

“The business process optimization of offer management for investment goods in individual production – the case of a German medium-sized company”

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Simon Fauser (Germany), Fabian Heidrich (Germany)

THE BUSINESS PROCESS OPTIMIZATION OF OFFER MANAGEMENT FOR INVESTMENT GOODS IN INDIVIDUAL PRODUCTION – THE CASE OF A GERMAN MEDIUM-SIZED COMPANY

Abstract

The article examines a typical offer management process of a medium-sized tool manufacturing company using a qualitative, explorative research design. The objective is to explore characteristic improvement measures for optimizing the offer process on three levels: process efficiency, process effectiveness and customer orientation. The case study's basis is a series of interviews conducted with any company employee who is in touch with the offer process. The interviews are analyzed using theoretical methods, such as benchmarking, the 7R method, the Deming cycle and the Ishikawa diagram. The purpose of the analysis is to provide results that are shaped into an action recommendation plan. The results show that creating an online product configurator (customer orientation), updating the calculation program (process efficiency) and creating a consistent offer follow-up system, will provide the highest potential for the process optimization.

Keywords

offer management process, process efficiency, continuous improvement of processes, customer orientation, manufacturing

JEL Classification

L23, M11, M39

INTRODUCTION

In the global economy and in business administration science, the interest in process-oriented organization and management has increased significantly since the 1990s (Scherer & Pietsch, 2007). The rising interest can be explained by the ongoing change and development of organizations' framework conditions, influenced, for example, by digital technologies that allow an ever-faster flow of information around the globe. Along with information, products and services are increasingly exchanged and traded across borders, which in turn causes more interaction between people with different cultural backgrounds. Products (or goods) are physical and have a tangible output, services are immaterial and thus, have an intangible output (Fauser, 2017, p. 1).

This article is about the case of a German medium-sized company in the mechanical engineering sector that must operate in this environment. The company manufactures individually customized production tools and must meet the challenge of transforming the highly complex technical requirements and customer demands into a com-

petitive product. Hence, it is of utmost importance to capture all relevant information at the onset of a project. The start of a project usually includes a customer inquiry, to which the company responds with an offer. This article examines the company's offer management (OM) in the context of business process optimization (BPO).

1. LITERATURE REVIEW

1.1. Business process management

It can be difficult to achieve a common understanding of business process management (BPM), because the term's ambiguity can lead to confusion and frustration (Roeser & Kern, 2015; Armistead, Pritchard, & Machin, 1999). The vast multitude of available definitions in literature supports this statement (compare with Opitz, 2015; Trkman et al., 2015; Margherita, 2014; Morais et al., 2014; Schmelzer & Sesselmann, 2013; Schmiedel, vom Brocke, & Recker, 2013; Silva, Damian, & Pádua, 2012; Palmberg, 2009).

There are two essential conclusions that can be drawn from these BPM definitions: first is that many different perspectives on BPM exist in literature. While some perspectives focus on specific aspects of BPM such as IT, process modeling, process redesign, process improvement, sustainable processes, customer-oriented processes, etc., other perspectives take a more universal approach, which seems more appropriate for determining the general outline of BPM. The second conclusion is that there is a tendency across BPM literature to view BPM as "holistic" or "integrated". Based on common elements of other definitions, BPM shall be defined as: "A holistic approach that targets the alignment of all business processes of an organization with the customer's needs in a continuous, systematic effort to sustainably improve an organization's effectiveness and efficiency".

This definition serves as a general guideline for all aspects of this article.

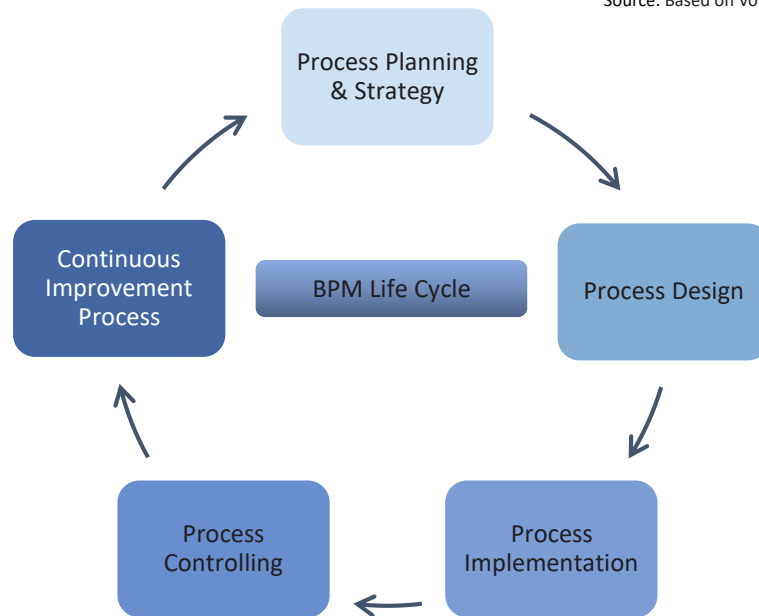
As another major term of the article, business process optimization must be defined. BPO can be attributed to the field of BPM and refers to "changing the organizational and technological design of a business process towards a better state. How "better" is defined depends on the target of the optimization (Brockmann & Stapf-Finé, 2012, p. 4).

BPO can also be defined as "all activities and decisions that improve the business processes of an organization. The pursued improvements refer to reduced costs, better services and improved quality" (Bundesinnenministerium, 2015, p. 120). Both definitions refer to improved internal elements, i.e. organizational and technological aspects, but lack of external aspects. An external (customer-specific) orientation is included in both the definition of business process and of BPM. For reasons of consistency, external orientation should be included in the definition of BPO as well. BPO must be distinguished from business process improvement (BPI) and business process orientation. The latter can also be abbreviated with BPO (Roeser & Kern, 2015), but is not a synonym. BPI, however, can be used synonymously with BPO and various authors in BPM literature use BPI instead of BPO (Bergener et al., 2015; Bolsinger et al., 2015). BPI as a synonym of BPO must not be confused with continuous process improvement as a part of the BPM life cycle (Von Büdingen & Schlaf, 2011). Taking the previous into account, BPO can be defined as: "All activities and efforts that support the organizational and technological improvements of business processes and that are directed at customer requirements".

