Reducing Requirements Heterogeneity in Enterprise System Projects –
A Case Study of Harmonizing and Optimizing Business Processes

Björn Michalik
University of Cologne
michalik@wiso.uni-koeln.de

Marcus Keutel
University of Cologne
research@marcus-keutel.de

Sebastian Müller
TÜV Rheinland
sebastian.mueller@de.tuv.com

Dirk Basten
University of Cologne
bastian@wiso.uni-koeln.de

Abstract
Requirements heterogeneity is a crucial problem in enterprise system (ES) projects. Organizational units working divergently (e.g., due to regional differences) are a root cause. To encounter this problem, we analyze how the application of an upstream business process harmonization and optimization (BPHO) reduces requirements heterogeneity in ES projects. We conducted an in-depth longitudinal case study at one of the worldwide leading providers of technical, safety, and certification services over a period of four years. Applying BPHO, the company’s existing processes and roles were mapped on a small set of generic process steps and roles. Increased abstraction ability, willingness to change, and communication efficiency successfully reduced requirements heterogeneity. For researchers, we for the first time show BPHO reducing requirements heterogeneity in ES projects. Practitioners get first insights into how and why BPHO helps to reduce the heterogeneity of requirements and thus have a better basis for decisions about applying upstream BPHO.

1. Introduction
Organizations have often developed different information systems (IS) for their different locations [1]. Reasons for this are for instance diverging strategies for national markets and the organizations’ internal dynamics caused by rapid growth. External dynamics due to changing market conditions require a flexible design of IS and related business processes. Enterprise (resource planning) systems (short: ES) [2] are supposed to overcome these challenges.

ES are enterprise-wide complex IS that integrate and optimize an organization’s business processes across regional and business units’ boundaries [3]. They consist of industry-specific and configurable modules [4]. The investment in such systems is crucial for organizations as it leads to reductions in operating expenses and cycle time, improved planning accuracy, optimized financing, lower use of human resources, and reduced costs in information technology [2].

ES projects are often challenged by the underlying requirements [5]. Especially, multinational ES projects show a higher degree of complexity, are often more effort-intensive, and more often fail compared to single-location projects [6]. Organizational units working in diverging ways, mainly due to regional differences, increase organizations’ effort required to implement ES [7]. These differences lead to customers specifying a great number of different and even diverging ES requirements (in the following short: heterogeneous requirements) [4].

To solve the problem of heterogeneous requirements, we aim to evaluate business process harmonization and optimization (BPHO). This approach denotes the standardization and improvement of existing business processes [8]. It is used to analyze and optimize organizations’ business processes to provide harmonized processes as basis of a system to be developed [4]. Our research question is thus:

How does BPHO help to reduce the heterogeneity of customer requirements in the context of ES implementations?

In this context, BPHO has not been investigated so far. To answer our research question, we conduct an in-depth longitudinal case study at one of the worldwide leading providers of technical, safety, and certification services. For researchers, we observe BPHO’s innovative application to solve the problem of heterogeneous requirements. For practitioners, we provide insights into why and when to apply upstream BPHO in ES projects. We also discuss this approach’s general positive impact on the overall project.

We use section 2 to provide a comprehensive overview of ES, heterogeneous customer requirements, and BPHO. In section 3, we describe our case study approach. We present our results in section 4 and discuss these in section 5. We conclude with implications for research and practice in section 6.
2. Theoretical Background

2.1. Enterprise System Projects

Beginning with material requirements planning systems in the 1970s, organizations kept evolving the development of technological systems to manage their business to what we today call ESs [2]. Without such systems, organizations’ different units mostly use different IS optimized for their specific business area [8]. An ES unifies these different systems and prepares them for different business processes. ES integrate and optimize an organization’s business processes across regional and business units’ boundaries [3]. They generally consist of industry-specific and configurable modules [4] and are less fault-prone compared to a set of different IS due to high data consistency and avoidance of manual data entries [3].

Due to their complexity, ES projects face extraordinary challenges that oppose the potential benefits [4, 9]. ES projects are primarily challenged by unfulfilled project goals and higher than budgeted cost.

