics

As already mentioned in the previous chapter, the final sample of this study consists of 483 organizations. 240 firms (that is 49.7%) operate predominantly in the manufacturing sector, 217 companies (that is 44.9%) are active in the service sector while 18 enterprises (that is 3.7%) serve both sectors equally. The remaining eight companies could not be clearly assigned. Tab. 5-1 shows the composition of the sample by the served ÖNACE 2008 sectors according to the indicated BRANCH1 code.

Industry (ÖNACE 2008 sector)	n	% of total
C: manufacturing	204	42.2
F: construction	48	9.9
G: wholesale & retail trade	75	15.5
H: transportation & storage	24	5.0
J: information & communication	19	3.9
K: financial & insurance	44	9.1
M: professional, scientific & technical services	26	5.4
N: administrative & support services	43	8.9
Total	483	100

Note: Classification according to the indicated Herold BRANCH1 code.

Tab. 5-1: Overview of the sample composition by ÖNACE 2008 sectors

It is not surprising that three fourths of the participating companies are situated in the four most populous Austrian states (Lower Austria, Styria, Upper Austria and Vienna). The largest proportion is made up by Viennese enterprises with a total of 132 (that is 27.3%). According to Tab. 5-2, the average enterprise of this study employs about 961 people in total and 12 exclusively for BPM activities[23] representing a share of circa 3%. Furthermore, it has an age of 41 years and deals with BPM since approximately eight years.

	Mean	Median	SD
Firm size [# of employees][1]	961.17	200.00	4615.25
Age of firm [years][1]	40.95	26.00	46.94
Active engagement in BPM [years][1]	7.84	6.00	7.34
Staff in BPM [# full-time equivalents][2]	12.48	3.00	59.46
Ratio BPM to total employees [%][2]	0.03	0.01	0.06

Notes: [1]n = 483. [2]n = 482.

Tab. 5-2: Means, medians and standard deviations for the sample firm's size, age and engagement in business process management

The distribution according to the employment size classes shows that 271 companies (that is 56.1%) have a workforce ranging from 50 to 249 people and that the remaining 212 or 43.9% have 250 or more employees. 462 firms (that is 95.7%) have, at least in part, defined business processes and 413 (that is 85.5%) are, at least partially, concerned with process performance

[23] In this context, the medians are more meaningful, since outliners pull the means upwards.

indicators. Furthermore, 258 companies (that is 53.4%) are certified in accordance with ISO 9001 standards, 6 firms solely performed an external quality assessment based on the EFQM model for business excellence while 29 organizations (that is 6.0%) successfully traversed external certification audits and assessments in both quality approaches.[24]

Tab. 5-3 reports the means, medians and standard deviations of all variables of interest in this study. The variable PODIM_PPM exhibits the highest standard deviation and the lowest mean compared to the other nine variables rated on a seven-point scale. This might result from the fact that 70 companies (that is 14.5%) indicated that they are dealing with process performance measurement in no sense. Consequently, the belonging section was skipped for these companies and a value of '1' was assigned to the items contained in the construct. This pulls the means somewhat downwards. In general, an average company rates its six PO dimensions under investigation better than the center of the scales. Furthermore, the average firm seems to be embedded in a highly competitive environment and is confronted with higher levels of environmental dynamism. With reference to the dependent variables it can be said that an average enterprise rates its sales growth and market share better than their competitors' financial and market performance and rates their customers' satisfaction better than the center of the scale. In addition, the average organization achieves 14.75% of its sales in 2010 with exploited goods and services whereas 8.26% of the sales result from explored goods and services. This stronger focus on exploitative activities is in line with the finding made by Meyer [2011, p. 14] during the same research period in Germany.

	Mean	Median	SD
Continuous Process Improvement (PODIM_CONTIMP)[1]	4.87	5.00	1.29
Corporate Culture (PODIM_CUL)[1]	5.43	5.40	0.91
Process Owner (PODIM_OWN)[1]	4.92	5.25	1.44
Management Commitment (PODIM_MGMTCOM)[1]	5.30	5.75	1.52
Process Performance Measurement (PODIM_PPM)[1]	4.19	4.60	1.76
Process Knowledge and Documentation (PODIM_KNDOC)[1]	4.69	4.71	1.14
Environmental Dynamism (DYNAMISM)[1]	5.19	5.50	1.41
Environmental Competitiveness (COMPETITION)[1]	5.80	6.00	1.22
Financial and Market Performance (FPDIM_FINMKT)[1]	4.84	4.67	1.12
Customer Satisfaction (FPDIM_CUST)[1]	4.69	4.50	1.13
Exploitative Innovation (POS_EXPLOI) [%]	14.75	10.00	15.45
Explorative Innovation (POS_EXPLOR) [%]	8.26	5.00	11.17
Ambidexterity (FPDIM_AMBI)[2]	174.94	45.00	368.82

Notes: n = 483 for all variables. [1]Measured on a seven-point scale. [2]Multiplication of POS_EXPLOI by POS_EXPLOR.

Tab. 5-3: Means, medians and standard deviations for the variables of interest

5.2 Regression Analyses and Interpretations

In order to answer the research questions, hierarchical moderated regression analysis is used, since it is a frequently applied procedure to test for moderators in literature. The regression analysis is based on three hierarchical layers, as it is the case in the study by Jansen, Van den Bosch and Volberda [2005, p. 358]. In the first block, the baseline model, the control

[24] Statistics regarding the questionnaire respondents are not included in consequence of two reasons. Firstly, it cannot be determined who answered the questions contained in the follow-up survey's questionnaire, as no specific item was included addressing this fact. Secondly, the span between the participating companies regarding their size is rather large. Therefore, comparing the company's organizational structures and establishing categories of respondents are difficult.

variables (firm size in terms of number of employees, environmental dynamism and environmental competitiveness) are entered. The second block contains the main effects and the industry dummy variable. Finally, the interaction terms are entered in the third block. Although the interaction in this case is between categorical and continuous variables, the PO variables are centered[25] in order to avoid multicollinearity problems [Aiken, West 1996, p. 9]. The centered and uncentered slope equations generate the same result [Aiken, West 1996, p. 34]. The dependent variables are typically not centered [Aiken, West 1996, p. 35]. At this point, it should also be noted that only the 457 enterprises which could be assigned to the two groups 'predominant manufacturer' and 'predominant service provider' are included in the regression analyses. These two categories are hereinafter referred to as manufacturing and service organizations.

5.2.1 (Univariate) Normality and Multicollinearity Assessment

The last step before answering the research questions is checking whether the calculated factor variables are in accordance with the normality assumption of multivariate analyses. This particular assumption is the most fundamental one because F and t statistics involved in the analyses presuppose this property. It is noted that the detrimental effects of non-normality diminish when the sample size exceeds 200 observations. Multivariate techniques require multivariate normality which means that each individual variable (univariate) and their combinations (multivariate) fulfill the normality assumption. Although assessing and achieving univariate normality for all variables helps gaining multivariate normality, it does not guarantee it. Nevertheless, these actions are considered to be sufficient in most cases. As a consequence, a graphical approach is used to assess univariate normality of all variables which go into the regression analyses. The normal probability plots are inspected to investigate whether the cumulative distribution of the values differs from the one of a normal distribution. [Hair et al. 2010, p. 70ff] All plots are contained in section C.2 in the appendix.

The data values of FPDIM_AMBI, POS_EXPLOI, POS_EXPLOR and SIZE strongly deviate from the diagonal. However, remedies exist to overcome this problem – in particular data transformation. The pattern of a distribution suggests which kind of transformation should be performed. All four variables are afflicted with positive skewness. Typically logarithm or square root transformations are applied in such situations. [Hair et al. 2010, p. 78f] For the first three variables the approach of Faems, Van Looy and Debackere [2005, p. 242] is followed. The natural logarithm of 1+original value is calculated, since values of zero are contained. Due to the fact that a company's size is at least 50, the addition of 1 to this figure is unnecessary for the logarithmic transformation. As can be seen in Fig. 5-1, Fig. 5-2, Fig. 5-3 and Fig. 5-4 on pages 74 to 75, the distributions better follow a normal distribution after the data transformation.

[25] This fact is not explicitly highlighted, for example, by prefixing the variable's names within the tables representing the regression results in the sections 5.2.2 to 5.2.5.2.

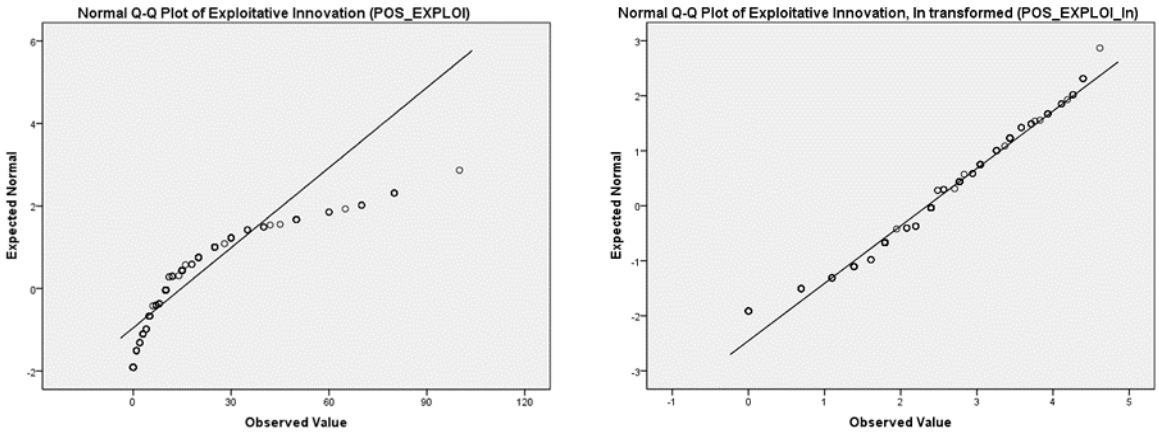

Fig. 5-1: Distribution of the data values of sales shares resulting from exploited goods and services before and after logarithmic data transformation

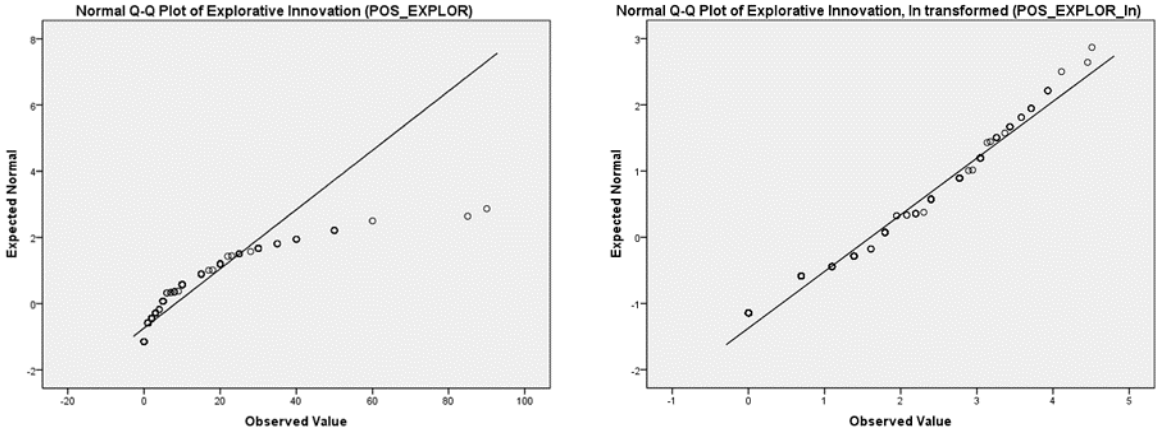

Fig. 5-2: Distribution of the data values of sales shares achieved by explored goods and services before and after logarithmic data transformation

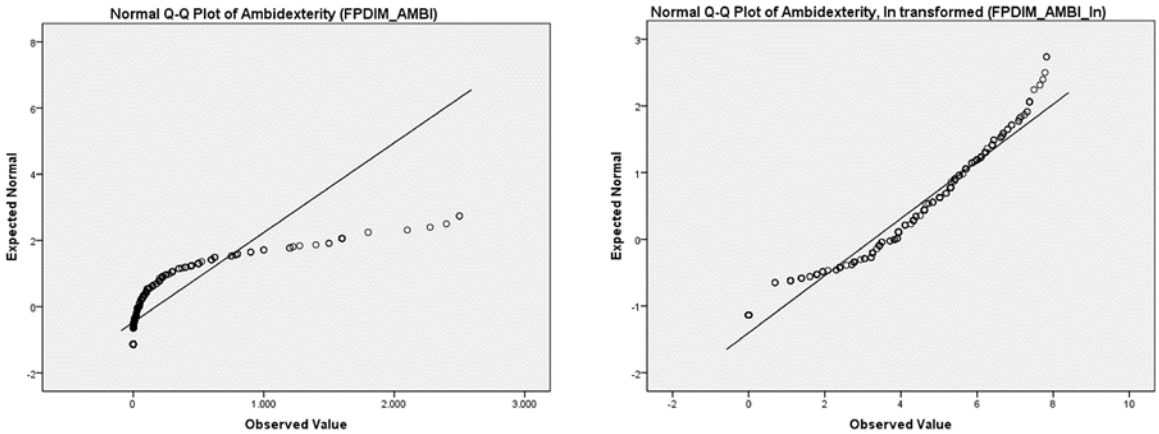

Fig. 5-3: Distribution of the data values of the dependent variable ambidexterity before and after logarithmic data transformation

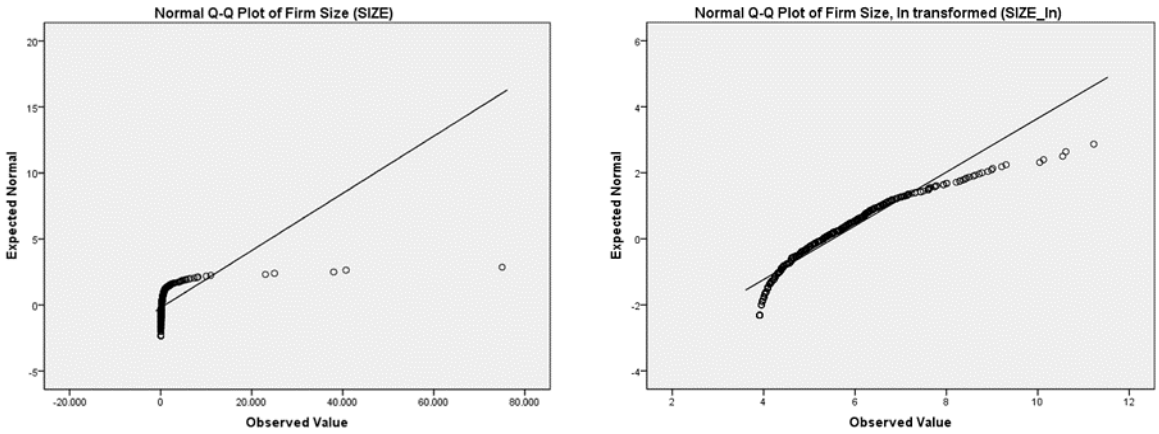

Fig. 5-4: Distribution of the data values of firm size before and after logarithmic data transformation

Furthermore, it is followed the common research practice to assess whether the two assumptions of regression analysis, namely multicollinearity and normality of the error term distribution, are met. In contrast to collinearity, multicollinearity represents the correlation among three or more independent variables [Hair et al. 2010, p. 165]. Linear regression models require that the independent variables do not depend exactly in a linear manner upon each other. However, empirical data exhibit always a certain degree of multicollinearity [Hair et al. 2010, p. 200] which is not necessarily a problem. [Backhaus et al. 2011, p. 93] The estimation of regression coefficients becomes unreliable when a rather high degree of multicollinearity is evident. This reduces the predictive power [Hair et al. 2010, p. 165] of the dependent variables, since their variances are overlapping.