The goal of this study is to optimize a business process (i.e. the offer process) and BPM theory offers various paths for this endeavor. The approach of BPM has been studied from a multitude of perspectives, resulting in diverse concepts (Jeston, 2018; Margherita, 2014; Niehaves et al., 2014). Almost all the concepts are based on the works of Hammer and Champy (1995) and Davenport (1994) and they are still frequently referred to in recent publications (compare with Roeser & Kern, 2015; Margherita, 2014; Sikdar & Payyazhi, 2014; vom Brocke et al., 2014; Schmelzer & Sesselmann, 2013; Röglinger, Pöppelbuß, & Becker, 2012).

One important aspect is to determine critical BPM success factors. Many studies on critical success factors for BPM present a similar list of

Source: Based on Von Büdingen and Schlaf (2011).

**Figure 1.** The BPM life cycle

general factors that provide little practical guidance (vom Brocke et al., 2014). Both more specific and more comprehensive is the list of success factors “Principles of good BPM” suggested by vom Brocke et al. (2014, p. 536). These success factors provide guidance for practical application. However, one success factor is still missing. All principles show an internal process orientation. “Most academic and practitioner efforts that target the improvement of business process focus on improving intra-organizational processes” (Trkman et al., 2015, p. 251). The external orientation is hinted at principle 6 (integrate all stakeholders), but the customer, as a major stakeholder and important reference point for OM, is not directly mentioned. Hence, the principle of customer orientation should be added to the list of success factors.

Another relevant aspect of BPM is the BPM life cycle. There are many different approaches of the BPM life cycle in literature (Wagner & Patzak, 2015; Morais et al., 2014; Von Büdingen & Schlaf, 2011)¹. The relevance of the BPM life cycle is based on the cycle’s inherent characteristic, namely its continuity. Continuity is one of the ten principles of good BPM and it is the major element of the BPM methods PDCA cycle and Kaizen/KVP.

Figure 1 shows the model of the BPM life cycle proposed by Von Büdingen and Schlaf (2011), which is composed of five phases. In the planning and strategy phase, the success factors, the general conditions and the BPM scope and methodology are defined. The process goals, the responsibilities, the technology and the target process design are set in the second phase. For the process implementation in phase three, adaptations of IT systems, processes and organizational standards are necessary. In the fourth phase, process controlling includes the analysis of processes (and weaknesses), monitoring of performance indicators and comparing current with target state. The continuous improvement process is the fifth and final phase, which is comprised of change management, revealing improvement potential, knowledge transfer and starting the cycle anew. There is no direct causal and no chronologic dependence between the all phases after the cycle has been completed once. Henceforth, the BPM approach is targeted at continuous improvement (Von Büdingen & Schlaf, 2011).

1.2. Offer management

According to Schmidt (2008), OM refers to the handling of all offer-related business processes, from the inquiry to the follow-up, including the

¹ For more BPM life cycle models, compare with Morais et al. (2014, pp. 417-424).

creation of the offer document, as well as the IT support for all associated activities. OM has a special significance and competitive relevance for companies with a complex, time consuming and technologically-sophisticated offer preparation process (Hofbauer & Hellwig, 2016). This is prevalently true for companies in the systems and machine business with complex products and components (Schmidt, 2004). The core aspect of OM is the offer process. According to Hüscher (1993)², an offer process includes services that are directed at the acquisition of potential orders, as well as all necessary tasks between the first contact of the supplier with the customer and the approval (purchase order) or disapproval (offer rejected) by the customer. In the case of investment goods, the result of an offer process is a binding offer that consists of a technical solution, the offer price, the payment conditions, the delivery date and other legal conditions (Hüscher, 1993). Similar to the previous definition, Much and Nicolai (1995, p. 121) define the offer process as the creation of “a time-limited, binding declaration of the supplier about goods, services and conditions”. Although both definitions are more than twenty years old, they still describe the offer process as it is today, with one exception. An important aspect, which is neglected in both definitions is IT, which is a part of Schmidt’s (2008) definition of OM. Most companies use an enterprise resource planning (ERP) system for their OM, alongside other programs or tools such as Microsoft Word, Microsoft Excel, Email programs, etc. (Schmidt, 2008). As a crucial element of the offer process, IT should be part of the definition. As a result, the offer process can be defined as: “All customer- and target-oriented activities that are directed at the acquisition of the customer’s approval, creating a binding document and using appropriate IT tools”.

Although the offer process is an indispensable part of a company’s sales management, it has become increasingly difficult for industrial suppliers to distinguish themselves from the competition (Hofbauer & Hellwig, 2016). Therefore, OM can be an important instrument for differentiation and customer relationship management (Schmidt, 2004). The following recommendations can be seen as success factors directly related to a com-

pany’s offer process (Hofbauer & Hellwig, 2016; Schmidt, 2004):

- evaluating the customer’s inquiry depending on the customer’s value;
- creating and offering services that are of additional value for the customer;
- structuring and standardizing solution concepts, configurations and calculations, in order to reduce the costs for offer creation;
- minimizing the reaction time;
- creating a systematic offer follow-up system;
- archiving inquiries, offers and orders and evaluating them.

Upon receiving an inquiry, an organization must decide whether or not to create and send an offer (Hüscher, 1993). Among the things to consider are the general feasibility of the required products and services, the availability of resources, the distinction between regular customers and new customers and budgetary inquiries (Pepels, 2014). For customer-oriented manufacturers of investment goods, the problem of evaluating customer inquiries increases with a rising degree of product individualization (Hüscher, 1993). Since the company shows a high degree of product individualization, inquiry evaluation is of high relevance for OM. In the investment goods sector, customers often send inquiries with incomplete technical specifications, because, by quoting, they want to assess the required investment sum. The costs for the offer process increase with the amount of information included in the offer. Thus, the information required must be determined before the evaluation of an inquiry. If the evaluation of an inquiry does not show any discrepancy with the previous issues, the supplier can proceed with the calculation of the requested products and services and the offer composition, which includes planning and creating the offer (Pepels, 2014). The general procedure of offer composition for B-to-B suppliers in the investment goods sector is commonly known and described similarly by various authors (compare with

2 Translated by the author.

Table 1. Key figures of offer management

Source: Kühnapfel (2017).