Requirements analysis in ES projects goes beyond classical analysis of an organization’s requirements towards an IS and also includes the ES’s global features [4]. The adaption of the organization’s processes and the ES’s features need to be balanced as both significantly impact project success [2].

2.2. Heterogeneous Requirements

Requirements are descriptions of a system’s functions, features, properties, or expected behavior [10]. Heterogeneous requirements arise if customers differ regarding their requirements [11]. This is a well-known problem in literature [12, 13]. Requirements heterogeneity in general leads to requirements uncertainty [11, 14, 15] and is one of the main threats to complete and correct requirements [16]. It might for instance be difficult to customize a system to one customer group without neglecting the requirements of another group [11]. In the context of ES, heterogeneity is caused on four different levels [17–20]:

Cultural level: Often different cultures exist within organizations [18, 21], especially in multinational ones [22] or organizations with external growth, that is, mergers and acquisitions [23]. Different cultures influence the values and behaviors of an organization’s employees and affect standards and overall business processes [21, 23]. This may lead to heterogeneous requirements [22]. The importance of individual requirements might vary between cultural groups.

Organizational level: Organizational issues may cause requirements heterogeneity [17] due to the existence of organizational differences in task environment [11]. Analogously to the cultural aspect, many different organizational and operational structures might exist in large organizations. Organizational structures describe an organization’s unit structure (e.g., departments) whereas operational structures determine business processes with regard to the available resources.

Technical level: In organizations’ different business units, IS are often developed and used independently [17, 19, 20]. The same business processes may be supported by IS in different ways and different depth. Users familiar with existing IS thus formulate requirements from their previous perspectives. This inevitably leads to heterogeneous requirements.

Conceptual level: Heterogeneous requirements might emerge through varying data models and different understandings of the same object of reality [17, 19, 20]. Different languages and terminologies can lead to confusion, for instance due to homonyms and synonyms [24].

2.3. Business Process Harmonization and Optimization

A business process is defined as “a set of logically related tasks performed to achieve a defined business outcome” [25, p. 12]. To achieve this business outcome, people, materials, energy, equipment, and procedures are logically organized into work activities according to business processes [26]. To increase business processes efficiency, turn an organization’s position [27], fulfill customer demands, or cope with increasing market competition [28], organizations may need to change their existing processes [29].

Harmonization is a precondition for optimizing business processes [30]. Thereby, process standardization is a crucial aspect for harmonization. For optimization, an integration of organizational units takes place to facilitate the collaboration between them [31]. O’Neill and Sohal [28] have shown in their review that a variety of terms and concepts exist to denote the activities for improving existing business processes. We follow Hammer and Champy [32, p. 19] who define business process optimization as “fundamental revision and radical redesign of processes to reach spectacular improvements in critical and contemporary measurements of efficiency, such as costs, quality, service and quickness”.

Business process optimization comes along with the adaption or redesign of existing IS which enable the automation of application flows [28, 33]. IS can fundamentally change the business and fulfill BPHO’s required conditions [34]. It is important that IS support
business processes and that business processes are aligned to the potential of IS.

3. Research Approach

We conducted an exploratory longitudinal single case study. A case study is “an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident” [35, p. 18]. It is therefore especially well-suited if research problems under investigation are complex, dynamic, and cannot be studied outside the context in which they occur [36]. Furthermore, case studies are recommended for exploratory studies and are the preferred method to answer how and why questions [35, 37]. Concerning the underlying philosophical paradigm, we position our work ontologically and epistemologically as positivist. The positivist approach stems from natural sciences [38, 39]. Therein, it is believed that an objective reality exists independently from the observer and that the world can be comprehended by identifying cause-effect relations not bounded in context and time [39].

3.1. Research Site

The case company is one of the worldwide leading providers of technical, safety, and certification services. With 500 locations (in 61 countries), it has 14,400 employees and sales of over 1,3 billion euro. The project scope was the in-house implementation of a globally common order-processing system in one of the company’s six business areas. In the following referred to as the customer, this business area concerned the company’s most international one and was characterized by a heterogeneous IS landscape. Due to strong internal and external growth, more than ten different IS were run in its worldwide locations with over 100 databases and/or user interfaces. Accordingly, targets were to increase efficiency, standardization, and customer satisfaction.