Different methods exist to reveal multicollinearity. One possibility is to investigate the correlation matrix. Substantial collinearity is indicated if the correlation coefficients are close to 1 (0.90 or higher [Hair et al. 2010, p. 200]). However, these coefficients assess only paired dependencies. [Backhaus et al. 2011, p. 94] Using this indicator is appropriate if there are only two independent variables contained in the model [Auer, Rottmann 2011, p. 508]. Otherwise, an indicator of the "*degree to which a single [independent variable] is explained by the set of other [independent variables]*" is required [Hair et al. 2010, p. 200]. One such indicator is the variance inflation factor (VIF). The higher this value, the greater the degree of multiple correlation. [Backhaus et al. 2011, p. 95] A typical cutoff is VIF > 10 [Hair et al. 2010, p. 204].

Tab. 5-4 on the next page shows a correlation matrix of all variables contained in the regression models. Several correlation coefficients between the six PO variables are greater than 0.5. Since PO is examined as multi-dimensional construct in this work, it is not surprising that the single dimensions are closer related. Although no substantial collinearity seems to be evident, these higher coefficients might have impact on the regression results [Hair et al. 2010, p. 204]. However, in many cases it is advisable to ignore the diagnosis, especially when the multicollinear variables are important due to the model theory [Auer, Rottmann 2011, p. 512]. Nevertheless, the investigation of the VIFs in all models shows that all values are well below the threshold of 10. More precisely, the highest VIF accounted for one of the variables within one of the models containing the entire 16 predictors is 4.853.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	SIZE_ln	1													
2	DYNAMISM	0.113*	1												
3	COMPETITION	0.051	0.257**	1											
4	PODOM_CONTIMP	0.232**	0.349**	0.161**	1										
5	PODIM_CUL	-0.053	0.259**	0.178**	0.451**	1									
6	PODIM_OWN	0.176**	0.258**	0.150**	0.469**	0.448**	1								
7	PODIM_MGMTCOM	0.058	0.216**	0.167**	0.567**	0.505**	0.575**	1							
8	PODIM_PPM	0.148**	0.225**	0.171**	0.579**	0.436**	0.556**	0.628**	1						
9	PODIM_KNDOC	0.041	0.182**	0.116*	0.626**	0.595**	0.484**	0.566**	0.582**	1					
10	FPDIM_FINMKT	0.154**	0.137**	0.021	0.199**	0.214**	0.137**	0.168**	0.172**	0.150**	1				
11	FPDIM_CUST	0.049	-0.020	0.040	0.203**	0.212**	0.159**	0.183**	0.164**	0.216**	0.226**	1			
12	POS_EXPLOI_ln	0.097*	0.115*	0.057	0.123**	-0.001	0.085	0.118**	0.048	0.069	0.131**	0.136**	1		
13	POS_EXPLOR_ln	0.038	0.302**	0.026	0.180**	0.042	0.147**	0.072	0.067	0.013	0.108*	0.114*	0.428**	1	
14	FPDIM_AMBI_ln	0.053	0.300**	0.028	0.182**	0.047	0.150**	0.087	0.068	0.043	0.139**	0.120**	0.585**	0.947**	1

Notes: ** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed).

Tab. 5-4: Pearson correlation of the continuous variables

The normality of the error term of the variate is assessed due to the same reasons already discussed above in the context of multivariate normality. In the case of non-normality of the residuals, the applied F and t-test would be invalid. [Backhaus et al. 2011, p. 96] As suggested by Hair et al. [2010, p. 185], normal probability plots are used to examine whether the distribution is ill-formed. These plots compare the standardized residuals with the normal distribution. The normal probability plots resulting from each of the performed hierarchical regression analyses are available in section C.2.4 of the appendix. None of these plots indicate substantial deviation from the straight diagonal line representing the normal distribution which leads to the conclusion that the regression variates meet the assumption of normality.

5.2.2 Process Orientation and Financial/Market Performance

This sub-section gives information on the regression results for the dependent variable 'financial and market performance'. After close consideration of the three regression models, it is tried to explain the reasons behind the revealed effects.

5.2.2.1 Regression Analyses

Tab. 5-5 shows the hierarchical regression results. The standardized regression coefficients as well as the t- and p-values referring to the significance of the relationships are reported. Since this work's intention is to determine whether individual PO dimension effects exist or not, the sign of the statistically significant regression coefficients are of primary interest. In contrast, when the regression models are used for prediction, the regression coefficients' magnitude becomes more important. [Kohlbacher 2009, p. 89]

	Regression Model 1			**Regression Model 2**			**Regression Model 3**		
	β	t	p	β	t	p	β	t	p
SIZE_ln	0.138	2.979	0.003**	0.145	2.981	0.003**	0.153	3.098	0.002**
DYNAMISM	0.116	2.410	0.016*	0.058	1.138	0.256	0.061	1.187	0.236
COMPETITION	-0.025	-0.525	0.600	-0.058	-1.220	0.223	-0.058	-1.189	0.235
PODIM_CONTIMP				0.048	0.706	0.480	0.004	-0.046	0.963
PODIM_CUL				0.182	2.951	0.003**	0.206	2.439	0.015*
PODIM_OWN				-0.040	-0.665	0.507	-0.033	-0.395	0.693
PODIM_MGMTCOM				0.038	0.577	0.564	0.120	1.234	0.218
PODIM_PPM				0.036	0.538	0.591	0.039	0.427	0.669
PODIM_KNDOC				-0.014	-0.203	0.839	-0.049	-0.522	0.602
$D_{INDUSTRY}$				-0.041	-0.872	0.384	-0.041	-0.864	0.388
$POCIxD_{INDUSTRY}$							0.065	0.753	0.452
$POCCxD_{INDUSTRY}$							-0.044	-0.541	0.589
$POPOxD_{INDUSTRY}$							0.003	0.031	0.975
$POMCxD_{INDUSTRY}$							-0.113	-1.124	0.262
$POPPMxD_{INDUSTRY}$							-0.009	-0.090	0.928
$POKDxD_{INDUSTRY}$							0.057	0.599	0.549
R^2	0.035			0.081			0.087		
ΔR^2				0.047**			0.005		
F	5.402**			3.952***			2.605**		
n	457								

Notes: Dependent variable: Financial and market performance (FPDIM_FINMKT). Standardized regression coefficients are reported. *p<0.05, **p<0.01, ***p<0.001. All tests are two tailed. Continuous process improvement multiplied by industry affiliation ($POCIxD_{INDUSTRY}$), corporate culture multiplied by industry affiliation ($POCCxD_{INDUSTRY}$), process owner role multiplied by industry affiliation ($POPOxD_{INDUSTRY}$), management commitment multiplied by industry affiliation ($POMCxD_{INDUSTRY}$), process performance measurement multiplied by industry affiliation ($POPPMxD_{INDUSTRY}$), process knowledge and documentation multiplied by industry affiliation ($POKDxD_{INDUSTRY}$).

Tab. 5-5: Effects of individual PO dimensions on financial and market performance

It is started by estimating the baseline model containing the control variables (regression model 1). According to the value of R^2, this model explains 3.5% of the variance in the financial and market performance ratings. The corresponding overall F-value of 5.402 shows that the model is valid for the entire population having a significance level of less than 1%. In examining the individual control variables it is found that the effects of firm size (SIZE), measured by the number of employees, and environmental dynamism (DYNAMISM) are significantly positive ($p<0.01$ and $p<0.05$ respectively) wherefore H_0 can be rejected.

The next model (regression model 2) adds the variables of interest (PO dimensions and industry dummy). The model explains 8.1% of the variance in the financial and market performance scale. This increases the variance explanation by 4.7%. The corresponding partial F-value of 3.250 indicates that the gain of information is significantly different from zero ($p<0.01$). Furthermore, regression model 2 has an overall F-value of 3.952. It is significant at an 1‰ level which indicates that the model is not only representative of the sample, but also of the population. The inspection of the single variables reveals two significantly positive effects. On the one hand, firm size has a beta weight of 0.145 with a t-value of 2.981, and on the other hand, the culture in line with the process approach (PODIM_CUL) achieves an even higher beta-value of 0.182. Both variables' significance level is well below 1%. The former finding is in line with the results of prior studies, including the ones of Chari, Devaraj and David [2008, p. 230], Kohlbacher [2009, p. 96] or Stam and Elfring [2008 p. 105], which report a positive relationship between a company's size and its financial performance.

Adding the interaction terms in regression model 3 results in an increase of the explained variance of financial and market performance by 0.5% up to 8.7%. However, the corresponding partial F-value of 0.411 with a p-value of 0.871 does not permit the rejection of H_0, since the error probability is clearly above the typical 5% level. Nevertheless, the overall model with an F-value of 2.605 is valid for the selected Austrian manufacturers and service providers employing at least 50 people. All of the interaction terms have a significance level well above the 5% threshold. This evidence indicates that the investigated PO effects do not differ significantly between manufacturers and service providers.

5.2.2.2 Interpretation of Results

Kueng [2000, p. 73] argues that processes affect the financial situation of a company, because they require financial and non-financial resources on the one hand and create value for the customers on the other hand. There is much empirical research work which addresses the issue of process management's financial implications within organizations. However, the findings of these studies are rather ambiguous. [Benner, Tushman 2003, p. 239] Nevertheless, a plethora of studies (qualitative and quantitative ones) exist which report that PO makes a positive contribution to financial performance [Kohlbacher 2009, p. 31]. A specific link between PO and sales growth or increased market shares was detected by Bulitta [2006, p. 487] and Wahlich [2004, p. 27]. The reasons for the ambiguity in the results of former scientific research might not only be different implementations of BPM practices within companies [Benner, Tushman 2003, p. 239], but also the used performance measurement parameters or varying business environments in terms of dynamism and competitive intensity in which firms are embedded. Furthermore, this ambiguity might be caused by the lack of consideration of single dimensions of PO.

In general, corporate culture makes a large contribution to a company's success and survivability respectively [Mochtarova 2000, p. 124; Wagner, Patzak 2007, p. 271]. This circumstance results from the fact that employees build the heart of an enterprise, as they

plan, execute and optimize the processes within organizations [Wagner, Patzak 2007, p. 207]. In further consequence, this means that employees bear the culture and vice versa if a strong and positive corporate culture exists [Albs 2005, p. 43]. As it was already shown in the study performed by Kohlbacher [2009, p. 115], the more a company's culture is in accordance with the process approach, the higher its financial performance. Within the Master's Thesis' context this means increased financial and market performance by contrast to competitors. This is associated with the findings of Birchall, Chanaron and Sonderquist. The French SMEs' ranking of performance sources indicated that on the one hand continuous work process improvement is the essential action in order to improve short-term profitability. On the other hand, according to the respondents' assessments, a company's long-term well-being can be improved best when customer focus is increased. [Birchall, Chanaron, Sonderquist 1996 quoted by Terziovski 2002, p. 7] Both are factors which are embedded in the process culture.

5.2.3 Process Orientation and Customer Satisfaction

The results of the hierarchical regression analyses for PO and customer satisfaction are reported in this sub-section. The interpretation of the revealed effect can be found on pages 80 and 81.

5.2.3.1 Regression Analyses

The three estimated regression models using 'customer satisfaction' as dependent variable are presented in Tab. 5-6.

	Regression Model 4			**Regression Model 5**			**Regression Model 6**		
	β	t	p	β	t	p	β	t	p
SIZE_ln	0.045	0.948	0.343	0.031	0.645	0.519	0.025	0.509	0.611
DYNAMISM	-0.020	-0.416	0.678	-0.098	-1.930	0.054	-0.096	-1.861	0.063
COMPETITION	0.044	0.902	0.367	0.003	0.066	0.947	-0.002	-0.045	0.964
PODIM_CONTIMP				0.115	1.701	0.090	0.159	1.714	0.087
PODIM_CUL				0.125	2.030	0.043*	0.173	2.064	0.040*
PODIM_OWN				0.040	0.672	0.502	-0.016	-0.197	0.844
PODIM_MGMTCOM				0.059	0.893	0.372	0.098	1.016	0.310
PODIM_PPM				-0.055	-0.836	0.404	-0.088	-0.976	0.330
PODIM_KNDOC				0.069	0.992	0.322	0.124	1.340	0.181
$D_{INDUSTRY}$				-0.069	-1.472	0.142	-0.069	-1.460	0.145
$POCIxD_{INDUSTRY}$							-0.057	-0.664	0.507
$POCCxD_{INDUSTRY}$							-0.073	-0.894	0.372
$POPOxD_{INDUSTRY}$							0.082	0.971	0.332
$POMCxD_{INDUSTRY}$							-0.060	-0.601	0.548
$POPPMxD_{INDUSTRY}$							0.064	0.679	0.498
$POKDxD_{INDUSTRY}$							-0.094	-0.999	0.319
R^2	0.004			0.086			0.101		
ΔR^2				0.082***			0.015		
F	0.588			4.180***			3.081***		
n	457								

Notes: Dependent variable: Customer satisfaction (FPDIM_CUST). Standardized regression coefficients are reported. *p<0.05, **p<0.01, ***p<0.001. All tests are two tailed. Continuous process improvement multiplied by industry affiliation ($POCIxD_{INDUSTRY}$), corporate culture multiplied by industry affiliation ($POCCxD_{INDUSTRY}$), process owner role multiplied by industry affiliation ($POPOxD_{INDUSTRY}$), management commitment multiplied by industry affiliation ($POMCxD_{INDUSTRY}$), process performance measurement multiplied by industry affiliation ($POPPMxD_{INDUSTRY}$), process knowledge and documentation multiplied by industry affiliation ($POKDxD_{INDUSTRY}$).

Tab. 5-6: Effects of individual PO dimensions on customer satisfaction

Regression model 4 contains only the control variables. These three independent variables account for a R^2 value of 0.004 which means that approximately 0.4% of the variation in customer satisfaction can be explained. The carried out F-test leads to non-significance with respect to the entire model (F-value of 0.588, error probability of about 60%). This implies that the independent control variables contained in regression model 4 are not significantly effecting customer satisfaction in their entirety. This fact makes the closer inspection of the included independent variables obsolete.

The R^2 value of regression model 5 indicates that 8.6% of the variance of customer satisfaction can be explained by the ten predictors. This represents an increase of the explained variance by 8.2%. The corresponding partial F-value of 5.701 shows that the gain of information is significant at an 1‰ level. With an overall F-value of 4.180, the regression model is representative for the entire population at the same significance level as mentioned before. The assessment of the independent variables exposes that it is, again, the corporate culture in line with the process approach (PODIM_CUL) which significantly affects, in this case, customer satisfaction at a 5% level.

By adding the interaction terms, which results in the estimated regression model 6, an increase of the explained variance of customer satisfaction ratings by 1.5% up to 10.1% can be achieved. The corresponding partial F-value only accounts for 1.228 with a p-value of 0.290 which is not enough to reject H_0. However, the overall model with an F-value of 3.081 is valid for the defined Austrian population at an 1‰ level. The significance levels of the interaction terms are all above 30%. This evidence shows that the individual PO effects on customer satisfaction do not differ significantly between the two compared industry sectors.