Offer development =	$\frac{\text{offer amount current year}}{\text{offer amount previous year}} \cdot 100$
Offer success rate (amount) =	$\frac{\text{amount of successful offers}}{\text{amount of total offers}} \cdot 100$
Offer success rate (volume) =	$\frac{\text{turnover of successful offers}}{\text{turnover of all offers}} \cdot 100$
Loss order rate =	$\frac{\text{amount of rejected offers}}{\text{amount of total offers}} \cdot 100$
Loss order quote =	$\frac{\text{amount of rejected offers}}{\text{amount of accepted offers}} \cdot 100$

Hofbauer & Hellwig, 2016; Pepels, 2014; Albers & Krafft, 2013; Schmidt, 2004; Kuhlmann, 2001).

The offer process is not complete with the sending of the offer to the customer. Following up on sent offers is necessary to increase the probability of winning the order (Hofbauer & Hellwig, 2016). Customers should be contacted after the offer is sent in order to guard against misunderstandings, update the offer status and react to mistakes in the offer or changes of the customer requirements (Pepels, 2014; Schmidt, 2004). It also is an opportunity to renegotiate or justify a high price if the customer is reluctant to place an order. In the case of an offer rejection, the reasons for declining should be inquired upon (lost order analysis). The customer's feedback must be evaluated in order to draw conclusions on the strengths of competitors and to improve the company's own offer performance for future inquiries (Schmidt, 2004).

A final aspect of OM is its general evaluation and controlling. Table 1 shows a number of key figures that can be used to analyze the performance of an organization's OM.

2. EVALUATION AND SELECTION OF KEY METHODS

There are several theoretical methods that are suggested by current literature that could be suitable for optimizing OM, such as business process engi-

neering (BPR) (Hammer & Champy, 1995), Failure Mode and Effects Analysis (FMEA) (Jochem et al., 2015; Meran et al., 2014), benchmarking (Vahs, 2015; Schulte-Zurhausen, 2014), "Moments of Truth" (Stöger, 2018), PDCA (Demning) cycle (Wagner & Patzak, 2015; Medinilla, 2014), 7R method (Nagel & Mieke, 2014), buying center analysis (Pepels, 2014; Albers & Krafft, 2013), balanced scorecard (Vahs, 2015; Madsen & Stenheim, 2014), total cycle time (TCT) (Schmelzer & Sesselmann, 2013; Bösing, 2006), Ishikawa-diagram (Jochem et al., 2015; Best & Weth, 2010), Kaizen method (Macpherson et al., 2015; Medinilla, 2014), and Six sigma (Albliwi, Antony, & Lim, 2015; Waurick, 2014; Antony, 2011).

These methods are evaluated by four criteria derived from the company's corporate and process goals:

- appropriate quality;
- appropriate time;
- appropriate customer orientation;
- appropriate costs.

Each criterion is used to evaluate the potential BPO methods on a scale of grades one to five (evaluation by the author). One means "very good" and five means "bad". The average grades are calculated for each method. Methods with an average grade between 1 and 2.25 are categorized as primary methods (marked in dark grey and bold). Methods with an average grade between 2.5

Table 2. Evaluation of potential BPO methods

Criterion Method	Appropriate quality	Appropriate time	Appropriate customer orientation	Appropriate costs	III grade, where 1 = best; 5 = worst
BPR	2	4	3	5	3.50
KVP/Kaizen	2	5	1	3	2.75
Six sigma	2	5	3	5	3.75
FMEA	4	3	4	3	3.50
7R method	2	1	2	1	1.50
Benchmarking	1	2	4	2	2.25
Buying center analysis	4	4	1	4	3.25
Balanced scorecard	1	4	3	3	2.75
Total cycle time	3	4	4	3	3.50
PDCA cycle	1	2	3	2	2.00
Moments of Truth	5	3	1	4	3.25
Ishikawa diagram	3	2	3	1	2.25

and 3.25 are categorized as secondary methods (marked in light grey and italic). Methods with an average grade of 3.5 and higher are categorized as unsuitable (not marked).

As shown in Table 2, the most appropriate methods are: 7R, PDCA cycle, benchmarking and Ishikawa diagram. These methods are used for the chapter interview analysis. The exception is the PDCA cycle. Due to its generic approach, the PDCA cycle is not explicitly applied in the analysis, but it serves as underlying guideline for all process optimization efforts.

3. EMPIRICAL RESEARCH

3.1. Methodology of empirical research

The empirical research is done using two research methods: the expert interview and the expert workshop. Since the issue of OM involves retrieving large amounts of qualitative information, the expert interview is an appropriate research method. The method has the potential to generate a ho-

listic framework with sufficient information, which could form an appropriate basis for the analysis of the offer process. Expert interviews are conducted first with the company's employees, customers and competitors for initial data acquisition. An expert workshop with the company's employees follows.

The three process goals of customer orientation, process efficiency and process effectiveness are used for structuring the interview analysis in three categories, which are subdivided into strengths and weaknesses. These analysis categories are joined by an additional category, namely software and systems. The analysis categories make up one of the three parts of the interview analysis. The second part identifies and determines decisive success factors. The third part of the interview analysis consists of the application and interpretation of the business methods that have been previously determined.

3.2. Success factors

The interviewed employees were asked to list the major success factors of the offer process in their opinion. All mentioned success factors are collected and structured into three groups (technical

Table 3. Offer process success factors identified by the company

Customer success factors	Technical success factors	Commercial success factors
<ul style="list-style-type: none"> Understand the customer and respond to their wishes Communicate customer requirements clearly and target oriented Customers require a fast and reliable offer Adaption to cultural and market related standards 	<ul style="list-style-type: none"> Unambiguous technical requirements Product must be producible Tool layout must be flawless Prioritization of technical examinations 	<ul style="list-style-type: none"> Attractive price and delivery time Consequently, use of the knowledge of reclamations and problems Make knowledge commonly accessible Consistent prices and texts in the offer document

success factors, commercial success factors and customer-related success factors), in order to attain a clear arrangement.