The project started in early 2008 and the first regional rollout, namely in Germany, was successfully completed in March 2012. All other regions follow later in 2012. In scope but preceding the actual system’s development phases, upstream BPHO was conducted due to negative experiences with heterogeneous requirements in former global projects. Consisting of two phases, process analysis and process harmonization and optimization, it took about eight months. For the process analysis, five countries based on the importance for the business area were selected representing all 61 countries: China, Germany, Japan, Taiwan, and the USA. Interviews with the head of department and key stakeholders were conducted in each country and the resulting process models were reviewed by the interviewees. For process modeling and documentation, the software ADONIS was used. In the following process harmonization and optimization phase, five generic process steps and six generic roles were derived (as these are not the focus of our study, we do not present them here). All identified current processes were mapped on process steps and roles that were independent of the current organizational implementation. If more than one implementation of the same process existed, the best alternative was selected. Only in case of inevitable exceptions, for example due to local legal and certification requirements, outliers were allowed. Additionally, optimization included critically questioning each process, that is, the necessity of process activities and their sequence were scrutinized and sharpened if applicable. Finally, the results were sent to the most important stakeholders for review and iterative improvements. Figure 1 provides an overview of the project’s logical sequence.

Including one of the researchers, the core project team consisted of 17 internal and seven external employees. However, only internal employees participated in the BPHO phase. The researcher on-site took part in all project phases finished so far, that is, from project initiation until rollout’s completion in Germany. As a fully-fledged employee, he had his own workplace, worked full-time on the project, and thus spent about 8 hours per day on-site.

3.2. Research Design

We used a holistic single case design. Concerning the nature of our single case design, we refer to our case as a unique case [35]. First, the case concerns an international BPHO project (unit of analysis) at one of the worldwide leading technical providers. Second, we had unlimited access to all relevant information, decisions, and experiences because of one of the researchers’ employment at the case company. Due to our continuous observation and document collection (cf. section 3.3), our study was longitudinal [40]. We collected on-going as well as retrospective data. Finally, we generated a case study protocol containing as much information as possible (e.g., an overview of the case study project, field procedures, the interview guide, and a guide for the case study report) to guide us through the data collection process as well as to increase reliability allowing other researchers to repeat the employed procedures and come to the same results [35, 36].
3.2.1 Data Collection. Our data sources included participant observations of meetings, workshops, and training sessions (547), semi-structured interviews (4), and documents (115).

Participant observation comprised four years of full collaboration of one of the researchers within the ES implementation project. Thus, he was able to take part in most of the formal and informal meetings, workshops, and training sessions. He took comprehensive field notes throughout these events as recommended by [35, 41] and conducted numerous informal discussions with all project members. During the kickoff phase, in which the methodology and responsibilities for the upcoming phases were defined, he participated in various meetings with process consultants, IT consultants, and responsible IT and business managers within the organization. During BPHO phase he was the responsible process analyst for the German region. He conducted interviews with employees in different organizational units. Similar to all other process analysts, he started interviews on management level and used the Six Sigma SIPOC methodology in order to identify major process steps including key stakeholders as well as inputs and outputs. Continuing the top-down approach, further interviews were conducted for each process step with various employees representing stakeholders within the different major process steps. After the process analysis and documenting all processes in detailed process flow charts, the researcher on-site and all other process analysts in the remaining regions contributed in harmonizing the processes and developing the future target process. After the operational participation during the BPHO phase, the researcher on-site supported the overall responsible project manager by coordinating the global project team with business team members and IT consultants. He continued this role throughout the requirements analysis phase, implementation phase, and the first rollout in Germany.

However, since participant observation always bears the risk of suffering from emotional involvement with the work and the project, we consistently paid attention to evaluate actions or processes value-free and not to alter any results despite being actively involved in the project work [36]. This way, the participant observation did not conflict with our underlying positivist stance (e.g., [42, 43]). The participant observation provided the unique opportunity of unlimited access to all relevant information, decisions, and experiences and thus deep contextual insights relevant to our research question.