5.2.3.2 Interpretation of Results

A positive effect of PO on customer satisfaction was already discovered by multiple studies (see Tab. 3-13 on page 35 or Kohlbacher [2009, p. 31]). As the findings of this empirical study show, the culture in line with the process approach is the central predictor within this context. This is in line with the research results of Kohlbacher [2009, p. 163] where a strong positive impact of the process culture on customer satisfaction was revealed. This relationship can be understood intuitively and is rather unsurprising. Customer orientation is embedded in a company's process culture [Hammer 2007b, p. 115] which, for its part, is immediately brought into connection with customer satisfaction [Gillespie et al. 2008, p. 119]. The performed study by Gillespie et al. [2008, p. 128] showed that, above all, the combination of customer orientation and coordination or rather integration throughout the entire organization strongly affects the satisfaction of customers[26]. Furthermore, the study of Nilsson, Johnson and Gustafsson [2001, p. 13] proves that the effect of PO is mediated by customer orientation within the manufacturing industry as against the service industry. This is caused by the fact that the production process is not visible to the customers in the manufacturing context (see section 3.4).

Similar findings were reported by Yeung, Cheng and Chan. According to their study's results, customer orientation leads to time-based efficiency and subsequently to increased customer satisfaction in terms of fewer complaints, reliable products and improved relations [Yeung, Cheng, Chan 2004, p. 93]. This originates from the fact that speedy and timely operations are highly valued by customers, especially in highly competitive and changing environments [Yeung, Cheng, Chan 2004, p. 86]. Therefore, the analysis of customer concerns and needs on

[26] Significant ($p<0.1$ and $p<0.05$) and positive correlations of both personal responsibility within the framework of empowerment and teamwork with customer satisfaction were also reported. [Gillespie et al. 2008, p. 122ff]

the one hand, and proactive responses on the other hand should result in time-based efficiency in the sense of both reduced lead times and reliable as well as timely deliveries. At the same time, the strong link between customer orientation and continuous process improvement is stressed. The latter results in cost efficiency (through process optimization and variance reduction [Yeung, Cheng, Chan 2004, p. 86]) which is likewise positively related to customer satisfaction. [Yeung, Cheng, Chan 2004, p. 93] Continuous process improvement is not only contained as individual construct in the underlying questionnaire of this present study, including indicators such as the degree to which methods and programs for this purpose are used, but also embedded as an individual item within corporate culture at the performing level. This further supports the significant positive impact of the process culture. It is worthwhile noting that the mere effect of continuous process improvement construct can be seen in regression model 5 in Tab. 5-6 on page 79. However, with $p<0.1$ this effect is only marginally significantly reflected. This circumstance might also indicate that applying methods such as KAIZEN and Six Sigma or having change management and process redesign experts employed is not sufficient in this context and that the staff's behavior and attitude towards these activities tend to be more important.

5.2.4 Process Orientation and Exploitative Innovation

This sub-section starts with the description of the hierarchical regression results for PO and exploitative innovation. Afterwards (on pages 82 to 84), it is tried to explain the reasons behind the revealed effects and differences.

5.2.4.1 Regression Analyses

The results of the regression analyses regarding exploitative innovation are represented in Tab. 5-7 on the next page containing the models relating to the control variables (regression model 7), main effects (regression model 8) and interactions (regression model 9). Exploitative innovation was measured in terms of 'last year's sales share achieved through incrementally improved goods and services which were launched within the last three years'. The equation estimation of regression model 7 results in a R^2 value of 0.016. Therefore, it can be said that approximately 1.6% of the variation in the exploitative sales shares is accounted for by the three control variables included in the model. The model's overall F-value is 2.518. However, the significance level has not reached the 5% threshold. Thus, H_0 has to be retained meaning that this model is not valid for the population. In further consequence, the investigation of the included control variables is not necessary.

The inclusion of both the single PO variables and the industry dummy results in the estimated regression model 8. This model explains 6.3% of the variance in the sales shares resulting from exploitative innovations. This increase by 4.7% is statistically significant at an 1% level, since the associated partial F-value accounts for 3.181. The regression model's overall F-value of 3.952 further indicates that the entire model is valid for the examined Austrian manufacturing and service organizations with an error probability of 1%. The consideration of the included independent variables reveals a positive relationship between management commitment towards the process program (PODIM_MGMTCOM) and achieved sales shares through exploited goods and services, but also a negative effect of the culture in line with the process approach (PODIM_CUL), ordered by the strength of the effects. Furthermore, the dummy ($D_{INDUSTRY}$) indicates that service providers achieve smaller shares of sales through exploited services than manufacturers with exploited goods. These effects and differences respectively are significant at a 5% level.

Regression model 9 expands model 8 by six interaction terms. This increases the explained variance in the sales share scale by 1.6%, resulting in a R^2 value of 0.079. However, the corresponding partial F-value of 1.285 does not reach the 5% significance level, wherefore this gain of information cannot be considered as significant in the population. Nevertheless, the significant overall F-value of 2.369 (at an 1% level) enables the generalization of the sample findings to the population. All but one interaction terms are not classified as significant. The evidence indicates that there is a significant difference between predominantly manufacturers and service providers regarding the utility of process performance measurement for increasing a firm's exploitative innovation performance ($POPPMxD_{INDUSTRY}$).

	Regression Model 7			**Regression Model 8**			**Regression Model 9**		
	β	t	p	β	t	p	β	t	p
SIZE_ln	0.072	1.543	0.123	0.053	1.088	0.277	0.068	1.375	0.170
DYNAMISM	0.095	1.953	0.051	0.098	1.908	0.057	0.090	1.724	0.085
COMPETITION	0.012	0.259	0.796	0.000	-0.008	0.994	0.010	0.206	0.837
PODIM_CONTIMP				0.058	0.852	0.395	0.059	0.633	0.527
PODIM_CUL				-0.147	-2.356	0.019*	-0.132	-1.552	0.121
PODIM_OWN				0.044	0.728	0.467	-0.060	-0.707	0.480
PODIM_MGMTCOM				0.150	2.242	0.025*	0.195	1.999	0.046*
PODIM_PPM				-0.127	-1.895	0.059	0.001	0.016	0.987
PODIM_KNDOC				0.087	1.225	0.221	0.022	0.234	0.815
$D_{INDUSTRY}$				-0.109	-2.284	0.023*	-0.109	-2.291	0.022*
$POCIxD_{INDUSTRY}$							0.003	0.040	0.968
$POCCxD_{INDUSTRY}$							-0.023	-0.282	0.778
$POPOxD_{INDUSTRY}$							0.153	1.802	0.072
$POMCxD_{INDUSTRY}$							-0.070	-0.697	0.486
$POPPMxD_{INDUSTRY}$							-0.199	-2.088	0.037*
$POKDxD_{INDUSTRY}$							0.108	1.142	0.254
R^2	0.016			0.063			0.079		
ΔR^2				0.047**			0.016		
F	2.518			3.007**			2.369**		
n	457								

Notes: Dependent variable: Exploitative innovation (POS_EXPLOI_ln). Standardized regression coefficients are reported. *p<0.05, **p<0.01, ***p<0.001. All tests are two tailed. Continuous process improvement multiplied by industry affiliation ($POCIxD_{INDUSTRY}$), corporate culture multiplied by industry affiliation ($POCCxD_{INDUSTRY}$), process owner role multiplied by industry affiliation ($POPOxD_{INDUSTRY}$), management commitment multiplied by industry affiliation ($POMCxD_{INDUSTRY}$), process performance measurement multiplied by industry affiliation ($POPPMxD_{INDUSTRY}$), process knowledge and documentation multiplied by industry affiliation ($POKDxD_{INDUSTRY}$).

Tab. 5-7: Effects of individual PO dimensions on exploitative innovation

5.2.4.2 Interpretation of Results

Successful innovations need support or rather the commitment of the management. Several studies have already pointed out this fact [Yang, Hsu 2010, p. 2234]. Irani and Sharp [1997, p. 204] note that (i) the management's faith in innovation; (ii) the provision of required resources; and (iii) the management's support are counted among those essential characteristics of an organization which promote innovation. The importance of management commitment furthermore arises from the fact that a company's inertia can only be overcome with the help of the top-management's power [Yang, Hsu 2010, p. 2234]. It is the top-management which targets a company's vision, goals and values which, in the end, should be reflected in the corporate culture [Mokhtar, Yusof 2010, p. 292]. Thereby, the management acts as a kind of role model or pioneer, as already mentioned, for all other employees within a company. In the concrete case, how their commitment towards process management with its continuous process improvements is lived [Elshennawy, Maytubby, Aly 1991, p. 92]. With

the support of process management practices, an environment of incremental change regarding organizational routines is established. In further consequence, this finds its expression in the development processes and, hence, also in the companies' innovations. [Benner, Tushman 2002, p. 680; Benner, Tushman 2003, p. 345] The top-management's actions and convictions support innovation activities in an incremental manner within a process-oriented organization. These facts underline the substantial influence of setting an example of values on a company's explorative and exploitative behavior [Geerts, Blindenbach-Driessen, Gemmel 2010b, p. 31]. Thus, it can be said that the more continuous process improvement and thinking in processes is communicated by the top-management and, in succession implemented by the employees, the more efficient innovation processes become resulting, though, in smaller variance of the output. This leads to increased incidence of exploitation caused by incremental learning within given technologies. [Benner, Tushman 2002, p. 680; Benner, Tushman 2003, p. 345]

In the most general sense, culture is decisive for a company's innovation capacity [Meyer 2011, p. 25]. The negative value for the association between the culture in line with the process approach and exploitative innovation is somewhat surprising and may seem to run counter to the arguments made so far. Such a link is expected in the context of exploration. Benner and Tushman [2002, p. 682] argue that a culture based on continuous improvement prevents exploration due to conflicts, distrust and increased control [Repenning, Sterman 2002, p. 265]. It was also verified that BPM activities and therewith the culture associated are strong drivers of exploitation based on existing knowledge [Benner, Tushman 2002, p. 699]. Furthermore, the study performed by Calantone and Rubera [2012, p. 154f] revealed that the collaboration between business units is positively associated with the development of exploitative innovations. Even in the service industry, Cheng and Krumwiede [2011, p. 65] pointed out that customer orientation, which is part of the process culture, is the main driver of incremental innovations.

In order to explain this relationship several experts were consulted. Their range of expertise included organizational, human resource and innovation management as well as economic ethics. Besides methodological causes, only a few theoretical or practical solutions were offered. It is known from behavioral research that a process organization suits the majority of people very well, since it prefers working according to established procedures. Simultaneously, these people, however, have a natural aversion to change. [Wagner, Patzak 2007, p. 222; Gay 2002, p. 48ff] The different types of personality may, indeed, have an influence on corporate culture, as they represent the smallest unit of an organization and, consequently, its culture [Wagner, Patzak 2007, p. 207]. Nevertheless, the mentioned behavioral tendency alone cannot be taken as an indication that a culture strongly based on factors such as teamwork and customer focus leads to lower exploitative innovation outcomes. For that reason, there is the need for further research on this effect.

Services are processes involving customers. Consequently, service innovations can be seen as part of these interactive processes. Incremental innovations which are implemented together with the customers are typical for service providers. However, this exploitation is rather unstructured and itself an emergent process. [Geerts, Blindenbach-Driessen, Gemmel 2010b, p. 43] In general, the innovation process of services is characterized by less formalization as compared to similar processes within the manufacturing sector [Geerts, Blindenbach-Driessen, Gemmel 2010b, p. 43] and most of the remaining other critical functions within an enterprise respectively. This lack arises, for example, out of the missing standardization which is caused by the integration of the customer into the service provision (to varying degrees). [Ettlie, Rosenthal 2011, p. 285] The customer or external factor in general is

characterized by its own heterogeneity which is likewise not beneficial for standardization, since each customer has different requirements, expectations and claims [Frei et al. 1999, p. 1211]. This leads to the fact that each service attains its own individual character and represents something unique to a certain extent [Benkenstein, Steiner 2004, p. 34].

In the light of the circumstances described above, the application of metrics is quite difficult, as they become variant [Ettlie, Rosenthal 2011, p. 285]. This is in accordance with the statement of Gallouj and Weinstein [1997, p. 537] that the fuzzy nature of the service output considerable impedes its measurement. According to Parasuraman, Zeithaml and Berry [1985, p. 42], the intangibility combined with the consequent lack of precise specifications make services hard to count, measure, inventory and test, too. Due to the fact that the customer is directly involved into the service creation process, considerations with regard to changes in these processes are primarily made on the basis of customers' wishes and their observed behaviors. This means that the efficiency aspect, whose basis is provided by process performance measurement and the accompanying key figures, plays a rather subordinated role. [Stauss, Bruhn 2004, p. 9] The study performed by Ettlie and Rosenthal [2011, p. 295] clearly shows that the co-determination of outcomes by customers and service providers is one of the reasons for the existing measurement difficulties in service innovation development. Thus, measuring processes being viewed as rather difficult might have an enormous error potential.

Altogether, this suggests the following consideration. Acting cautiously is important when key figures are introduced in enterprises in general and this is not done in a fail-safe manner. All employees head for the defined performance indicators. However, when the model of key figures is incorrect, working with these figures might not be helpful at all, but could backfire instead. It is probably more difficult for service providers to find suitable process performance indicators, since the service performance is characterized by high variance. Consequently, those service providers who have indicated using the figures might do it in the wrong way, wherefore process performance measurement may be less helpful for exploitative innovation in this particular context than in manufacturing. The difference between manufacturing and service organizations concerning their exploitative innovation outcomes is discussed in section 5.2.7 on page 92.

5.2.5 Process Orientation and Explorative Innovation

Information on the results of the regression analyses for the dependent variable 'explorative innovation' is provided in this sub-section. Furthermore, the revealed significant effects are interpreted, starting on page 86.

5.2.5.1 Regression Analyses

The results of the regression analyses using 'last year's sales share achieved through radically improved goods and services which have been launched within the last three years' as dependent variable are presented in Tab. 5-8 on the following page. The first estimated model (regression model 10) explains 8.0% of the variance in the sales share data. With a corresponding overall F-value of 13.185, this model can be generalized to the entire population at a significance level of 1‰. The examination of the included control variables reveals a strongly positive effect of environmental dynamism (DYNAMISM), at an 1‰ level, with a corresponding t-value of 6.248. This permits the rejection of H_0 which means that the effect is valid for the basic population.

Regression model 11 includes further the PO dimensions and the service dummy. The estimation of the regression equation results in a R^2 value of 0.127 which means that the variance in the stated shares of turnover is to approximately 12.7% explained by the ten predictors. This increase of the explained variance by 4.7% is statistically significant at an 1% level (partial F-value of 3.424). The model's overall F-value of 6.500 indicates that the model is not only valid for the sample, but also for the total population even at a significance level of 1‰. Besides the significant effect of environmental dynamism, the inspection of the independent variables shows a significantly positive effect of continuous process improvement (PODIM_CONTIMP) at an 1% level and of the process owner role (PODIM_OWN) at a 5% level. Additionally, a negative effect of process knowledge and documentation (PODIM_KNDOC) is reported having an error probability of 3.5%. As in case of exploitative innovation, the dummy variable ($D_{INDUSTRY}$) also refers to smaller shares of sales resulting from explorative innovations achieved by service providers compared to manufacturers. This revealed difference is significant at a 5% level.