The conclusion that can be drawn from this list of success factors is that only a close and well-functioning cooperation between technical experts (project management and design) and commercial experts (sales team), as well as a sensitive handling of customer needs can lead to ultimate success in winning orders.

3.3. Interview analysis – categorization

In the interviews, with employees the strengths and weaknesses of each category are inquired upon, whereas the main emphasis is placed on the weaknesses, in order to determine each category's optimization potential.

The four tables in Appendices 1-4 show the collective points mentioned by employees when referring to weaknesses and the optimization potential of the offer process. The bullet points have been collected and structured into the four categories, but otherwise they are unfiltered. Only precise duplications have been eliminated from the list. Nevertheless, some points show slight overlaps. The aim is to identify the points with the most optimization potential to be used in the application of the analysis methods in the subsequent section and form the basis for the evaluation and prioritization of improvement measures in the workshop.

One possibility is to further consider the points that have been mentioned by multiple interviewees and which are marked bold in the category lists. The three areas mentioned by multiple interviewees to be of major significance for optimizing the offer process include the active advising of customers and inquiring on their wishes and requirements, visualization of specific offer features and ensuring the offer's clarity and uniformity. Some of the other points on the list coincide with one of the three major points or support their statement. This effect is illustrated by the numbering of the respective points, which is for Appendix 1:

- 1-5: clarity of the offer document;
- 6-12: visualization of offer features;

- 13-17: customer issues;
- 18-22: unassigned.

The points 15, 19 and 20 are not directly related to OM, but to sales management in general. Therefore, they are not further pursued, but should still be recognized by the company's sales management. The three bold points, on the other hand, should play a central role in the offer process optimization. In order to assess the customer orientation from an external perspective, the interviewed customers were asked to express their satisfaction with the company on a scale of one to five, with one being very satisfied and five being unsatisfied. The average customer evaluation lies at 1.6, which indicates that customers generally are satisfied with the company's performance.

In the process efficiency category, four aspects have been named repetitively, as shown by the bold marked points in Table 6. The number codes for Appendix 2 are:

- 1-4: technical issues;
- 5-10: unassigned;
- 11-16: ERP system issues.

Technical examinations can be a crucial factor in the offer process. This procedure is sometimes too time-consuming, because the design department's product examinations can be too detailed for the purpose.

A noticeable aspect of the process efficiency category is that almost all interviewees refer to the ERP system for improvement potential. Another crucial factor that can cause a decline in process efficiency is the signature rule: an employee must have a colleague review and sign an offer with a value above 5,000 Euros. Offers with a value of above 20,000 Euros must be signed by an authorized company representative. The process can be delayed, if an authorized representative is not readily available. Especially for offers within the company group, the signature rule is questionable. Although many of the interviewees regard reaction time as a crucial optimization aspect, the customer interviews revealed that customers are

generally satisfied with the reaction time to inquiries. The customer's average evaluation grade of the reaction time is 2.1, which is better than the company's average evaluation of 2.6. This result also is reflected in absolute numbers: the employees' estimation of the average reaction time of an offer is 4.6 days, while the customer's average expectation of reaction time is 7.8 days. The process costs are not separately analyzed at this point, because they are directly linked to the offer processing time. A decrease in processing time automatically means a decrease in offer process costs.

The number codes for Appendix 3 are:

- 1-2: ERP system issues;
- 3-5: customer issues;
- 6-14: unassigned.

One essential factor for effective offers is to determine a competitive price that both provides a solid return and is attractive for the customer. Determining the offer price can be difficult, because not all customer requirements are clear at the point of offer creation. Additionally, distorted "political prices" are sometimes used. For example, a higher price could be quoted due to an overall higher price level in a certain country, while a lower price could be quoted to maintain market share or because the price difference is covered by other projects with the same customer. If political prices and the reasons behind them are not clearly marked, the price estimation of later projects becomes harder. Several points in Table 7 clearly point to this issue. Therefore, a diligent documentation of calculations and political price determination can be eminently important for the offer process' effectiveness. Another point that crucially affects the effectiveness of offers is systematic and consistent follow-up with the customer. Several interviewees mentioned the lack of such a system. Hence, it can be concluded that there is considerable optimization potential in the introduction of a follow-up system.

The estimated evaluation by employees of the process effectiveness on average lies at "3" which means mediocre. This evaluation includes both

offers for tools and spare parts. On average, employees estimated the tool offer success rate at 14 percent and the spare part offer success rate at 61 percent. These estimations by the employees are not far from the real figures³ with 20 percent for tool offers and 56 percent for spare part offers. The offer success rate is determined by the total number of orders generated in a period, divided by the total number of offers sent to customers in the same period.

Table 4. Offer success rate in previous period

	Tools	Parts	Total
Offers	524	1138	1662
Orders	118	608	726
Success rate	23%	53%	44%

Table 5. Offer success rate in current period

	Tools	Parts	Total
Offers	513	1037	1550
Orders	91	600	691
Success rate	18%	58%	45%
Mean	20%	56%	44%

The offer success rate is an indicator to measure the offer process effectiveness. The offer success rate has been measured for two consecutive periods (as shown in Table 4 and Table 5). An interesting development can be observed when comparing the two periods. While the tool success rate has declined from 23 percent to 18 percent, the spare part success rate has increased from 53 percent to 58 percent. The slump of the tool success rate can partly be explained by personnel restructuring, which led to a temporarily understaffed sales department. The spare part offer tendency should be continued, whereas the tool offers need a significant improvement in offer effectiveness. The customer interviews revealed a few measures to achieve that. The customers were asked to evaluate a list of possible improvement measures on a scale of one (very good) to five (meaningless). The three best improvement measures that would increase the offer effectiveness in the eyes of the customers are: customer visits (Ø1.9), better payment options (Ø1.8) and bonus system (Ø1.2). Apart from the three highest ranked improvement measures, each individual customer feedback should be considered when making an offer to that customer.

3 Measured as the arithmetic mean over a period of 2 years (November 1, 2013 – October 31, 2015).

The number codes of Appendix 4 are:

- 1-11: ERP system issues;
- 12-19: unassigned.