In total, we conducted four semi-structured interviews. Each of them lasted between one and one and a half hour. We used and pretested an interview guide within the researcher group and sampled the four interviewees out of the project team by maximum variation sampling [44]. We chose interviewees holding different roles in the project (e.g., project manager vs. consultant) as well as the case company (e.g., business vs. IT department), stemming from various hierarchy levels (e.g., director vs. general manager), and working in different countries (e.g., South Korea vs. Germany). We not only interviewed internal but also external employees. Internal employees on an operational level were not interviewed separately since their information and viewpoints were gathered in detail during participant observation. Our final sample encompassed the project manager of the ES project, who also serves as the director of one of the case company’s sub-units in Asia; the IT project manager, who usually is in charge of the organization’s IT strategy; the general manager of the global IT program management department; and a business service area consultant. The interviews were audio-recorded, transcribed, and finally reviewed by the interviewee to ensure communicative validity [45].

We had insights into all relevant documents by unrestricted access to the project’s hard drive and Lotus teamroom and by being part of all relevant email conversations. Thus, we investigated all documents (e.g., presentations, minutes, and process models) for useful information concerning our research question.

We stored all documents, notes, and narratives in a case study database [35].

![Figure 1. Overview of the project’s chronicle sequence.](chart)
In the following analysis, we applied the concept of data triangulation by combining the multiple data sources to converging lines of inquiry [35].

3.2.2 Data Analysis. As recommended [35, 37, 41], data analysis and data collection were overlapping, for instance by the researcher on-site taking field notes. Raw data (interview transcripts, field notes, and documents) was coded using the software NVivo.

As recommended for exploratory studies [37], we did not build on existing theory. Codes were derived from data [46]. Researcher triangulation was broadly applied as two researchers independently coded every data piece and discussed and consolidated their results among each other. This ensured that all results were developed independently from the subjective view that the researcher on-site may have generated due to his strong involvement. The study’s final results were presented to the responsible CROs (Chief Regional Officers) and the Group CIO to check the credibility of our findings. Feedback was consistently positive.

4. Results

BPHO was said to be a huge success. In countries where the rollout has already started, the system acceptance was high. This is reflected in the number of change requests which were only half as high compared to similar previous system implementations. More than 150 processes were identified in different departments and regions. Analyzing these processes, an unexpectedly large number of similar processes were identified that existed for historical or cultural reasons:

“We found a multiplicity of similar processes. I have to admit that I had never thought we will end up with such a huge number” (Consultant).

Five generic process steps and six generic roles were derived. All processes were mapped on those generic steps and roles. The large number of processes and thereby heterogeneous requirements could be reduced. We present the identified benefits of BPHO in section 4.1 and argue for their relevance in the context of heterogeneous requirements in section 4.2.

4.1. Identified Benefit Dimensions of BPHO

We identified three benefit dimensions, namely (1) increased abstraction ability, (2) increased willingness to change, and (3) increased communication efficiency.

4.1.1. Increased Abstraction Ability. People are used to think in familiar patterns [47]. During requirements analysis, this often makes people copy existing systems, processes, and structures:

“Without harmonization, people would have simply reproduced what they already knew. [...] everyone would have tried to describe old examples. For instance, they would have stated that in their old system they had a button which did x. Thus, they would have tried to copy their old systems instead of thinking about the underlying processes” (IT project manager).

In numerous meetings and workshops, we observed that BPHO forced every participant to abstract from existing conditions and think out of the box since it was clear to everyone that a harmonization would never be successful without concessions:

“People could not simply copy what they knew from the past” (IT project manager).

The abstraction mainly consisted of deriving the five generic process steps and six generic roles and the mapping of the existing processes on these process steps and roles. This took place for instance in numerous meetings and workshops using flipchart brainstorming. Thus, local conditions due to organizational structures and roles were neglected if possible. Furthermore, the stakeholders abstracted from the old and limited IS. The abstraction was even enhanced by the application of modeling techniques and employees who were not familiar with the specific processes. Thus, despite that processes seemed to differ at first glance, many similarities could be identified:

“Switching from the process into a helicopter view, one noticed many similarities in the differently described processes” (Consultant).