	Regression Model 10			**Regression Model 11**			**Regression Model 12**		
	β	t	p	β	t	p	β	t	p
SIZE_ln	0.000	-0.007	0.995	-0.052	-1.095	0.274	-0.047	-0.973	0.331
DYNAMISM	0.292	6.248	0.000***	0.265	5.319	0.000***	0.257	5.103	0.000***
COMPETITION	-0.055	-1.189	0.235	-0.067	-1.450	0.148	-0.069	-1.473	0.142
PODIM_CONTIMP				0.179	2.717	0.007**	0.269	2.963	0.003**
PODIM_CUL				-0.054	-0.901	0.368	-0.024	-0.294	0.769
PODIM_OWN				0.132	2.268	0.024*	0.087	1.070	0.285
PODIM_MGMTCOM				-0.013	-0.196	0.845	-0.017	-0.181	0.856
PODIM_PPM				-0.037	-0.579	0.563	-0.014	-0.154	0.878
PODIM_KNDOC				-0.144	-2.114	0.035*	-0.242	-2.665	0.008**
$D_{INDUSTRY}$				-0.106	-2.303	0.022*	-0.108	-2.346	0.019*
$POCIxD_{INDUSTRY}$							-0.119	-1.417	0.157
$POCCxD_{INDUSTRY}$							-0.033	-0.415	0.678
$POPOxD_{INDUSTRY}$							0.055	0.668	0.504
$POMCxD_{INDUSTRY}$							0.000	0.000	1.000
$POPPMxD_{INDUSTRY}$							-0.043	-0.467	0.641
$POKDxD_{INDUSTRY}$							0.147	1.599	0.110
R^2		0.080			0.127			0.135	
ΔR^2					0.047**			0.008	
F		13.185***			6.500***			4.294***	
n	457								

Notes: Dependent variable: Explorative innovation (POS_EXPLOR_ln). Standardized regression coefficients are reported. *p<0.05, **p<0.01, ***p<0.001. All tests are two tailed. Continuous process improvement multiplied by industry affiliation ($POCIxD_{INDUSTRY}$), corporate culture multiplied by industry affiliation ($POCCxD_{INDUSTRY}$), process owner role multiplied by industry affiliation ($POPOxD_{INDUSTRY}$), management commitment multiplied by industry affiliation ($POMCxD_{INDUSTRY}$), process performance measurement multiplied by industry affiliation ($POPPMxD_{INDUSTRY}$), process knowledge and documentation multiplied by industry affiliation ($POKDxD_{INDUSTRY}$).

Tab. 5-8: Effects of individual PO dimensions on explorative innovation

The inclusion of the interaction terms results in an increase of the explained variance of the belonging sales shares by 0.8% up to 13.5% as compared to regression model 11. The corresponding partial F-value only accounts for 0.667 with a p-value of 0.677 which prohibits the rejection of H_0. However, since the overall F-value of 4.294 is significant at an 1‰ level, regression model 12 can be generalized to the defined Austrian population. The significance levels of the interaction terms are all above 10%. With regard to the interaction terms this leads to the conclusion that the investigated PO effects on the sales shares achieved via explored goods and services do not differ significantly between the two investigated industry sectors.

5.2.5.2 Interpretation of Results

The significant positive impact of environmental dynamism on explorative innovation is consistent with the study results of Jansen, Vera and Crossan [2009, p. 13], Koller [2011, p. 87] and Kochauf [2011, p. 65]. This is caused by the fact that goods and services become rather quickly obsolete within environments which are characterized by dynamism. As a result, suitable novelties need to be developed, since the routines which are continuously improved within the framework of exploitation are less and less valued by such an environment [Sørensen, Stuart 2000, p. 87]. Due to this compulsion, companies tend to face these dynamic and insecure environments with radical innovations [Tushman, Romanelli 1985, p. 207], leading to the conclusion that environmental dynamism is a significantly greater predictor for exploration than for exploitation [Koberg, Detienne, Heppard 2003, p. 38]. This fact was also observed in the study performed by Jansen, Vera and Crossan [2009, p. 13] and is confirmed by the Master's Thesis' study results. The comparison of the regression models 8 and 11 (contained in Tab. 5-7 on page 82 and Tab. 5-8 on page 85 respectively) indicates on the one hand, that the significance level of 5% is narrowly missed in the context of exploitative innovation. On the other hand, substantial differences in the variable's standardized regression coefficients are revealed.

At the first moment, such a positive impact of continuous process improvement would be more logical in the context of exploitation. Nevertheless, continuous process improvement methods such as Lean Sigma, which were part of the dimension's operationalization, need not necessarily be in conflict with innovations of this type. In general, Terziovski [2002, p. 6] argues that revenues resulting from radical novelties are not sustainable without a culture of continuous improvement. Innovations associated with the latter activities ensure permanent quality and make goods and services more efficient in order to increase competitiveness [Meyer 2011, p. 10] and to avoid that improved versions of the 'new' product are launched by competitors driving the company's original innovation out of the market. The positive link between continuous process improvement and explorative innovation further arises out of the following considerations.

Continuous improvement tends to be more important for new processes which have to be introduced within the framework of exploration. Processes associated with exploitative innovation activities are already experienced and systematic [McLaughlin, Bessant, Palie 2005, p. 2], especially within the manufacturing sector. Consequently, less or smaller changes arise in the context of incremental innovation compared to the introduction of completely new value-adding processes. Processes related with explorative innovation offer great potential for improvement (they can be ill-defined, unstructured and complexly modeled [McLaughlin, Bessant, Palie 2005, p. 2] causing high error and scrap rates as well as additional time and costs for subsequent improvements [Töpfer, Günther 2009, p. 87]) until they become a matter of routine themselves after some time. Finally, it only has to be worked on the continuous fine tuning. Perhaps, it is also necessary to introduce new processes for idea generation involving a wide area of external sources. Especially, this might be required when companies shift their innovation focus. Focusing solely on the continuous interaction with existing customers usually does not result in radical innovation ideas [McLaughlin, Bessant, Palie 2005, p. 15]. Exploration typically requires varying technological and functional expertise which increases its complexity, since these innovations do not build upon existing goods and services [Azadegan, Wagner 2011, p. 57]. However, first of all those processes need to be designed and executed efficiently.

Six Sigma initiatives are used for different purposes, including the solution of particular problems raised by existing customers. Consequently, the pursuit of process improvements results in enhanced existing goods and services which potentially satisfy the needs of existing customers, but might attract a new customer base as well. Hence, it is pointed out that a basis for addressing both existing and new customers can be established when Six Sigma projects are still at an early stage of implementation[27] [Parast 2011, p. 51]. The learn cycles which are boosted by continuous improvements are able to reduce risk-aversion and support innovation by reducing the costs and consequences associated with negative outcomes [Reinertsen, Shaeffer 2005, p. 54]. The IBM Global CEO Study performed in 2006 involving 765 worldwide leaders revealed that Lean Six Sigma not only enables breakthrough innovations, but is also able to establish a culture promoting continuous innovation [Byrne, Lubowe, Blitz 2007, p. 6].

The crux within this context, however, is the interpretation of the elements of process thinking, the made choices and the spirit of their deployment. Standardization should not be viewed as finalization. In contrast, as concretely queried in the continuous process improvement construct contained in the Master's Thesis' questionnaire, it should be regarded as continuous process of further improvement. According to Johnstone, Pairaudeau and Pettersson, the true aim of standardization in this context is to ensure that work is conducted in accordance with best practices. Simultaneously, employees should endeavor to continuously improve these practices and communicate their efforts after successful proving. Through this approach, not only continuous improvement but also innovation rather explorative in nature is supported by standardization. Furthermore, it is noted that the decision for process variance reduction should be based on the consideration whether the variation is desirable or undesirable (see Reinertsen and Shaeffer [2005, p. 54] or the discussion of Hammer and Stanton [1999, p. 114]), because R&D processes are characterized by higher levels of variation, especially in the context of services. Based on the decision taken, the advantages of process improvement can be brought to bear: faster, reproducible, stable and comparable outcomes are delivered in a reliable manner. Finally, identifying and eliminating superfluous and non-value adding processes frees resources. This does not automatically mean rationalization of human workforce. Instead of using these free resources for increasing productivity by continuing the same work, they should deal with explorative activities which would otherwise fall by the wayside. Without available resources it is impossible to implement innovations, regardless whether they have an exploitative or explorative character. [Johnstone, Pairaudeau, Pettersson 2011, p. 55; Wördenweber, Wickord 2008, p. 12; Meyer 2011, p. 22] Giving employees the time and opportunity to find out how to further develop their services is essential in this particular sector. Commonly, no individual departments exist within service organizations which solely focus on exploration [Geerts, Blindenbach-Driessen, Gemmel 2010b, p. 43].

The positive contribution that the process owner makes towards innovation has already been recognized by IBM. The redesign of their organization, which also included the introduction of process owners, increased their calculation unit's ability to successfully introduce new products [Hammer, Stanton 1999, p. 110]. As the study's findings clearly reveal, exploration is frequently an answer to dynamic environments in which companies are embedded. Depending on the changes in the economic framework conditions (market, new technologies and competitors), the process designs must also be further developed [Hammer, Stanton 1999,

[27] In Parast's [2011, p. 52] point of view, an important problem in this context is that Six Sigma implementations are not suitable for behavioral and change processes (decision making, communication or learning), since they cannot be addressed via specific, quantifiable and measureable goals of improvement.

p. 118]. Process owners guide these developments [Hammer, Stanton 1999, p. 111] and accordingly need to have strategic capabilities at their disposal. Owing to the fact that the design of a process constitutes its upper performance limit, the owners play a crucial role even without the consideration of external influences. They have the required competencies in order to reshape the process. [Kohlbacher, Grünwald 2011, p. 711] This circumstance becomes particularly important when taking the above mentioned characteristics of exploration processes into account. Thus, this role in a process-oriented organization is closely linked with the positively contributing continuous process improvement activities, as they are part of the process owners' responsibilities.

Particularly in the context of exploration, the importance of staffing the process owner role with experienced managers is further clarified by various considerations. On the one hand, the introduction of new exploration processes involves a great deal of time and effort (design, documentation, employee training, persuading employees of cross-departmental alterations, etc.) and requires appropriate experience and skills. On the other hand, it might be possible that sub-processes of the entire design and development process become lapsed for diverse new products whose market launch is intended. Due to different product characteristics it may be necessary to implement process variants. This decision is up to process owner who has to ensure that the process retains its initial goals and integrity. [Siemieniuch, Sinclair 2002, p. 456] In this case, process owners have to carefully balance the elements associated with the decisions (such as time, costs and quality) based on their experiences.

PO and BPM activities do not necessarily lead to positive outcomes, as already determined in the context of customer satisfaction. New product introductions can be hampered by time-consuming documentation and inflexible processes [Golann 2006, p. 379]. Golann observed that product innovation ideas are sometimes completely ignored or never launched on the market. This is caused by several circumstances [Golann 2006, p. 382; Meyer 2011, p. 14]: (i) structures are too rigid; (ii) decision-making processes are too time consuming; and (iii) the processes for obtaining approvals become too cumbersome for employees, since they require an enormous amount of documentation (especially in the context of ISO). The staff knows the process which needs to be executed and which activities (in this case documentation effort) are associated with it. In further consequence, employees prefer to withhold, maybe even brilliant, ideas instead of initiating the time-consuming process.[28] [Golann 2006, p. 382] According to respondents' statements, the process procedures led to a doubling of paperwork's load. As a result, employees have to deal too much with details rather than with the really relevant tasks. In particular, this might become problematic when the number of human resources is limited. [Golann 2006, p. 381] Within the context of explorative innovation the increased effort of documentation results from the fact that there is often little existing material (in terms of documentation and knowledge) to fall back on compared with exploitation.

The special nature of services also influences the corresponding innovation processes. Hipp and Verworn [2007, p. 107] remark that service innovations typically require flexibility and, partially, iterations. Consequently, it should be abstained from unnecessary formalization. According to Damanpour [1991, p. 589], formalization "*reflects the emphasis on following rules and procedures in conducting organizational activities*". Since this characteristic is usually measured by the amount of rule manuals defining workflows and job descriptions, higher degrees of process documentation could also be associated with higher degrees of formalization. Klappert et al. [2011, p. 237] remark that radical innovations cannot be

[28] This is a behavior which is often observed in connection with company suggestion systems.

expected from strongly formalized processes. The authors clarified their assertion with the aid of an example regarding the stage-gate model[29]. Typically, cross-functional teams make the decision whether product development continues or not at several milestone during the process. Although this composition combines different perspectives, this variety causes progress which is based on the lowest common denominator. In practice, this leads to incremental innovations with a minimum of risk. An ample scope for explorative innovations is therefore required. [Klappert et al. 2011, p. 236f]

Golann stresses the risk that employees tend to delay their procedures by waiting for formal processes. Another mentioned staff's tendency is adhering to existing and defined procedures instead of developing own creative ideas as response to unexpected market changes and acting immediately. Although it would be appropriate, the personnel is frequently under the obligation to act in such a way, since they do not have the permission to deflect from allegedly established procedures. [Golann 2006, p. 382] It was also recently discovered that, even within innovation departments, it is a common practice to strictly follow the defined rules and that their breaking is only possible to a very limited extent [Meyer 2011, p. 18]. In both cases, the severely restricted discretionary is caused by high degrees of formalization.

In further consequence, a strong focus on rules and regulations decreases employees' creativity and initiative [Meyer 2011, p. 18]. At the same time, this negative relationship could also be a sign of poor processes (regarding design and implementation), which lead to frustration instead of empowerment and in further consequence to obstructed creativity and innovation as well [Johnstone, Pairaudeau, Pettersson 2011, p. 55; Golann 2006, p. 381]. Furthermore, people often do not want to divest themselves of cumbersome innovation processes, since they have the need for protection. Meyer argues that well-organized processes pretend an apparent safety. Within environments characterized by incremental process thinking and safety the trial-and-error method, frequently necessary for achieving explorative innovations is typically not applied, leading to the considerations in sub-section 5.2.4.2. [Meyer 2011, p. 19] Another reason for the negative effect associated with process knowledge could be that employees are used to the routines. Rethinking might be difficult for these people, especially when they have been learning such innovation routines for years. [Meyer 2011, p. 23]

The revealed negative effect also finds support from Benner and Tushman. The two authors discovered in their performed long-term study that ISO practices – in concrete terms the documentation of processes and their adherence – have positive effects on exploitation[30], but hamper exploration [Benner, Tushman 2002, p. 690ff]. This is because the requirements affiliated to exploration are inconsistent with those of practices that are based on incremental process improvements [Benner 2009, p. 477]. Especially when companies are embedded in turbulent environments such a limitation can have fatal consequences [Benner, Tushman 2002, p. 700]. Therefore, an eye should be always kept on the nature of change within a company's business environment when PO is pursued. All in all, it can be said that conventional innovation processes with responsibilities, defined interfaces and clear responsibilities are only suitable for incremental improvements and recent developments on the basis of existing goods and services [Meyer 2011, p. 17f].

[29] A standardized innovation process [Hipp, Verworn 2007, p. 100].

[30] This is partially proven by the available evidence. See the variable's positive beta and t-test sign in regression model 8 in Tab. 5-7 on page 82. However, statistical significance was not met. It is noted that the articulation and codification of knowledge does not only promote organizational learning, but also extrapolates new possibilities for improving processes or existing products and services respectively [Azadegan, Wagner 2011, p. 58].

The difference between manufacturers and service providers regarding their explorative innovation outcomes is discussed in section 5.2.7 on page 92.

5.2.6 Process Orientation and Ambidexterity

This sub-section provides a short overview on the hierarchical regression results for PO and ambidexterity. On pages 91 and 92, the revealed significant effects are interpreted.

5.2.6.1 Regression Analyses

Tab. 5-9 presents the results of the regression analyses regarding the dependent variable 'ambidexterity' (multiplication of exploitative and explorative sales shares). Regression model 13 involving the control variables explains 7.8% of the variance in the ambidexterity data. Since the corresponding overall F-value accounts for 12.852, this model is also valid for the defined population at a significance level of 1‰. The examination of the included variables reveals the same positive effect of environmental dynamism (DYNAMISM) at an 1‰ level as in the case of explorative innovation.