It is obvious that the improvement potential of the ERP system is very high. One disadvantage is that the company's system requires the creation of an inquiry before an offer can be recorded in the system. This means that additional time must be spent entering an inquiry, even in cases when only an offer is required. The text editor of the ERP system is another drawback due to its inflexible and inconsistent text modules and its inability to properly incorporate pictures or drawings into the offer document, resulting in the need to handwrite parts of the offer. To compensate for missing or inadequate functions in the ERP system, the company applies a relatively high number of additional individual software programs and tools; as many as 14 different kinds of software are mentioned by the interviewees. The multitude of programs and tools require more maintenance effort and sometimes cause redundant work.

3.4. Interview analysis – key methods

The information acquired in the previous analysis of interview categories is used for the application of the analysis methods described below.

7R method

The 7R method's aim is to derive optimization potential of a process by examining the process from seven different perspectives (Nagel & Mieke, 2014). Although the analyses and methods conducted above have generated a considerable amount of optimization potential, the 7R method is used to complement the process analysis by looking at the offer process from different perspectives. It must be noted that not all of the seven perspectives suggested by the method necessarily are applicable or reasonable in this context. This is due to the universal character of the method, which ensures, however, that one does not oversee any relevant optimization points of the analyzed process. The procedure of the method is to reflect upon each "R" individually and to draw conclusions for the offer process.

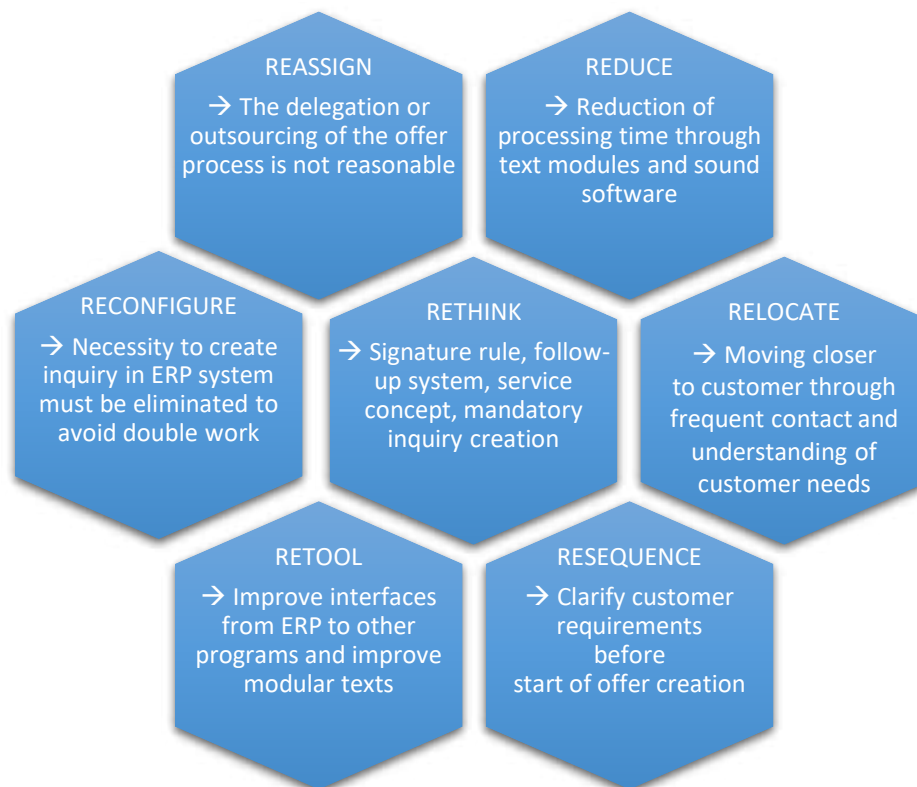


Figure 2. The 7R method applied to the offer process

The first R is “reassign”, which is comprised the delegation or outsourcing of certain activities in a process. Since properly creating a competitive offer requires customer background knowledge, it is not reasonable to delegate or outsource the company’s offer process activities. The next R is “reduce”, which refers to the reduction of resources or the frequency of an activity to make the process more efficient. This is mainly applicable to the reduction of processing time, which could be achieved through optimized and comprehensive text modules in the ERP system and sound software operation. The third R is “relocate”, which means moving an activity closer to the customer to execute it more effectively. Moving closer to the customer in the offer process can be accomplished through frequent contact with customers to understand their needs and to provide better follow-up on sent offers. Perspective number four, “resequence”, considers the schedule of activities and their chronological order. The chronological order of offer process activities is not worth

changing, but it is reasonable to collect as many customer requirements as possible before starting to create an offer. The fifth perspective is “retool”, which questions the options for system support and the automation of activities. There is significant optimization potential within this perspective, as pointed out in the previous analyses. The ERP system must be simplified and must guarantee smooth offer processing. The interfaces between the ERP system and other programs require improvement as do the modular offer texts. The sixth R is “reconfigure”, which reviews if activities of a process can be consolidated or eliminated. The necessity to create an inquiry in the ERP system must be eliminated in order to avoid double work. The final perspective is “rethink”, which considers why process activities are conducted in the current way. Elements of the offer process that should be “rethought” include the signature rule for high offer values, the follow-up system and the creation of a service concept. The results of the 7R method are summarized in Figure 5.