Also, it was easy to inform and convince the management:

“It became evident, also to the management [...], that although some processes looked quite different, they were basically so similar that they could be combined into one single process” (Consultant).

Additionally, we observed that employees of different regions and hierarchy levels developed a common understanding of all processes and roles. Moreover, the abstraction led to an objective view, detached from emotional factors.

“This led to fewer controversial discussions, since discussions took place on an objective rather than emotional level” (IT project manager).

4.1.2. Increased Willingness to Change. Especially in large organizations, initiating change can be difficult [48]. This phenomenon could also be noticed in the initial meetings and workshops for collecting the current processes:

“First, there were many responses from the different regions requiring their systems and processes to be maintained” (IT project manager).

However, shortly after the beginning of the project, we observed that change was not only accepted but
also actively supported by the employees due to BPHO. The increased level of abstraction (cf. section 4.1.1) simplified disengaging from existing systems, processes, and structures since…

… “after presenting the new target processes in the different regions, employees identified themselves with these” (IT project manager).

Discussing pros and cons of the existing process alternatives, employees recognized existing processes’ deficits. They gained the understanding and motivation to improve the processes and contributed innovative ideas. This was enhanced by people unfamiliar with the existing processes and getting involved in the optimization phase. Thus, target processes were innovatively redesigned considering the stated project objectives of standardization and efficiency and detached from the present systems, processes, and structures. For example, some processes’ steps became unnecessary whereas others were processed totally differently. Despite the radical changes, …

… “there was little resistance from the employees against the process changes approved by the management. The employees rather recognized the resulting advantages […] Employees clearly stated that they think the target processes are going to work out” (Consultant).

Graphical modeling and documentation also helped to get management’s approval. Through continuous communication and employees’ feedback process, we observed that this aspect was continuously stressed in meetings, workshops, and training sessions. Thus, in many places, BPHO led to improved communication.

“Early in the project, it became evident that adopting the target processes not only leads to changes to the organization’s processes but also to the organization’s structure. This kind of changes often causes resistance among the employees. Due to employees’ comprehension this resistance was very limited” (Consultant).

4.1.3. Increased Communication Efficiency.
Communication is a critical factor in ES projects [49]. In BPHO, all parties involved were more than usual aware that communication was crucial for its success. We observed that this aspect was continuously stressed in meetings, workshops, and training sessions. Thus, in many places, BPHO led to improved communication.

From the start, all relevant employees were BPHO team members. As described in section 3.2, employees of the regions China, Germany, Japan, Taiwan, and USA were involved representing the product departments’ key business area. Moreover, extensive training took place so that everybody got familiar with the necessary methods and tools. Furthermore, we observed an intensive use of audio, video, and web conferences strongly increasing the employees’ direct communication.

“We noticed that modern communication technology was very important. Via video conferences, people were interconnected across borders” (General manager of the IT program management department).

In critical project phases, we observed personal meetings with intensive and controversial discussions. “They frequently conducted audio as well as video conferences. Especially in critical project phases also personal meetings took place, for instance, the workshop in Shanghai for defining the target processes” (Project manager).

Indirect communication was supported in the way that all relevant information, for instance presentation slides, minutes, process models etc., were constantly shared via email or the project’s hard drive. Communication was facilitated through computer-aided modeling, analysis, and documentation. The software Adonis was used to model, analyze, and document all current and targeted processes.

“Applying modeling techniques showed considerable success, not only in communication […]” (General manager of the IT program management department).

Figure 2 illustrates a sketch of such a process model. As part of a continuous communication and feedback process, we saw that the results of the initial target process design were sent to all employees for review and their suggestions for improvement were implemented if reasonable. Furthermore, differences in syntax and semantics were avoided:

“Differences existed within the terminology, and the vocabularies used in the different regions were varying” (IT project manager).

During the overall BPHO process, we observed that those problems were identified and successfully solved in the harmonization and optimization phase by defining the standardized target processes and thus a mutual language and understanding.
“It was a key advantage that a common language was established in an early stage [of the ES project]. Employees of the IT department as well as the functional departments have a mutual understanding of the same terms. In many past projects, exactly this went much worse as employees from different departments communicated with each other using the same terms but meaning something completely different” (Consultant).