	Regression Model 13			**Regression Model 14**			**Regression Model 15**		
	β	t	p	β	t	p	β	t	p
SIZE_ln	0.013	0.292	0.770	-0.029	-0.621	0.535	-0.022	-0.449	0.654
DYNAMISM	0.287	6.129	0.000***	0.268	5.387	0.000***	0.257	5.110	0.000***
COMPETITION	-0.052	-1.114	0.266	-0.067	-1.439	0.151	-0.065	-1.382	0.168
PODIM_CONTIMP				0.144	2.179	0.030*	0.234	2.579	0.010*
PODIM_CUL				-0.071	-1.176	0.240	-0.060	-0.735	0.463
PODIM_OWN				0.121	2.072	0.039*	0.067	0.823	0.411
PODIM_MGMTCOM				0.017	0.267	0.790	0.014	0.148	0.882
PODIM_PPM				-0.063	-0.980	0.328	-0.008	-0.091	0.927
PODIM_KNDOC				-0.078	-1.134	0.257	-0.181	-1.996	0.047*
$D_{INDUSTRY}$				-0.131	-2.847	0.005**	-0.133	-2.888	0.004**
$POCIxD_{INDUSTRY}$							-0.121	-1.439	0.151
$POCCxD_{INDUSTRY}$							-0.005	-0.060	0.952
$POPOxD_{INDUSTRY}$							0.068	0.824	0.411
$POMCxD_{INDUSTRY}$							0.000	0.004	0.997
$POPPMxD_{INDUSTRY}$							-0.092	-0.994	0.321
$POKDxD_{INDUSTRY}$							0.159	1.732	0.084
R^2	0.078			0.124			0.135		
ΔR^2				0.046**			0.011		
F	12.852***			6.333***			4.291***		
n	457								

Notes: Dependent variable: Ambidexterity (FPDIM_AMBI_ln). Standardized regression coefficients are reported. *p<0.05, **p<0.01, ***p<0.001. All tests are two tailed. Continuous process improvement multiplied by industry affiliation ($POCIxD_{INDUSTRY}$), corporate culture multiplied by industry affiliation ($POCCxD_{INDUSTRY}$), process owner role multiplied by industry affiliation ($POPOxD_{INDUSTRY}$), management commitment multiplied by industry affiliation ($POMCxD_{INDUSTRY}$), process performance measurement multiplied by industry affiliation ($POPPMxD_{INDUSTRY}$), process knowledge and documentation multiplied by industry affiliation ($POKDxD_{INDUSTRY}$).

Tab. 5-9: Effects of individual PO dimensions on ambidexterity

The inclusion of the variables of interest results in a regression function with a R^2 value of 0.124 which means that 12.4% of the variance in the calculated ambidexterity scale is accounted for by the ten independent variables included in regression model 14. The partial F-value of 3.340 indicates that this gain of information by 4.6% is statistically significant at an 1% level. The model's overall F-value of 6.333 furthermore enables the generalization to the selected Austrian manufacturers and service providers with a workforce of at least 50 people at a significance level of 1‰. The individual effects are rather similar to the one discovered in regression model 11. Continuous process improvements (PODIM_CONTIMP) with a t-value

of 2.179 and the process owner role (PODIM_OWN) with a t-value of 2.072 both significantly affect a firm's ambidexterity at a 5% level. Furthermore, the service dummy ($D_{INDUSTRY}$) refers to lower levels of ambidexterity exhibited by service organizations compared to manufacturing organizations even at a significance level of 1%.

The incremental contribution to the explanation of the variance of the interaction terms accounts for 1.1% resulting in a final R^2 value of 0.135. The related partial F-value amounts to 0.903, with a p-value of 0.493 which does not support the rejection of H_0. Nevertheless, the overall F-value of regression model 15 is 4.291 and can therefore be considered as significant at an 1‰ level. This implies that the model is valid for the population. The t-test, carried out with respect to the coefficients of the interaction terms, leads to non-significant results. In sum, the evidence shows that no significant differences exist between manufacturers and service providers regarding the individual PO effects on ambidexterity.

5.2.6.2 Interpretation of Results

The strong influence of environmental dynamism on a firm's ambidexterity is clearly in line with the findings of Jansen, Van den Bosch and Volberda [2005, p. 358]. Within this study not only a significant effect on ambidexterity is revealed when environmental dynamism and competitiveness interact, but also an individual effect of environmental dynamism is reported in this context. The same relationship is proven by the two Austrian studies performed by Koller [2011, p. 84] and Kochauf [2011, p. 71]. This is a visible sign that companies have recognized that synchronizing or achieving the balance between the exploitation of existing potentials and exploration of new opportunities is not only associated with advantages but also a necessity [Volberda, Lewin 2003, p. 2127f; March 1991, p. 71; Levinthal, March 1993, p. 105]. By following an integrated strategy of exploitation and exploration, on the one hand, greater performance synergies in various areas including relative technological competitiveness can be created compared to an individual implementation of these strategies [Terziovski 2002, p. 11]. On the other hand, such a strategy ensures the long-term sustainability of an enterprise [Levinthal, March 1993, p. 105; Koberg, Detienne, Heppard 2003, p. 22; Geerts, Blindenbach-Driessen, Gemmel 2010b, p. 23].

Since ambidexterity is a company's ability to simultaneously innovate exploitatively and exploratively on the one hand, and the positive driving PO dimensions are the same as in the context of explorative innovation on the other hand, the above statements can basically be adopted. A short look at the relationship between continuous process improvement and exploitation was already given in the previous sub-section. According to Benner and Tushman [2002, p. 680], the repetition and continuous improvement of established procedures generally result in their increased efficiency and proficiency. In the context of innovation processes this means faster innovation and, in the case that a decision for low variance was made, increasing amounts of exploited goods and services [Parast 2011, p. 50]. This once again underlines the direct connection between process improvement activities and such types of innovation which comply with reduced process variance.

In this context, it is worth noting that continuous, stepwise improvement is considered as greatest driver for any improvement efforts [Terziovski 2002, p. 6; Harrington 1995, p. 48]. Azadegan and Wagner [2011, p. 58] remark that the process of learning, which is passed regardless whether a company is exploiting or exploring its goods and services, takes place step-by-step. It is argued that the transfer of learning abilities to other parts of a company's business constitutes the real benefit of firms which implement new or improved processes and upgrade their skills. The two authors consider process improvement as exploitative learning which supports both exploitative and explorative innovation. Their study results endorse this

fact. [Azadegan, Wagner 2011, p. 63] Additionally, Wördenweber and Wickord [2008, p. 11] argue that efficiently and effectively running processes of innovation, which are achieved by continuous process improvement, are advantageous in any case. These findings or rather statements encourage once more the obtained result that continuous process improvement has a positive influence on ambidextrous innovation.

Furthermore, Schroeder et al. [2008, p. 537] allude that ambidextrous structures can be established with the aid of Six Sigma. These structures create the required conditions for the development of new ideas within an environment which is rather efficiency-oriented when these ideas are implemented and used [Daft, Murphy, Willmott 2010, p. 456]. Additionally, the accompanying Six Sigma mechanisms allow for the addressing of the contradictory requirements of control and exploration in the improvement efforts [Schroeder et al. 2008, p. 537].[31] Nevertheless, it is noted once more that an overemphasis on variance reduction within workflows or on continuous improvements of activities can tip the necessary balance between exploitation and exploration [Benner, Tushman 2002, p. 702; Parast 2011, p. 50]. The demands on the companies' innovation behavior should, therefore, always been taken into account. Continuous process improvement activities should be adapted to the current situation (see the above consideration of elements of process thinking and their interpretation) in order to support ambidexterity, but not to hamper it.

As already mentioned, the considerations regarding the relationship between the process owner role and explorative innovation are also applicable in the context of ambidexterity. The process owner role is of importance in general, since the employee who is in this position carries responsibility for the successful realization of the end-to-end process [Hammer 1997, p. 75]. In any case, process improvement can be performed regardless whether a problem exists or not [Ungan 2006a, p. 402]. Therefore, it should be treated as permanent task whose governance is performed by the process owner.

The retention of the two positively contributing PO dimensions can also be explained on closer consideration of the regression models and the calculation of the ambidexterity variable. The related coefficients' signs in the regression models 8 and 11 (see Tab. 5-7 and Tab. 5-8 on pages 82 and 85) are positive. However, the variables make a smaller contribution to the explanation of variance in the context of exploitative innovation than in the one of explorative innovation. Remember that the values of a company's ambidexterity score are calculated by multiplication. Since the indicated sales shares resulting from explored goods and services are lower and furthermore less frequently greater than zero compared to their exploited counterparts, the exploration scores have a greater influence on the computation. On that account the values remain within the defined significance level in the context of ambidexterity, but with higher error rates compared to the exploration figures. At this point it is recalled that the findings within this context have to be treated with caution, since internal consistence of this dependent variable is less than desirable.

The revealed difference between manufacturing and service organizations concerning their ambidextrous innovation behavior is discussed in in the following section.

5.2.7 Differences between Manufacturers and Service Providers Regarding their Innovation Behavior

The identified and significantly lower sales shares of service providers compared to manufacturers which are achieved in general with the help of innovations are confirmed by

[31] For additional information also see the work of Anand [2006, p. 81ff].

performed analyses of Statistik Austria. Within the period under review (the years 2006 to 2008), Austrian manufacturing organizations exhibited a higher degree of innovation compared to service organizations with regard to product innovations (in terms of new or significantly improved goods and services) and sales achieved by these innovations. The difference between manufacturers and service providers is lower when comparing the number or percentage of companies which innovate actively. In this case, 59.4% of the investigated manufactures are faced with 53.8% of service providers. [Statistik Austria 2011e] Nevertheless, this higher proportion of innovation active manufacturing companies is in line with the European ratios [Geerts, Blindenbach-Driessen, Gemmel 2010b, p. 36]. The mentioned difference is getting larger when considering only the amounts of companies which put product innovations on the market. In this case, the share of manufacturers with 36.5% outweighs the one of service providers with only 27.4%. [Statistik Austria 2011e] These percentages are comparable with figures ascertained in Great Britain earlier in time [Reichstein, Salter, Gann 2005, p. 635]. With the help of these product innovations, manufacturers of goods were able to achieve 17.6% of their sales in 2008 while service providers recorded a sales share of 7.2% on average [Statistik Austria 2011f]. This trend already existed at the end of the last millennium. The study performed by Sirilli and Evangelista [1998, p. 893] shows that the manufacturer's sales shares obtained through radical and incremental innovations were significantly higher than those of service organizations. This might result from the fact that innovations within the service sector are still a relatively new discipline wherefore the R&D spending in this sector has been continuously rising for the last few years [Ettlie, Rosenthal 2011, p. 286].

Geerts, Blindenbach-Driessen and Gemmel [2010a, p. 3ff] provide enhanced insights into the distinctions regarding the different types of innovation within their long-term study of Belgian enterprises. Their analyses revealed that service providers tend to exploitation[32] and punctuated equilibrium (alternating between exploitation and exploration) in their innovation activities. In contrast, the ambidextrous innovation strategy is more frequently chosen by innovative manufacturers in order to balance exploitation and exploration. According to the Belgian authors, the service providers' tendency towards exploitation is caused by the industry's focus on value creation for the customer and improving the efficiency of service delivery. It is further argued that service organizations do not have to invest in exploration continuously in order to stay up-to-date, since their innovations are typically less technical than those of manufacturing companies[33] on the one hand (see Nijssen et al. [2006, p. 244]). On the other hand, services are less frequently located in R&D-intensive branches [Geerts, Blindenbach-Driessen, Gemmel 2010b, p. 12]. The performed case study analysis leads to the conclusion that service providers can wait with their investments in explorative innovations until an opportunity or particular need occurs. The service providers' pursuit of punctuated equilibrium explains the even more significant difference in the context of ambidexterity between the two investigated sectors compared to the levels of exploitative and explorative innovation. Furthermore, the Belgian study shows that pure exploitation and pure exploration are more frequently pursued by manufacturers. Nevertheless, the innovation behavior is varying within single branches of both manufacturing and service industry [Geerts, Blindenbach-Driessen, Gemmel 2010b, 21f; Statistik Austria 2011f, Statistik Austria 2011g].

[32] This was also confirmed by the Austrian service study carried out by Klausegger and Salzberger [2004, p. 425], by Cheng and Krumwiede's [2011, p. 52] investigation or by Burr [2007, p. 76].

[33] It should be noted that this is an overall view of the service sector. For instance, IT services are, indeed, confronted with technological changes.

5.3 Summarization of Significant Findings

This section explored not only the individual effects of specific PO dimensions on organizational performance but also differences within this context between manufacturers and service providers. The values of the coefficients of determination in the models of primary interest are relatively low. The carried out F-tests, however, lead to significance at least at the 1% level. Therefore, it can be concluded that there is a weak, but highly significant linear relationship between process-oriented organizational design and firm performance in general. The main findings regarding the research questions are summarized in Tab. 5-10 on page 95. As can be seen, the majority of these findings are significant at a 5% level.

The empirical evidence indicates that continuous process improvement, a corporate culture in line with the process approach (with one exception), the process owner role and management commitment towards the process program are significantly and positively related with organizational performance. More specifically, the culture in line with the process approach seems to be of central importance for achieving better financial and market performance compared to competitors as well as higher levels of customer satisfaction. Based on the empirical data it can also be said that the more the management is committed to the process program (this means that a senior executive exists who takes leadership and responsibility of the process program, the management perceives process management as a way of managing the business, is actively engaged in the process program and provides adequate resources to improve core processes), the higher are the shares of turnover gained by exploited goods and services. Furthermore, continuous process improvement and the process owner role positively contribute to explorative and ambidextrous innovation performance. This implies that the more continuous process improvement is forced by a company and the more the concept of the process owner is implemented, the higher are the sales shares resulting from explored goods and services on the one hand and the ambidextrous performance on the other hand.

Nevertheless, negative and significant relationships are exposed too. Firstly, the more a culture is in line with the process approach (that is a culture based on customer orientation, where teamwork is taken for granted, where the employees feel accountable for process results, where the workers strive after process excellence, and where the management lives the processes), the lower are a company's sales shares resulting from exploited goods and services. Secondly, the more knowledge an employee has about the business processes and the more these processes are or rather have to be documented, the lower are the shares of turnover gained by explored goods and services.

Only one significant difference between manufacturing and service organizations is revealed. Service organizations are to a lower degree affected by process performance measurement (in terms of existing process performance indicators for several processes, their derivation from enterprise goals, their presentation to workers, their usage for initiating process improvement actions, and the general usage of ABC) than their manufacturing counterparts within the context of exploitative innovation. Since process performance measurement does not affect the corresponding sales shares significantly in the overall analysis, it can be concluded that the uncovered individual and significant effects of the PO dimensions on the different performance aspects are valid for both industry sectors.

	Financial/Market Performance	Customer Satisfaction	Exploitative Innovation	Explorative Innovation	Ambidexterity
Continuous Process Improvement				positive significant (1% level)	positive significant (5% level)
Corporate Culture	positive significant (1% level)	positive significant (5% level)	negative significant (5% level)		
Process Owner				positive significant (5% level)	positive significant (5% level)
Management Commitment			positive significant (5% level)		
Process Performance Measurement			significant difference (5% level)		
Process Knowledge and Documentation				negative significant (5% level)	

Notes: All tests are two tailed. Variables which did not significantly enter the regressions as well as control and dummy variables are not reported.

Tab. 5-10: Summarization of the revealed effects and differences relevant for answering the research questions

Although the evidence shows that process performance measurement does not have an individual effect on firm performance, it might be possible that this construct acts as enabler for other PO dimensions. For instance, in order to avoid that continuous process improvement is implemented aimlessly, process performance metrics must be in place. [Kohlbacher 2009, p. 172] This leads to the assumption that such dimensions which are not directly associated with firm performance outcomes may be necessary, since they provide the potential to achieve better results, but do not guarantee them [Hammer 2007b, p. 114; Kohlbacher 2009, p. 174].