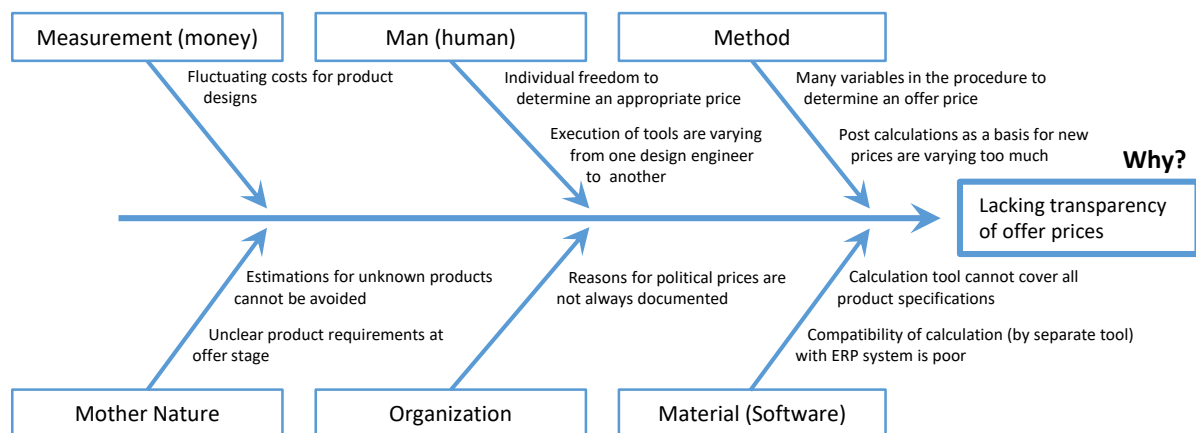


Figure 3. Ishikawa diagram on transparency of offer prices

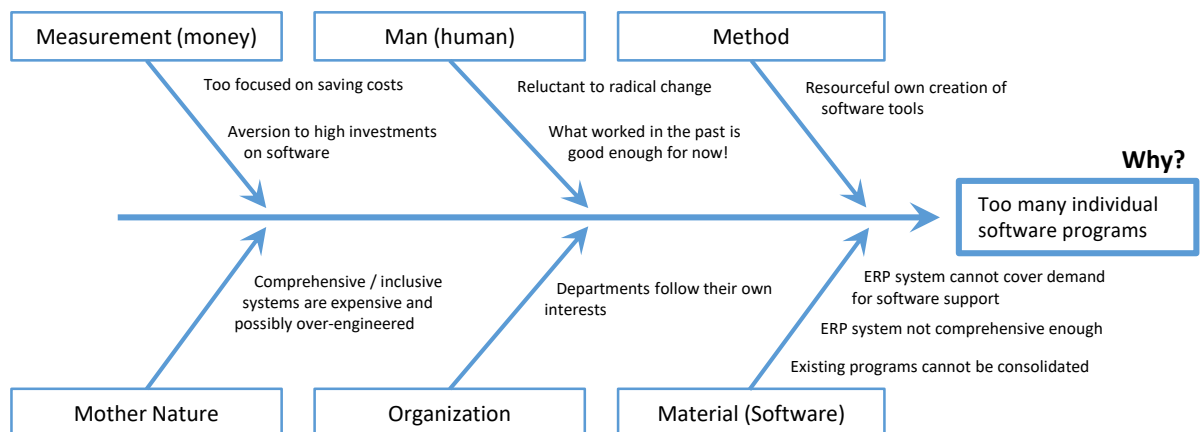


Figure 4. Ishikawa diagram on the multitude of software programs in the offer process

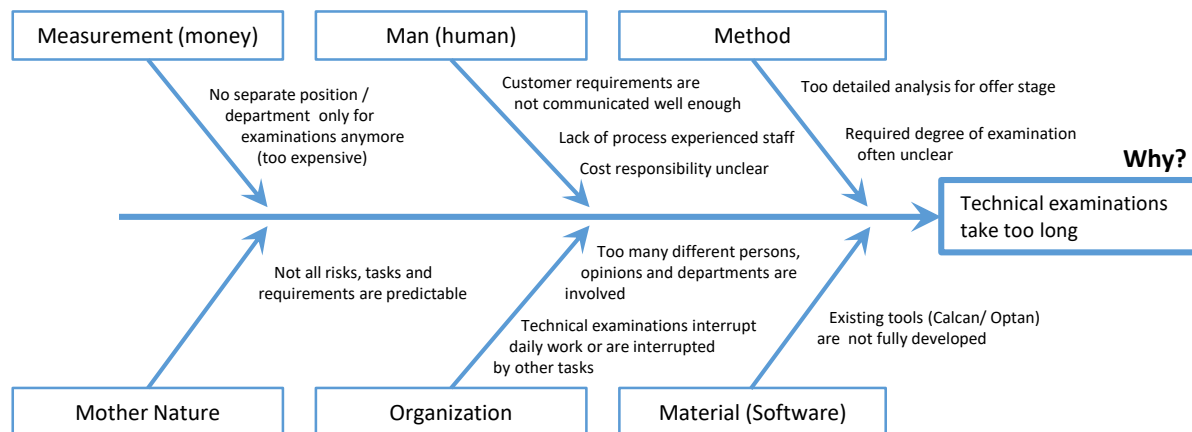


Figure 5. Ishikawa diagram on the duration of technical examinations

Ishikawa diagram

The Ishikawa diagram is used to explore problem causes and identify improvement measures (Jochem et al., 2015; Meran et al., 2014; Medinilla, 2014). Due to the method's structure, the analyzed problem should be complex, significant for the process, and suitable for asking "why-questions". In accordance with these requirements, three considerable problems were chosen: lacking transparency of offer prices, too many individual software programs and lengthy technical examinations. The identified causes are assigned to the best fitting of the six factors (measurement/money, man, method, Mother Nature, organization, material/software). The original six "Ms" are adapted for this purpose and form the characteristic fish bone structure of the diagram. Below, Figures 3-5 show the identified problem causes structured by the six M-factors that seek to answer the respective why-questions. The aim of the Ishikawa matrix is not to solve all the problem causes, but to create an overview of sources of impediments to the offer process and to contribute to a basis for the action recommendation plan.

Benchmark analysis

The benchmark analysis is based on an interview with a major competitor and it follows the same structure with the four categories: customer orientation, process effectiveness, process efficiency and software. In addition to the interview, two of the competitor's offers are analyzed, which were forwarded to the company by common customers of both companies.