“Clearly, the use in doing so is that [...] everybody speaks a common language” (Project manager).

This included not only employees across functional departments but also between the functional and the IT department.

4.2. BPHO’s Benefits Regarding Heterogeneous Requirements

We now focus on the positive effects of BPHO regarding the levels of heterogeneous requirements (cf. section 2.2). Table 1 shows the coherences between the identified benefit dimensions and the levels of heterogeneous requirements. An ‘X’ represents a dimension reducing the heterogeneity of customer requirements on the according level.

To reduce requirements heterogeneity on the cultural level, increased abstraction ability and increased communication efficiency have proved to be effective (cf. Table 1). Due to the abstraction (cf. section 4.1.1), all existing processes were mapped on five generic process phases and six process roles. Thereby, cultural differences between different organizational units as a cause of requirements heterogeneity were reduced by decreasing the diversity of organizational roles and thus establishing a common understanding of the emerging key roles. Moreover, causes of heterogeneity on a cultural level were reduced by increased communication efficiency (cf. section 4.1.3) as BPHO enables cross-cultural collaboration and improves the mutual understanding of cultural features. It thus decreases cultural differences concerning business processes and IS.

Decreases in requirements heterogeneity on the organizational level can be attributed to increased abstraction ability and increased willingness to change (cf. Table 1). Different organizational structures and process organizations cause heterogeneous customer requirements as different organizational units demand their processes to be maintained. The negative impact of diverging structures was reduced by the abstraction from the existing organizational structures, in our case especially the diverging processes (cf. section 4.1.1). Moreover, we observed an increased willingness to change (cf. section 4.1.2) as team members transparently saw BPHO’s benefits and were able and motivated to contribute their own ideas. Non-conform thinking led to completely newly designed processes.

The requirements heterogeneity on the technical level was likewise reduced by increased abstraction ability and increased willingness to change (cf. Table 1). Different IS with varying functional width and depth led to diverging requirements for systems to be developed. However, in our case increased abstraction ability reduced this diversity by abstracting from existing processes as described above as well as from limitations concerning the existing IS and their operation (cf. section 4.1.1). Moreover, increased willingness to change (cf. section 4.1.2) facilitated team members to disengage from the existing IS. Neglecting previous and limiting IS thus reduced requirements heterogeneity on the technical level.

Increased communication efficiency reduced requirements heterogeneity on the conceptual level (cf. Table 1). Communication was crucial as employees from different regions (with geographical, timely, linguistic, and cultural differences) were involved (cf. section 4.1.3). Their communication throughout the project required the standardization of diverging terminologies in existing processes and highly systemized means of communication (audio, video, and web conferences, that is, virtual meetings while sharing information on the moderator’s virtual desktop). Moreover, indirect communication enabled by for instance documented process models was highly relevant. Thus, increased communication efficiency reduced the causes of requirements heterogeneity on a conceptual level (cf. section 2.2).

5. Discussion

We present the results of a longitudinal case study at one of the worldwide leading providers of technical, safety, and certification services applying BPHO to improve requirements heterogeneity on the ES level. Our case study shows that BPHO can effectively reduce requirements heterogeneity in ES projects. It
BPHO helped to identify only reasonable and employees' expectations and needs. Early user resulting processes were closely adjusted to were involved in shaping the new processes. Thus, the communication efficiency) throughout the or to communication of these changes (increased abstraction ability and increased willingness to change) contributed to organizational changes (increased resources [53].

BPHO took place in the beginning of the ES project and was performed with regard to the organization’s strategic goals. BPHO and especially increased communication efficiency supported the clear definition and communication of goals, expectations, and deliverables – which is seen as crucial in ES projects [2, 52, 53]. Such objectives must be specific and operational and all project team members must be conscious of them throughout the whole project [9]. As increased communication efficiency reduced the cultural and conceptual levels of requirements heterogeneity (cf. section 4.2), it created a mutual understanding and common language between all team members. Additionally, employees directly recognized the benefits that could be realized by harmonizing and optimizing the organization’s business processes.