6 Conclusion

This chapter gives a brief summary, points out research limitations and provides suggestions for further research.

6.1 Overall Summarization

The aim of this work was twofold: on the one hand to investigate the individual PO dimensions effects on organizational performance and on the other hand to examine whether these relationships are moderated by industry affiliation. For this purpose, a quantitative empirical study involving companies out of selected ÖNACE 2008 manufacturing and service sectors was carried out. More specifically, two web surveys were conducted in order to obtain dependent, independent and descriptive data. The personalized web survey variant was selected in order to gain a preferably large data sample which supports the demonstration of causal connection between PO dimensions and performance types. Several quality issues have been addressed. In order to ensure unidimensionality of all dimensions involved in this research project, factor analyses were employed. Furthermore, their reliability and validity were assessed. The evaluation of the data was performed via linear moderated regression analyses. Therefore, some key assumptions of multivariate data analysis methods have been assessed, including normality and multicollinearity, and countermeasures were taken if necessary and appropriate.

The empirical evidence indicates that continuous process improvement, a corporate culture in line with the process approach, the process owner role and management commitment towards the process program are significantly and positively related with certain types of organizational performance. Within this context, the culture in line with the process approach is the unique dimension which significantly contributes to the achievement of better financial and market performance compared to competitors as well as higher levels of customer satisfaction. The remaining dimensions become relevant in association with the investigated types of innovation. However, negative impacts have also been revealed. On the one hand, the more a culture is in line with the process approach, the lower a company's outcomes of exploitative innovation. On the other hand, the more knowledge an employee has about the business processes and the more these processes (or this knowledge) have to be documented, the lower a company's outcomes achieved through explored goods and/or services.

Another finding is that the innovation performance of service providers in general is still on a significantly lower level compared to the one achieved by manufacturers. This is conditioned, inter alia, by the fact that innovations in the service context are still a relatively new discipline. Regarding the second and central research question of this Master's Thesis, it can be said that only one significant difference between manufacturing and service organizations has been discovered. The difference concerns the utility of process performance measurement in the context of exploitative innovation. More specifically, the process performance indicators and ABC associated with the measurement of process performance are less helpful for generating exploitative service innovations. However, process performance measurement in general showed no individual effect on this particular innovation type. Hence, all significant effects of specific PO dimensions on organizational performance, which have been revealed when jointly examining the enterprises, do not depend on industry affiliation. Altogether, this leads to the conclusion that although the characteristics of goods and services are rather diverse and there might be differences regarding manufacturers' and service providers' performance, the positive and negative impacts of PO hold for both industries.

6.2 Research Limitations

As with any empirical study, this work has obvious limitations which should be recognized. First of all, this sample comprises only of Austrian companies operating in selected manufacturing and service sectors. Therefore, it cannot be ensured that the findings are generalizable to the remaining uninvestigated industry sectors or other countries.

As already outlined, it was not possible to contact the whole defined Austrian population within this study. Although the gap cannot be characterized as being large, it might be possible that some of the sectors are underrepresented. However, it might also be the case that parts of the manufacturing sectors are overrepresented. This could be caused by the fact that those companies taking part in the study of Kohlbacher [2009] have been interested to gain new insights into the topic and were already familiar with some parts of the questionnaires.

Although Harman's single factor test was conducted in order to examine whether common method variance constitutes a problem in the present data or not, it cannot be ruled out completely. Furthermore, data can be biased by several other reasons. It is a debatable point whether emails which were sent anonymously to a company have been forwarded to an employee or executive with adequate knowledge about internal procedures and accompanying activities. One item at the end of the main questionnaire addressed the knowledge level of the respondents, their faithfulness in answering cannot be determined. It might be possible that some respondents used this questionnaire as a means of self-display. Likewise, the majority of participating companies indicated dealing with BPM and at least partially with process definition. Missing statements of such companies which are not working on their process program can also bias the findings.

It was mentioned in this work that hierarchical regression analysis are frequently applied in order to investigate interaction effects. However, their validity is questioned due to several reasons, including the rare detection of moderating effects or the inability of accounting for measurement error. [Cheng, Krumwiede 2011, p. 61] Furthermore, multiple regression analysis rates among those multivariate analysis methods which can only handle a single relationship at one time. This implies that these methods are limited to a single dependent variable and, consequently, interrelated questions cannot be addressed. In contrast, advanced multivariate techniques, such as SEM, can deal with multiple dependent variables at a time that might be even causally related themselves. More specifically, SEM is able to simultaneously estimate a series of separate, independent multiple regression equations. Additionally, SEM incorporates the latent constructs or variables into the analysis and improves the estimations of the variables' relationships by accounting for the measurement error in the variables. [Backhaus et al. 2011, p. 517; Hair et al. 2010, p. 629ff]

The reliability of the final ambidexterity construct is less than desirable. As a consequence, the findings involving ambidexterity as dependent variable have to be treated with caution.

Data were primarily obtained from executives. Although two surveys have taken place, it must be assumed that mainly one and the same person responded in both cases, since the contact details have been reused. Consequently, this work is likely to rely on single informant survey data. Despite the fact that using single informants is most studies' primary research design, a survey of two or more key informants in each company could increase data quality [Jiménez-Jiménez, Sanz-Valle 2011, p. 416], as it helps overcoming SIB and CMB. Interviewing both executives and employees makes the comparison of the different viewpoints possible in order to find out whether the opinions or rather perceptions of the two groups, especially regarding PO, coincide.

The differentiation between incremental and radical innovations originally came from the manufacturing sector. Since services are less clear defined in practice, the transition from an old to a new service and the degree of innovation, in terms of incremental and radical, are difficult to recognize. Therefore, applying other categorizations in the context of services is suggested. [Burr 2007, p. 76; Ettlie, Rosenthal 2011, p. 296]

6.3 Suggestions for Further Research

As already noted in the research limitations above, only Austrian organizations were involved in this research process. Applying this study to other countries could give an insight whether the individual effects vary from country to country. However, it would also be possible to examine whether the investigated relationships depend on the served customer group as well. More precisely, this means comparing companies operating on a business-to-business, business-to-consumer or business-to-government basis. Within the supply chain, companies are often forced to certify themselves according to different standards which include specific PO activities.

Since PO activities might not result in financial performance improvements immediately, their long-time effects could be investigated within the framework of a longitudinal study. It would be interesting to examine how the degree of PO and firm performance change over time, especially when taking into account the fact that multiple investigated companies are just at the beginning of their BPM practices. Due to this time lag, findings regarding causality resulting from cross-sectional investigations should be treated with caution [Jiménez-Jiménez, Sanz-Valle 2011, p. 416].

With reference to financial performance, the regression analyses could be carried out by using objective instead of subjective data. This would offer an opportunity to investigate the effects on corporate success and profitability by using concrete financial performance ratios such as return on sales or return on investment. Nevertheless, this can only be done after the companies' financial statements regarding the period under review are available.

Within this work the heterogeneous nature of the service sector was highlighted several times. Owing to this diversity within this industry sector, differences are not only likely in innovation outcomes, as it is outlined by Statistik Austria or in the study performed by Klausegger and Salzberger [2004, p. 425], but also regarding the degree of PO and requirements on BPM. However, this may require (i) an extension to service sectors which have not been involved so far; (ii) reducing the employee threshold; (iii) choosing a larger country than Austria; or (iv) combining the data of multiple countries having a similar small and medium-sized company structure.

Wagner and Patzak [2007, p. 275] point to the fact that cultural differences between business (value-creating and value-defining), management and support processes become apparent. Since these types of processes have different characteristics in general, an analysis on this level may provide additional insights into their needs and claims regarding the examined PO dimensions.

This study shows that environmental dynamism is a predictor for different innovation activities within enterprises. It would be of particular interest whether this environmental condition, but also the extent of competition on the market, has a moderating effect on the relationship between PO and firm performance.

Perfectly linear relationships typically do not exist in practice. Nevertheless, the regression models' coefficients of determination indicate only lower linear correlations between the independent and dependent variables. This might be caused by the fact that the variables exhibit a non-linear relationship. Further research could, therefore, investigate the individual PO dimension's shape of relationship with firm performance more closely.

Furthermore, it could be empirically verified whether some dimensions of PO are, indeed, enablers for other ones. As in the study performed by Kohlbacher and Grünwald [2011], the interaction effects between single PO dimensions, apart from the relationship between the process owner role and process performance measurement, might be further explored.

Finally, the revealed negative impact of the corporate culture in line with the process approach on exploitative innovation could not be clarified. On that account, it would be particularly interesting to receive a deeper insight into this relationship and its causes. In this case, performing a qualitative analysis would make sense. Simultaneously, the idea of personality models could be seized. Future research could examine how various compositions of workforce regarding patterns of behavior are associated with the process culture and in further consequence with organizational performance.

Lists of Abbreviations

This section contains listings of commonly used acronyms as well as of the meaning behind each item and variable name used in this work. All lists are sorted alphabetically.

General Abbreviations

ABC	Activity-Based Costing
BPM	Business Process Management
BPR	Business Process Re-engineering
CMB	Common Method Bias
CPO	Chief Process Officer
DEA	Data Envelopment Analysis
EFA	Exploratory Factor Analysis
EFQM	European Foundation for Quality Management
H_0	Null Hypothesis
ISO	International Organization for Standardization
KMO	Kaiser-Meyer-Olkin
MSA	Measure of Sampling Adequacy
NACE	Nomenclature statistique des Activités économiques dans la Communauté Européenne
PLS	Partial Least Squares
PO	Process Orientation
R^2	Coefficient of Determination
ROA	Return on Assets
ROS	Return on Sales
SD	Standard Deviation
SEM	Structural Equation Modeling
SIB	Single Informant Bias
SME	Small and Medium-sized Enterprise
SSB	Single Source Bias
VIF	Variance Inflation Factor

Performance, Control and Moderating Item Abbreviations

ANN_CHAN	Extent of last year's changes within the industry
COMP_INT	Intense competition on the local market
COMPET	Existence of strong competitors
CUST_COMPL	Reduction of customer complaints within the last three years
CUST_REQ	Regular customer demands for new products/services
CUST_SAT	Increase of customer satisfaction within the last three years
$D_{INDUSTRY}$	Industry affiliation, dichotomous variable coded according to the predominantly served sector
EBITM	EBIT margin, compared to competitors
IND_CHAN	Continuous change in industry
MSHARE	Market share, compared to competitors
MSHARE_GR	Market share growth, compared to competitors
POS_EXPLOI	Exploitative innovation, measured by achieved sales shares
POS_EXPLOR	Explorative innovation, measured by achieved sales shares
PRICE	Price fight represents a market's hallmark
RAN_CHAN	Frequent changes in the volume of products/services to be delivered
SALES_GR	Sales growth, compared to competitors

PO Item Abbreviations

ABCOST	Use of activity-based costing for all processes
ATT_CHNG	Employees' attitude towards change
CHARGE	Employees feel accountable for process results
CI_BEL	Belief in the perpetual nature of continuous process improvement
CI_EXP	Existence of a process redesign, and change management expert cadre
CI_METH	Use of continuous process improvement methodologies
CI_STR	Striving for continuous process improvement
CUST_FOC	Customer-focused attitude of employees
CUSTSUPP	Clear definition of internal/external customers/suppliers for all processes
DOC	Documentation of all business processes
DOCUSE	Update of process documentation in the case of changes
EXCEL	Employees strive to simplify their workflows and to increase output quality
KN_CUSUP	Employees' ability to accurately reflect their business process' customers and suppliers
KN_MAP	Workers' knowledge towards how processes are executed
KN_MOD	Employees' ability to describe the company process model effortlessly
KN_OWN	Employees' knowledge about the process owners' tasks, responsibility and competence
KN_PR	Employees' understanding of defined processes regarding content and form of expression
LANG	Employees' usage process language
LIVE_EMP	Defined/documented processes are lived by employees
LIVE_MGMT	Defined/documented processes are lived by the management
MACROM	Existence of a company process model
MC_AW	Management's perception of process management as a way of managing the business
MC_BEH	Active engagement of the executive board in the process program
MC_CPO	An executive board member has taken responsibility and leadership of the process program
MC_RES	Management's provision of adequate resources to improve core processes
PO_ACT	Process owners' responsibility for continuous process improvement and its proactive execution
PO_BUD	Responsibility of process owners for budget
PO_EX	Existence of process owners for each business process
PO_MNGR	Process owners are experienced managers
PO_STAFF	Process owners' influence on personnel decisions
PPM_ACT	Action initiation if process performance is poor
PPM_DEF	Existence of process performance indicators for all processes
PPM_DRV	Derivation of process performance indicators from business goals and/or (internal) customer expectations
PPM_PRES	Regular presentation of process performance indicators to process performers
TEAMW	Teamwork is a matter of course

Performance, Environmental and PO Dimension Abbreviations

COMPETITION	Environmental competitiveness
DYNAMISM	Environmental dynamism
FPDIM_AMBI	Ambidexterity, measured as a product of exploitative and explorative innovation
FPDIM_CUST	Customer satisfaction
FPDIM_FINMKT	Financial and market performance, compared to competitors
PODIM_CONTIMP	Continuous process improvement
PODIM_CUL	Corporate culture in line with the process approach
PODIM_KNDOC	Process knowledge and documentation
PODIM_MGMTCOM	Management commitment towards the process program
PODIM_OWN	Process owner role
PODIM_PPM	Process performance measurement

Interaction Term Abbreviations

$POCCxD_{INDUSTRY}$	Corporate culture multiplied by industry affiliation
$POCIxD_{INDUSTRY}$	Continuous process improvement multiplied by industry affiliation
$POKDxD_{INDUSTRY}$	Process knowledge and documentation multiplied by industry affiliation
$POMCxD_{INDUSTRY}$	Management commitment multiplied by industry affiliation
$POPOxD_{INDUSTRY}$	Process owner role multiplied by industry affiliation
$POPPMxD_{INDUSTRY}$	Process performance measurement multiplied by industry affiliation

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Appendix A – ÖNACE 2008 Sections

The ÖNACE 2008 structure according to Statistik Austria[34] is listed below. Investigated sectors are indicated by an asterisk (*).

SECTION A	AGRICULTURE, FORESTRY AND FISHING
SECTION B	MINING AND QUARRYING
SECTION C	MANUFACTURING *
SECTION D	ELECTRICITY, GAS, STEAM AND AIR CONDITIONING SUPPLY
SECTION E	WATER SUPPLY; SEWERAGE, WASTE MANAGEMENT AND REMEDIATION ACTIVITIES
SECTION F	CONSTRUCTION *
SECTION G	WHOLESALE AND RETAIL TRADE; REPAIR OF MOTOR VEHICLES AND MOTORCYCLES *
SECTION H	TRANSPORTATION AND STORAGE *
SECTION I	ACCOMMODATION AND FOOD SERVICE ACTIVITIES
SECTION J	INFORMATION AND COMMUNICATION *
SECTION K	FINANCIAL AND INSURANCE ACTIVITIES *
SECTION L	REAL ESTATE ACTIVITIES
SECTION M	PROFESSIONAL, SCIENTIFIC AND TECHNICAL ACTIVITIES *
SECTION N	ADMINISTRATIVE AND SUPPORT SERVICE ACTIVITIES *
SECTION O	PUBLIC ADMINISTRATION AND DEFENCE; COMPULSORY SOCIAL SECURITY
SECTION P	EDUCATION
SECTION Q	HUMAN HEALTH AND SOCIAL WORK ACTIVITIES
SECTION R	ARTS, ENTERTAINMENT AND RECREATION
SECTION S	OTHER SERVICE ACTIVITIES
SECTION T	ACTIVITIES OF HOUSEHOLDS AS EMPLOYERS; UNDIFFERENTIATED GOODS- AND SERVICES-PRODUCING ACTIVITIES OF HOUSEHOLDS FOR OWN USE
SECTION U	ACTIVITIES OF EXTRATERRITORIAL ORGANISATIONS AND BODIES

[34]The English language version of the entire ÖNACE 2008 structure can be retrieved by following the link http://www.statistik.at/KDBWeb/kdb.do?FAM=ALLE&&KDBtoken=null, selecting the classification and changing the language version afterwards.