In order to assess the customer orientation of both companies' tool offers, the positive and negative features of each are compared. The competitor's positive offer features include a high automation through text modules connected with the article number structure and a uniform layout of all offers. The drawbacks of the competitor's offers are complexity, lack of graphics and drawings and partially unclear or superfluous content, which stretches the offer to an average length of 25 to 35 pages. This makes it hard for the customer to understand the offer. This contrasts to the company's positive features of an average offer length of three to four pages and a flexible, individually adaptable offer structure that allows the integration of pictures and drawings. The negative features of the company's offers comprise a low degree of automation, low uniformity and low standardization with differing prices. As a consequence, it should be the company's objective to maintain its offer flexibility, but to improve the uniformity and structure, which can be achieved through a higher automation of text modules. For the purpose of comparing both companies' offer process effectiveness, the tool offer success rates are compared. The competitor's tool offer success rates are only estimates, but still serve as an orientation. Their offer success rate is estimated at 60 to 70 percent with "very good" (1) for offers that include a tool and a machine and at 20 to 25 percent with "weak" (4) for offers that include only a tool, but no machine. Since the competitor is a supplier of machine and tools, they are in a superior position compared to other tool suppliers. Nevertheless, the estimated offer success rate of 20 to 25 percent (opposed to the company's 20 percent) shows that it still is rel-

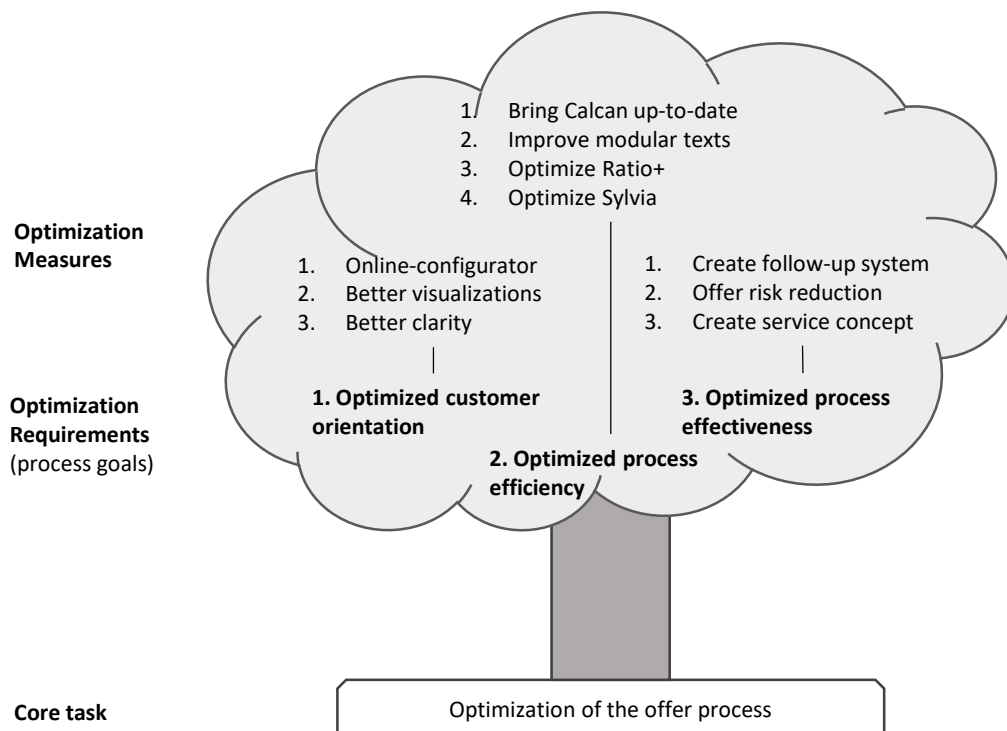


Figure 6. The process optimization requirements tree

atively difficult for the competitor to sell tools separately. For the assessment of the process efficiency of both companies, the estimation figures from the interviews are compared. The company's offer process efficiency is estimated at 2.6 (mediocre) on average, while the competitor estimates the figure at 2 (good) for standard tools and at 4 (weak) for unusual tools. This highlights the competitor's competencies and advantage as a system provider (supplier of machine and tool). This is also reflected in the comparison of reaction times. The company's average reaction time for a tool offer is estimated between four and five days, whereas the competitor's reaction time for a standard tool offer is estimated between one and two days. It seems that the competitor's weaknesses are unusual tool offers, because the latter's reaction time is estimated at two to three weeks.

The final area of comparison is software, where the competitor uses SAP R3 as an ERP system and the company uses an inferior low budget system. The competitor estimates their ERP system as very good (1) which does not differ much from the company's estimation as good (2). However, when comparing the number of programs that are used in the offer process, the difference is more

significant, because the company uses 14 different programs and tools, and the competitor only uses two (ERP system and Email). In conclusion, the software area leaves significant optimization potential for the company and it could be a contributing factor to the company's inferior offer process efficiency.

3.5. Workshop procedure and results

Compared to the interviews, the workshop has less weight regarding the process analysis. As an empirical research method, the workshop has fewer analytical characteristics than conceptual characteristics. This is due to the workshop's objectives:

- determination of central strengths and weaknesses of the offer process;
- identification of improvement potential;
- prioritization and decision-making of improvement measures.

Consequently, the workshop is less about analyzing and more about conceptualizing measures for process optimization.

During the workshop, participants (five executive managers) suggested structuring the top three measures in a cluster, based on the priority list (priorities one to three) in order to highlight the major requirements for the offer process and maintain an overview of the large amount of optimization measures. Therefore, a structure was developed with the core task at the bottom, using the process goals as general optimization requirements and clustering the major optimization measures along the requirements. The outcome of the structure is depicted as a tree in Figure 6. These optimization measures are implemented using an action recommendation plan.

4. IMPLEMENTATION OF RESULTS

The success of the optimization efforts must be monitored to ensure the continuity of improvement and to monitor the development of the offer process. This can be achieved by installing a Process Performance Measurement System (PPMS). Process performance measurement usually is done using a specific set of key performance indicators (KPIs) (De Waal & Van der Heijden, 2015; Wieland et al., 2015).

Suitable KPIs can be found in Table 2 “Key figures of OM”. In order to measure the process effectiveness, the KPIs “offer success rate (amount)”, “offer success rate (volume)” and the “loss order rate” are chosen for the PPMS. The KPIs “average reaction time” and “average processing time” are suitable to measure the process efficiency. The third process goal, customer orientation, should be included in the PPMS as well. It is represented by the KPI called “customer satisfaction index” (CSI), which is calculated by the arithmetic mean of the three customer evaluations that are part of the customer interview (general satisfaction with the company, satisfaction with the reaction time, and satisfaction with the offers’ content and quality).