The increased abstraction ability (cf. section 4.1.1) and its impact on requirements heterogeneity on cultural, organizational, and technical levels showed the high potential for improvements concerning the organization’s current processes. This emphasizes BPHO’s importance for the overall organization. It thus raised and maintained top management’s attention and support which is crucial for ES projects [9, 54–56]. Next to the need of substantial resources, ES projects require extensive changes in key business processes [2]. As these decisions need to be made top-down [57], top management has to provide leadership and the required resources [53].

Moreover, the benefit dimensions (cf. section 4.1) contributed to organizational changes (increased abstraction ability and increased willingness to change) or to communication of these changes (increased communication efficiency) throughout the organization. During BPHO, a multitude of employees were involved in shaping the new processes. Thus, the resulting processes were closely adjusted to employees’ expectations and needs. Early user involvement is a key factor to reduce fears and avoid user resistance [34]. In our case, abstraction during BPHO helped to identify only reasonable and realizable process changes. Employees recognized that changes were necessary, profitable, and meaningful. Moreover, the targeted processes and accompanied changes were communicated immediately and transparently after the BPHO process. Everybody got to know the upcoming changes and was able to adapt oneself to them. Thus, BPHO enabled extensive changes to organizational structures, policies, key business processes, and employees. These changes are seen as highly relevant for ES project success [2, 9].

BPHO’s resulting processes were closely adjusted to employees’ expectations and needs due to their involvement. The necessity of extensive education and training was perceived to be much stronger because process changes were considered more profound than simply implementing a new system. Regarding ES complexity, such extensive education and training is of enormous importance in ES projects [9, 54, 55]. End-users must not only be taught to handle the system properly but also to understand the new processes and the overall integration [53]. Only in this case, it is avoided that end-users create their own processes around the system’s individual functions and thus the system’s full potential is tapped [2].

Many aspects of our study can be attributed to diverging views and expectations mainly caused by the cultural level of heterogeneity. In the course of the abstraction of irrelevant process differences in the various locations, multisite issues on the process level were extensively identified, analyzed, and reduced and thus complexity was decreased beforehand. Moreover, extensive communication led to a mutual understanding and common language. This way, the multisite factor addressing the choice between corporate standardization and local optimization was positively influenced [2]. Usually, this question makes ES projects additionally complex [58]. If necessary, permission needs to be granted for the different circumstances at multiple sites. In addition, [2] and [54] state that a phased implementation approach is generally preferable. That way, successful examples can be made and lessons learned be derived from one site to another.

We see two major limitations to our study. First, participant observation always bears the risk of suffering from emotional involvement with the work and the project. However, we were aware of this issue during the whole study and consistently paid attention to evaluate actions or processes value-free as well as not to alter any results despite being actively involved in the project work [36]. This issue was also addressed by the fact that only one of the four researchers had the role of a participant observer. All others did not have any relationship to the project or the case company. Second, order processing is a specific and not one of
the most complex business processes, so the results might not be generalized to more complex processes.

6. Conclusion

BPHO’s application to an ES project has been shown to be effective as it contributed to fewer heterogeneous customer requirements by reducing causes of requirements heterogeneity on all four heterogeneity levels (cf. section 2.2 and Table 1). However, since BPHO for itself is very effort-intensive, we recommend to first assess the four different heterogeneity levels in a specific situation and thus the overall risk for heterogeneous requirements. BPHO might not be essential and simply intensify the ES project’s effort. In general, our study of how BPHO helps to reduce the heterogeneity of customer requirements represents an innovative approach as previous studies on ES projects focused either on fundamental optimization or adaption of ES business processes. Thus, for researchers, we for the first time show BPHO reducing requirements heterogeneity in ES projects. Practitioners get first insights into how and why BPHO helps to reduce the heterogeneity of customer requirements and therefore have a better basis for decisions about applying BPHO. Practitioners concerned with ES projects should assess whether BPHO is worthwhile to increase ES project success based on a thorough cost-benefit analyses. In our case, the enormous benefits justified the additional effort.

7. References