Appendix B – Questionnaires

This chapter presents the original German questionnaire items used in the study's online surveys. Scale anchors are available in parentheses in the case of non-open-ended questions. Additionally, reversed items are indicated by an asterisk (*) while those items which were deleted after EFA are marked with a dagger (†).

B.1 Main Survey

B.1.1 General Items

FUNC. Welche Funktion besitzen Sie in Ihrem Unternehmen?

EMPLOYEE. Wie viele Mitarbeiter beschäftigt Ihr Unternehmen derzeit?

TURNOVER. Wie hoch war Ihr Umsatz (in EUR) im letzten Geschäftsjahr? (optional)

EMPL_PM. Bitte schätzen Sie die Anzahl der Mitarbeiter, die in Ihrem Unternehmen im Bereich Prozessmanagement beschäftigt sind (vollzeitäquivalent).

RESULTS. Unser Unternehmen würde gerne die Ergebnisse der Studie erhalten. (Ja, Nein)

RESP_KNOW. Inwieweit reichte Ihr Wissen zur Beantwortung der enthaltenen Fragen aus? („1 = ungenügend“ bis „5 = ausreichend“)

B.1.2 Process Orientation Items

PRO_DEF. Sind in Ihrem Unternehmen zumindest teilweise Geschäftsprozesse definiert bzw. beschäftigt sich Ihr Unternehmen zumindest teilweise mit Prozessmanagement? (Ja, Nein)

PRO_RAT. Ihr Unternehmen beschäftigt sich zumindest teilweise mit Prozesskennzahlen? (Ja, Nein)

MACROM. In unserem Unternehmen existiert ein einheitliches und vollständiges Unternehmensprozessmodell, welches die Geschäftsprozesse unseres Unternehmens namentlich darstellt. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“) †

DOC. Alle Geschäftsprozesse unseres Unternehmens sind ausreichend detailliert dokumentiert. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“)

DOCUSE. Wenn sich etwas im Arbeitsablauf ändert, wird die Prozessdokumentation des betroffenen Prozesses stets aktualisiert. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“)

CUSTSUPP. Die internen/externen Kunden und die internen/externen Lieferanten sind für jeden Geschäftsprozess unseres Unternehmens klar festgelegt. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“)

CI_METH. In unserem Unternehmen werden Methoden bzw. Programme für Kontinuierliche Prozessverbesserung, wie z.B. KAIZEN, KVP, Six Sigma, Lean Sigma, etc., eingesetzt. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“)

CI_EXP. In unserem Unternehmen gibt es erfahrene Change Management und Prozess-Redesign-Experten. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“)

CI_STR. Wir sind bestrebt, unsere Prozesse kontinuierlich zu verbessern. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“)

CI_BEL. Wir glauben, dass die Verbesserung eines Prozesses niemals aufhört. Es gibt immer Raum für zusätzliche, schrittweise Verbesserung. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“)

KN_MAP. Unsere Mitarbeiter können den Ablauf des Geschäftsprozesses, in dem sie tätig sind, genau beschreiben. Sie wissen, wie ihre Arbeit andere Mitarbeiter, Kunden und Prozessperformance beeinflusst. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“)

KN_CUSUP. Unsere Mitarbeiter können die Kunden/Lieferanten des Geschäftsprozesses, in dem sie tätig sind, exakt wiedergeben. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“)

KN_MOD. Unsere Mitarbeiter können das Unternehmensprozessmodell mühelos beschreiben. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“)

KN_PR. Die definierten/dokumentieren Prozesse werden von unseren Mitarbeitern in hohem Maß hinsichtlich Inhalt und Darstellungsform verstanden. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“)

KN_OWN. Unsere Mitarbeiter kennen Aufgabe, Verantwortung und Kompetenz der Prozesseigner in unserem Unternehmen. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“) †

TEAMW. Teamwork ist in unserem Unternehmen selbstverständlich (auch zwischen verschiedenen Abteilungen). („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“)

CUST_FOC. Unsere Mitarbeiter verstehen, dass der Sinn ihrer Arbeit darin besteht, die Bedürfnisse der internen/externen Kunden zu erfüllen. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“)

CHARGE. Mitarbeiter auf allen Hierarchiestufen fühlen sich für Prozessergebnisse verantwortlich. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“)

ATT_CHNG. Veränderungen in ihrem Arbeitsablauf werden von unseren Mitarbeitern nur schleppend akzeptiert. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“) * †

LANG. Mitarbeiter auf allen Stufen unserer Organisation sprechen von Prozessen, Prozesskennzahlen und Prozessverantwortlichen. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“) †

EXCEL. Unsere Mitarbeiter sind bestrebt, ihre Arbeitsabläufe zu vereinfachen und die Qualität ihres Outputs zu erhöhen. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“)

LIVE_EMP. Unsere definierten/dokumentierten Prozesse werden von unseren Mitarbeitern gelebt. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“) †

LIVE_MGMT. Unsere definierten/dokumentierten Prozesse werden vom Management gelebt. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“)

MC_AW. Die Geschäftsführung sieht Prozessmanagement nicht als einmaliges Projekt, sondern verwendet es, um das Unternehmen zu managen. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“)

MC_CPO. Zumindest ein Mitglied der Geschäftsführung hat Führung und Verantwortung des unternehmensweiten Geschäftsprozessmanagement inne. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“)

MC_BEH. Die Geschäftsführung befasst sich aktiv mit dem unternehmensweiten Prozessmanagement. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“)

MC_RES. Die Geschäftsführung stellt ausreichende Ressourcen (Geld, Personal, Zeit) zur Verfügung, um Kernprozesse zu verbessern. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“)

PO_EX. Für jeden Geschäftsprozess gibt es in unserem Unternehmen einen definierten Prozessverantwortlichen (auch „Prozesseigner“ oder „Process Owner“ genannt). („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“) †

PO_MNGR. Die Prozessverantwortlichen sind erfahrene Führungskräfte/Manager. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“)

PO_ACT. Jeder Prozessverantwortliche ist für die kontinuierliche Optimierung/Verbesserung seines Prozesses verantwortlich und führt dies auch proaktiv durch. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“)

PO_BUD. Die Prozessverantwortlichen tragen Budgetverantwortung. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“)

PO_STAFF. Die Prozessverantwortlichen haben einen starken Einfluss auf Personalentscheidungen. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“)

PPM_DEF. In unserem Unternehmen sind für sämtliche Geschäftsprozesse Prozesskennzahlen definiert. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“)

PPM_DRV. Prozesskennzahlen werden von den Unternehmenszielen und/oder von den (internen) Kundenanforderungen abgeleitet. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“)

PPM_ACT. Bei schlechter Prozessperformance werden tatsächlich Maßnahmen zur Verbesserung eingeleitet. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“)

PPM_PRES. Prozesskennzahlen werden den Prozessausführenden regelmäßig präsentiert. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“)

ABCOST. Wir setzen Prozesskostenrechnung für sämtliche Prozesse unseres Unternehmens ein. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“)

B.1.3 Environmental Condition Items

CUST_REQ. Unsere Kunden fragen regelmäßig neue Produkte und Dienstleistungen nach. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“)

IND_CHAN. In unserer Branche gibt es ständig Veränderungen. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“)

ANN_CHAN. Innerhalb eines Jahres hat sich nichts in unserer Branche verändert. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“) *

RAN_CHAN. In unserer Branche verändert sich der Umfang der zu liefernden Produkte und Dienstleistungen sehr schnell und häufig. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“)

COMP_INT. Der Wettbewerb in unserem Markt ist sehr intensiv. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“)

COMPET. Unser Unternehmen hat sehr starke Mitbewerber. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“)

PRICE. Preiskampf ist ein markantes Kennzeichen unseres Marktes. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“)

B.1.4 Firm Performance Items

ROS. Bitte beurteilen Sie Ihr Unternehmen im Verhältnis zum Branchendurchschnitt innerhalb der letzten drei Jahre in Bezug auf die durchschnittliche Nettoumsatzrendite. („-3 = weit unter dem Branchendurchschnitt“, „0 = durchschnittlich“, „+3 = weit über dem Branchendurchschnitt“)

ROA. Bitte beurteilen Sie Ihr Unternehmen im Verhältnis zum Branchendurchschnitt innerhalb der letzten drei Jahre in Bezug auf die durchschnittliche Gesamtkapitalrentabilität (Gewinn/Bilanzsumme). („-3 = weit unter dem Branchendurchschnitt“, „0 = durchschnittlich“, „+3 = weit über dem Branchendurchschnitt“)

SALES_G. Bitte beurteilen Sie Ihr Unternehmen im Verhältnis zum Branchendurchschnitt innerhalb der letzten drei Jahre in Bezug auf das durchschnittliche Umsatzwachstum. („-3 = weit unter dem Branchendurchschnitt“, „0 = durchschnittlich“, „+3 = weit über dem Branchendurchschnitt“)

CU_SAT. Kundenzufriedenheit insgesamt. („-3 = sehr schlecht im Vergleich zum Mitbewerb“, „0 = durchschnittlich“, „+3 = sehr gut im Vergleich zum Mitbewerb“)

CU_VAL. Mehrwertgenerierung für unsere Kunden. („-3 = sehr schlecht im Vergleich zum Mitbewerb“, „0 = durchschnittlich“, „+3 = sehr gut im Vergleich zum Mitbewerb“)

CU_DEL. Erfüllung der Kundenbedürfnisse. („-3 = sehr schlecht im Vergleich zum Mitbewerb“, „0 = durchschnittlich“, „+3 = sehr gut im Vergleich zum Mitbewerb“)

CU_RET. Bindung unserer Kunden. („-3 = sehr schlecht im Vergleich zum Mitbewerb“, „0 = durchschnittlich“, „+3 = sehr gut im Vergleich zum Mitbewerb“)

PI_MAJOR. Unser Unternehmen machte bedeutende Innovationen im Bereich branchenüblicher Prozesse. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“)

PI_DEVEL. Unser Unternehmen hat intensiv neue Methoden und Abläufe für die Produktion/Bereitstellung von Produkten/Dienstleistungen entwickelt. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“)

PI_SPEND. Unser Unternehmen verwendet den Großteil des F&E Budgets für die Entwicklung neuer Methoden/Abläufe/Prozesse. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“)

AM_ANALY. Wir analysieren häufig unsere Produkte und/oder Dienstleistungen, um Verbesserungspotentiale zu identifizieren. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“)

AM_CHAN. Wir nehmen regelmäßig kleinere Anpassungen bei unseren Produkten und/oder Dienstleistungen vor. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“)

AM_INTRO. Wir führen öfters verbesserte, aber bereits vorhandene Produkte und/oder Dienstleistungen in unseren Märkten ein. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“)

AM_MATEC. Wir verwenden ausgereifte Technologien bei unseren Innovationsvorhaben. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“)

AM_EXPA. Unser Unternehmen erweitert Dienstleistungen für bestehende Kunden. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“)

AM_DEV. Wir entwickeln laufend neue Produkte und/oder Dienstleistungen. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“)

AM_EXPER. Wir experimentieren mit neuen Produkten und/oder Dienstleistungen in unseren Märkten. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“)

AM_OPP. Wir nutzen nie neue Chancen in neuen Märkten. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“) *

AM_MAR. Wir bieten Produkte und/oder Dienstleistungen an, die völlig neu am Markt sind. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“)

AM_TECH. Wir benutzen oft neue Technologien, die komplett neu für unser Unternehmen sind. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“)

B.2 Follow-up Survey

B.2.1 General Items

BPM_YEARS. Bitte schätzen Sie seit wie vielen Jahren (ganzzahlig) sich Ihr Unternehmen bereits aktiv mit Geschäftsprozessmanagement beschäftigt.

EMPL_PM_CORR. Bitte schätzen Sie die Anzahl der Mitarbeiter, die in Ihrem Unternehmen ausschließlich für Prozessmanagement beschäftigt sind (vollzeitäquivalent). (Ihre vorherige Antwort: #u_mapm#[35] bei #u_matotal# Mitarbeitern)

ISO_EFQM. Ist Ihr Unternehmen nach DIN EN ISO 9001 (durch Auditoren) und/oder den Standards der EFQM (durch externe Assessoren) zertifiziert? („1 = ja, nur ISO“, „2 = ja, nur EFQM“, „3 = ja, beides“, „4 = nein“)

B.2.2 Firm Performance Items

CUST_SAT. Während der letzten drei Jahre ist die Kundenzufriedenheit gestiegen. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“)

CUST_COMPL. Während der letzten drei Jahre ist die Anzahl der Kundenbeschwerden gesunken. („1 = trifft überhaupt nicht zu“, „4 = trifft teilweise zu“, „7 = trifft voll und ganz zu“)

SALES_GR. Bitte beurteilen Sie Ihr Umsatzwachstum im Vergleich zu Ihren Mitbewerbern. („1 = deutlich schlechter“, „4 = gleichwertig“, „7 = deutlich besser“)

MSHARE. Bitte beurteilen Sie Ihren Marktanteil im Vergleich zu Ihren Mitbewerbern. („1 = deutlich schlechter“, „4 = gleichwertig“, „7 = deutlich besser“)

MSAHRE_GR. Bitte beurteilen Sie Ihre Marktanteilsgewinne im Vergleich zu Ihren Mitbewerbern. („1 = deutlich schlechter“, „4 = gleichwertig“, „7 = deutlich besser“)

EBITM. Bitte beurteilen Sie Ihre EBIT Marge im Vergleich zu Ihren Mitbewerbern. („1 = deutlich schlechter“, „4 = gleichwertig“, „7 = deutlich besser“) †

POS_EXPLOI. Bitte schätzen Sie den relativen Umsatzanteil (ganzzahlig in %) im Jahr 2010, der durch schrittweise Verbesserungen bzw. Erweiterungen von bestehenden Produkten und/oder Dienstleistungen (z.B. Funktionalität, Qualität, neue Varianten), die in den letzten drei Jahren am Markt eingeführt worden sind, erzielt wurde.

POS_EXPLOR. Bitte schätzen Sie den relativen Umsatzanteil (ganzzahlig in %) im Jahr 2010, der durch vollkommen neue Produkte und/oder Dienstleistungen, die in den letzten drei Jahren am Markt eingeführt worden sind und auf keine nennenswerte Weise von bestehenden Produkten/Dienstleistungen abgeleitet waren, erzielt wurde.

[35] This is a database value place holder used by EFS Survey.