The PPMS is completed by the “right first time, on time” (RFTOT) concept (Womack & Jones, 2003, for a solution matrix, see Fauser, 2013, p. 119), in order to measure “offer completeness” and “offer timeliness”. An offer is considered complete if price, lead time, delivery date, delivery terms, payment terms, commitment period and warranty period are provided in an offer. This can be measured by running a Structured Query Language (SQL) query in the ERP system. The resulting KPI shows the percentage of all sent offers that are complete (right first time). “On Time” is measured by the 3-day rule (i.e. offers must be sent within three days after the receipt of the inquiry). Adherence to the 3-day rule is measured by an SQL query in the ERP system that identifies the average amount of days between the offer registration date and the offer sending date for all standard offers within a period, under the assumption that all offers are registered in the ERP system the day they arrive. The resulting KPI (On Time) determines the percentage of all sent offers that were sent on time in a period.

Table 6. The process performance measurement system

KPI	Efficiency	Effectiveness
Offer success rate (amount)	–	45.9%
Offer success rate (volume)	–	23.3%
Loss order rate	–	54.1%
III reaction time	4.6 days	–
III processing time	64 minutes	–
Customer satisfaction index (CSI)	–	1.78
Right first time (offer completeness)	–	71.9%
On time (3-day rule)	63.4%	–

It is recommendable to evaluate the performance of the offer process regularly, e.g. in the beginning of every year. Target numbers and improvement measures should be determined for the current year according to the results of the previous year.

CONCLUSION

The core elements of this study’s results are optimization measures for an improved customer-orientation, process efficiency and process effectiveness. The customer orientation of the company’s offer process is optimized by creating an online configurator for product layouts, by improving the clarity of

offers and maintaining a uniform structure, and by including more illustrations of technical product components for customers who need them. The essential measures to optimize the offer process efficiency include the updating of the offer calculation tool, a comprehensive text module structure for offer texts, the comparability and further improvement of the ERP system, and the continuous adaptation of the technical specification program. The effectiveness of the offer process is improved by using a consistent offer follow-up system, by reducing offer risk through special terms and conditions for certain countries, and by the development of a global service concept. Some of these optimization measures are one-time actions (e.g. creating an online configurator), while others must be performed regularly (keeping the offer calculation program up-to-date).

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APPENDICES

APPENDIX 1. WEAKNESSES/POTENTIAL OF CUSTOMER ORIENTATION IN THE OFFER PROCESS

1. Offers sometimes are too detailed and extensive.
2. Do not “flood” customer with information.
3. Present options clearly and distinctively.
4. **Ensure clarity and uniformity of offers.**
5. Highlight special recommendations.
6. Highlight customer value.
7. **Visualization of features and animations.**
8. Specially highlight fulfilled customer wishes.
9. Visualize company terminology.
10. Hyperlinks to Mindserver¹.
11. Online calculator for budgeting.
12. Standard pictures for spare parts.
13. **Actively advise customers and inquire on wishes and requirements.**
14. Make the offer text more customer-friendly (email and offer document).
15. Use customer’s vocabulary.
16. Adapt offer mask to markets.
17. Customer-/culture-specific offer text modules.
18. Closer customer contact.
19. Improve and extent service – develop a new service concept.
20. More customer visits and more competitive prices.
21. Better highlight USPs.
22. Display of delivery time on spare part offers.

APPENDIX 2. WEAKNESSES/POTENTIAL OF PROCESS EFFICIENCY IN THE OFFER PROCESS

1. Technical layouts/examinations take too long and must improve.
2. Too detailed work by the design department for offers.
3. Price determination for unusual parts.
4. No price lists for angular articles.
5. **The signature rule (four eyes principle) costs too much time (necessary for in-house business?).**
6. **Improve reaction time (from inquiry receipt to offer sending).**
7. Improve determination of shipping date.
8. **Better communication between sales, project management and design.**
9. Maintain price lists more consequentially.
10. Improve time and cost awareness.
11. Standard terms of payment and delivery for both tools and spare parts.
12. Offer texts must be available in German and English and be easily includable.
13. Check availability of parts more easily.
14. Improve calculation process and scheduling.
15. Unclear structure of specification tool.
16. Several debtor numbers for one customer.

¹ Mindserver is a cloud database where customers can access product information (e.g. videos).

APPENDIX 3. WEAKNESSES/POTENTIAL OF PROCESS EFFECTIVENESS IN THE OFFER PROCESS

1. Calculations (price) should be saved in system.
2. No good overview of open inquiries.
3. Generate more inquiries and offers through more service deployments.
4. More presence at customer.
5. Improve direct customer service through better human interaction.
6. Too much reaction and not enough action (towards the customer/the market).
7. Use old projects as reference.
8. **Missing transparency of offer prices (arguments for political prices unknown).**
9. Reclamations and problems lead to inhibitions to make new offers.
10. Concentration of knowledge in individual persons (bottle neck).
11. **Improve offer follow-ups.**
12. **Minimize estimations in offer creation.**
13. Fast and flawless processing of reclamations.
14. Different sales managers can get to different prices.
15. Lacking (passing of) knowledge.

APPENDIX 4. WEAKNESSES/POTENTIAL OF SOFTWARE AND SYSTEMS IN THE OFFER PROCESS

1. Linking of Calcan with ERP system.
2. Degree of automation must be increased.
3. **Avoid double work.**
4. ERP system does not have a consistent calculation option.
5. Inflexible report system in ERP system.
6. No warning signal for missing content/information (e.g. missing payment terms).
7. **Better text modules for offer creation.**
8. Technical and commercial level not connected in ERP system (parts list).
9. Missing standard texts (modules) in English.
10. Only one payment condition can be saved for spare part offers.
11. Poor customer support for ERP system.
12. Calcan is not up-to-date.
13. Insufficient prioritization in Redmine² (what do we need until when?).
14. Avoid lengthy chain emails through short summaries (memos instead of forwarded emails).
15. **Too many individual programs/tools.**
16. High amount of single programs require high maintenance effort.
17. Complete customer information not available in single/ central database.
18. Geometrical similarity search.
19. Improve customer knowledge database.

2 Redmine is a software used to request a technical examination of product specifications.