Appendix C – Statistics

C.1 Missing Items

	Main Survey			Follow-Up Survey		
	n	Missing		n	Missing	
Item	Count	Count	%	Count	Count	%
ROA	839	1	0.12			
ROS	839	1	0.12			
SALES_G	839	1	0.12			
KN_PR	803	37	4.40	462	21	4.35
LIVE_EMP	803	37	4.40	462	21	4.35
LIVE_MGMT	803	37	4.40	462	21	4.35
MC_AW	803	37	4.40	462	21	4.35
MC_CPO	803	37	4.40	462	21	4.35
MC_BEH	803	37	4.40	462	21	4.35
MC_RES	803	37	4.40	462	21	4.35
PO_MNGR	802	38	4.52	459	24	4.97
PO_ACT	802	38	4.52	459	24	4.97
PO_BUD	802	38	4.52	459	24	4.97
PO_STAFF	802	38	4.52	459	24	4.97
KN_OWN	802	38	4.52	459	24	4.97
KN_MOD	791	49	5.83	455	28	5.80
PPM_DEF	715	125	14.88	413	70	14.49
PPM_DRV	715	125	14.88	413	70	14.49
PPM_ACT	715	125	14.88	413	70	14.49
PPM_PRES	715	125	14.88	413	70	14.49
ABCOST	715	125	14.88	413	70	14.49

Tab. C-1: Missing value analysis of the main survey data (left) and follow-up survey data (right)

C.2 Normal Probability Plots

The normal probability plots of all non-categorical variables used within the regression analyses and of the residuals are reported in this section.

C.2.1 Process Orientation Dimensions

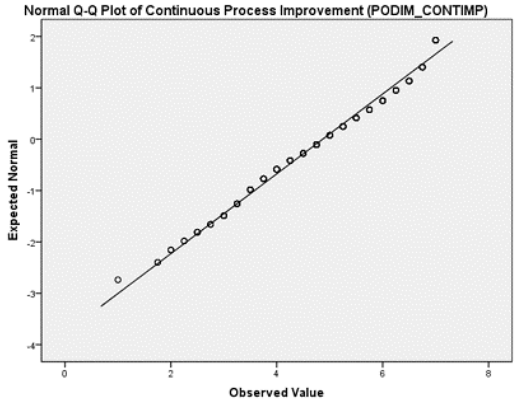

Fig. C-1: Normal probability plot of PODIM_CONTIMP

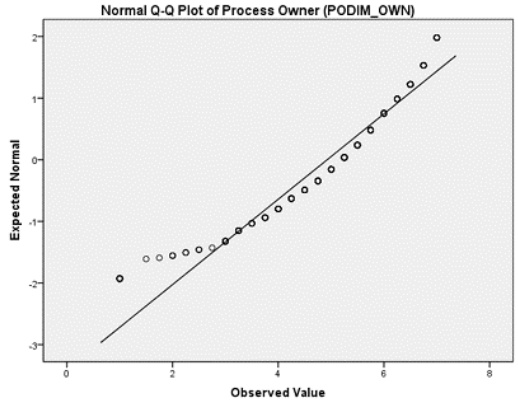

Fig. C-2: Normal probability plot of PODIM_OWN

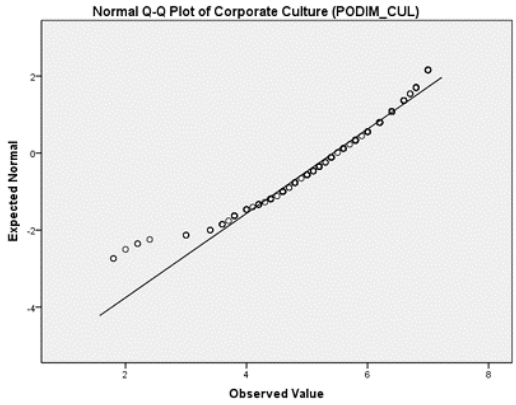

Fig. C-3: Normal probability plot of PODIM_CUL

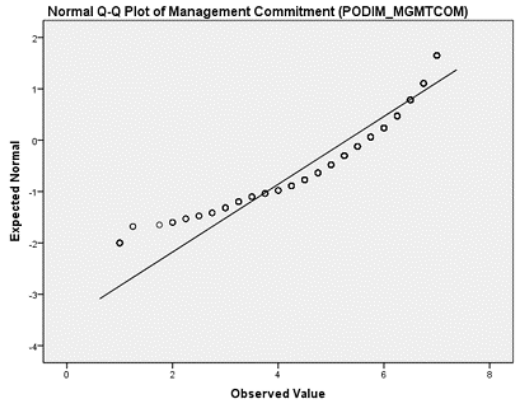

Fig. C-4: Normal probability plot of PODIM_MGMTCOM

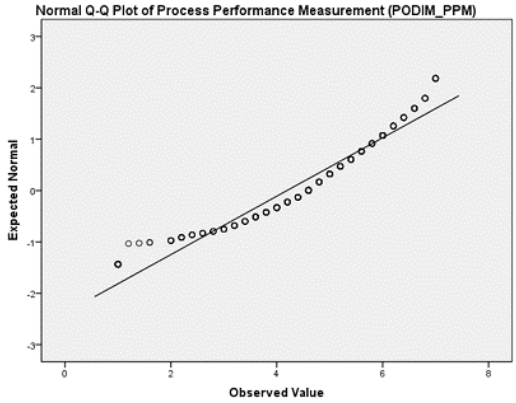

Fig. C-5: Normal probability plot of PODIM_PPM

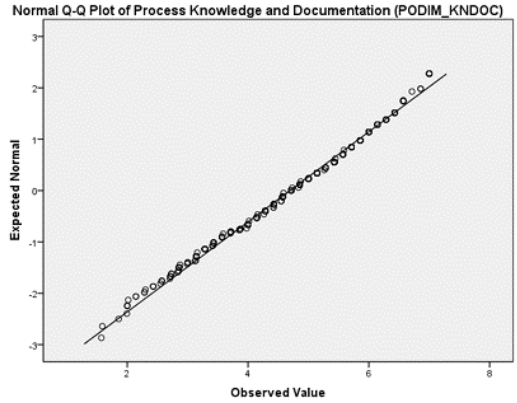

Fig. C-6: Normal probability plot of PODIM_KNDOC

C.2.2 Control Variables

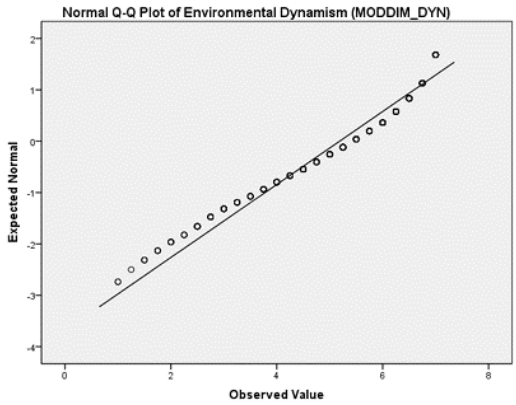

Fig. C-7: Normal probability plot of DYNAMISM

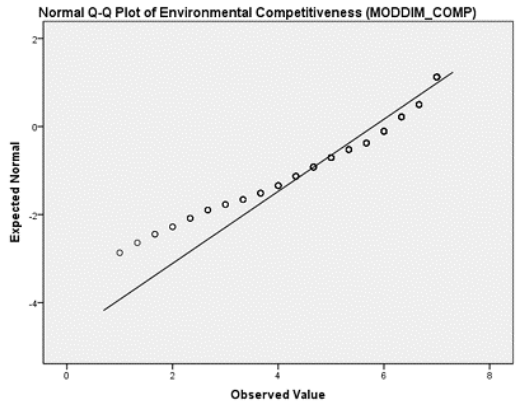

Fig. C-8: Normal probability plot of COMPETITION

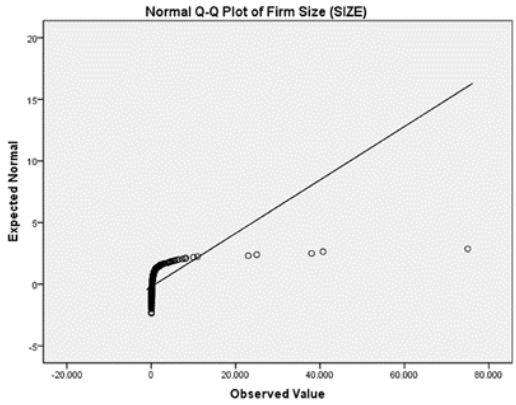

Fig. C-9: Normal probability plot of SIZE

C.2.3 Firm Performance Dimensions

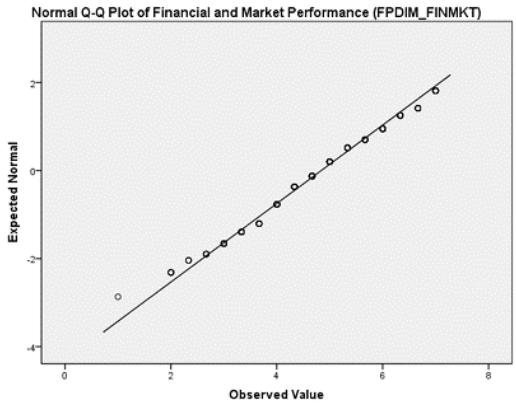

Fig. C-10: Normal probability plot of FPDIM_FINMKT

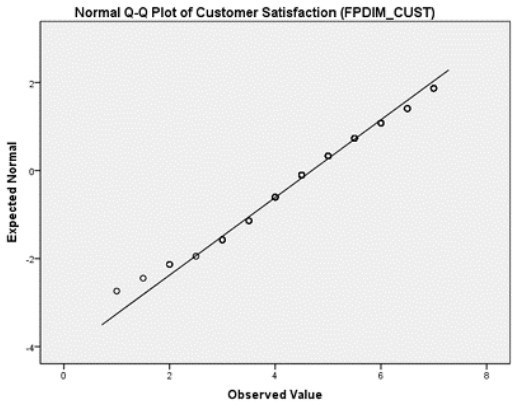

Fig. C-11: Normal probability plot of FPDIM_CUST

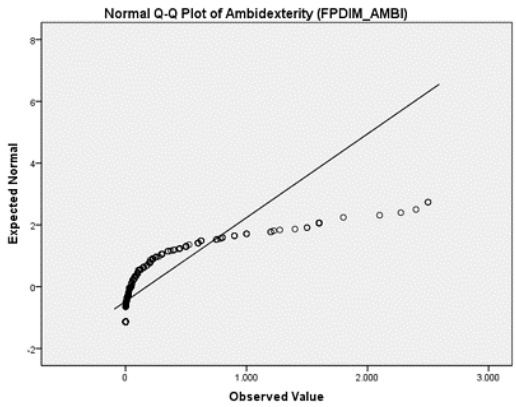

Fig. C-12: Normal probability plot of FPDIM_AMBI

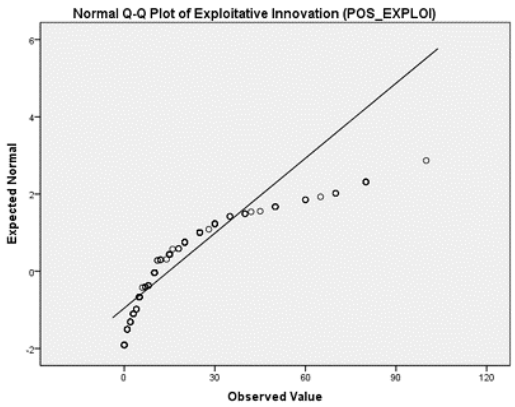

Fig. C-13: Normal probability plot of POS_EXPLOI

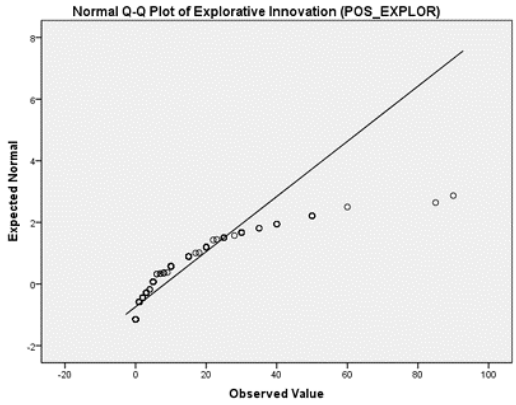

Fig. C-14: Normal probability plot of POS_EXPLOR

C.2.4 Residuals

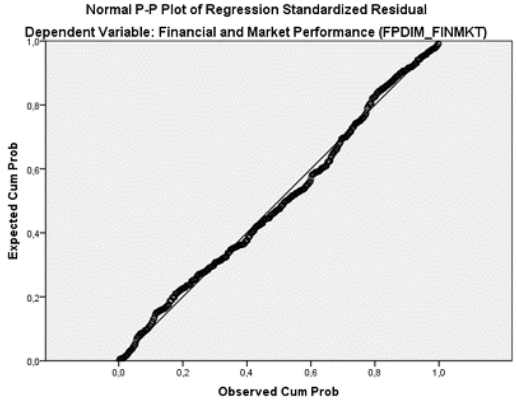

Fig. C-15: Residual plot of FPDIM_FINMKT

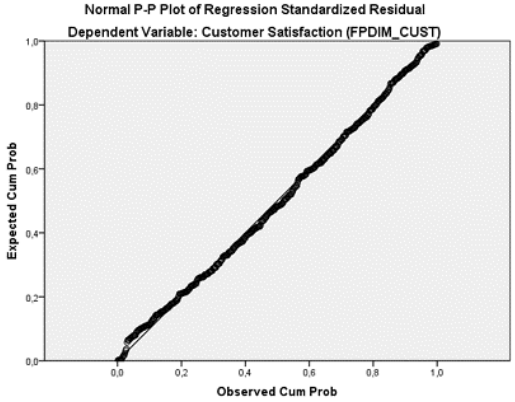

Fig. C-16: Residual plot of FPDIM_CUST

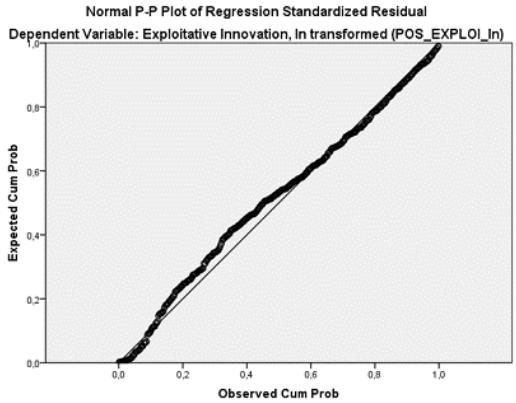

Fig. C-17: Residual plot of POS_EXPLOI_ln

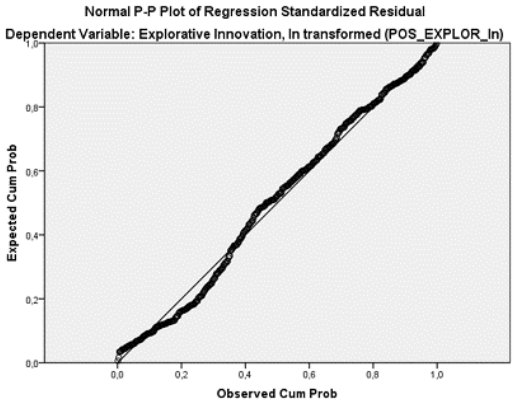

Fig. C-18: Residual plot of POS_EXPLOR_ln

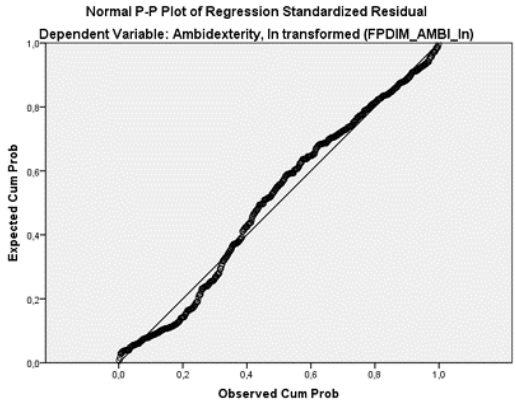

Fig. C-19: Residual plot of FPDIM_AMBI_ln