Service Design for Business Process Reengineering

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Abstract. In the technology enabled, competitive service environment, organizations try to innovate their service while redesigning their processes to increase efficiency. The present study is aimed at developing a design method that brings together, complementarily, constructs and approaches from two fields: Service Design, which offers a human-centered, holistic focus on creating novel services and Business Process Reengineering, mainly organizational, process redesign and process efficiency focused. The Service Design for Business Process Reengineering (SD4BPR) method was developed following a Design Science Research methodology and it was applied in a business environment for the improvement of the Pre-Sale processes of a software development company dedicated to the health area. The development of the method and its process of work are presented and discussed in order to show how SD4PBR can support the design of technology-enabled services while taking into consideration organizational issues and desired business efficiency.

Keywords: Service design · Business Process Reengineering · Design thinking · Design science research · Pre-Sale

1 Introduction

1.1 Research Context

Businesses and organisations from the present competitive, globalised era are forced to become more innovative through adopting new methods, tools, technologies and change approaches. Reorganizing resources and redesigning processes are considered important approaches to change in business environments [1], with great potential in reducing costs and improving customer satisfaction [2]. Business Process reengineering (BPR) is an approach used for redesigning or replacing inefficient processes in order to achieve improvements on performance indicators such as cost, speed or quality. BPR can be applied to the whole organisation, to parts of the organisation or to a single unit [1]. Most often, the

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re-design of the core processes happens using information technology in order to enable improvements [3]. Service Design(SD) is a multidisciplinary approach to creating new services, which integrates elements from marketing, operations, organizational structure, technology, human resources [4]. SD has started by relying on interaction design paradigms, focused on promoting service innovation through the design of touchpoints [5], the orchestration of service interfaces aimed at enhancing customer experiences [6]. To this end, SD involves understanding customer needs and goals (context and social practices) and translating them into requirements and evidence of service system interaction [7].

As stated in [7], there are few SD research initiatives that address organizational dimensions. They mainly look into what enables or inhibits organizational change: how SD can act as a driver for organizational change at different levels (from service interface to organizational values and norms) [8], how SD can have a transformational role in the infusion of an innovative culture in organizations(through SD knowledge and tools for decision making) [9]. Complementary, [10] investigated how SD can be embedded within organizational practices, in order to lead to sustainable design and human-centered services developed in-house. However, how SD methods can be applied in organizations for reengineering of processes (analysis and redesign) is still underexplored. The application of SD as an approach within organizations is formulated among the future research possibilities by [7], mentioning the need of investigating how "human-centered design methods could be extended and adapted for service system development and delivery". The findings of the same study imply that SD capabilities should be extended towards actual practical implementation proposals.

Previous research pointed out that the design and implementation of an organization is enabled and, at the same time, constrained by its information system, so "the effective transition of strategy into infrastructure requires extensive design activities on both sides, organizational and technological" [11]. While technology offers great potential and opportunities, it should be adequately matched with the business objectives, requirements and limitations in order to support process and service innovation and to enable seamless customer experiences [12]. In order to support the design of technology-enabled services in an efficient way, multidisciplinary contributions should be integrated [12], bringing together several constructs (methods, models, techniques, tools) from different fields.

Therefore, integrating SD and BPR can make an important contribution to better connect the creation and implementation of novel technology enabled services. However, these two approaches are usually performed by different teams, and have different focus, either on the process efficiency (BPR) or on the customer experience (SD). As such, further research is needed to explore how these two approaches can be applied in a complementary way. This study makes a step forward this challenge by developing a BPR method, derived from existing SD methods and BPR models, focused on analysing and restructuring business processes in a human-centred way, tackling the specific improvement points that have great impact on the broad processes.

2 Theoretical Framework

2.1 Business Process Reengineering

Initially, the term "reengineering" was related to the Information Technology (IT) field, but has later evolved, gaining the meaning of broader change process. Therefore, as explained by [13], BPR can be used for the analysis of an organization's business processes, for identifying alterations that can be made in order to attain strategic goals and improve performance and for reducing the costs of activities through the redesign of their workflows. BPR is seen as efficient from a managerial point of view, helping organizations to cope with technological and marketing changes while in a competitive, continuously evolving market [14]. Recent studies [15] have shown how BPR has been used by several organizations of different sizes and from different fields.

However, most of the BPR analysis techniques are focused on the process, but fail to tackle other dimensions (such as People, Communication or Structure). Most of the BPR modelling techniques have a very good level of accuracy, but they are dedicated to more technical modelling and so, they fail to offer strategic implications inclusion. On the contrary, the ones based on conceptual modelling are easy to understand, offer a total view of the process and tackle also the strategic implications. Although the level of accuracy cannot be as high as in the case of the other methods, the conceptual models compensate by offering more flexibility to the modelling process.

2.2 Service Design

Service Design integrates contributions from related fields such as service marketing, operations, interaction design, through a holistic approach. SD follows a human-centered vision, starting from understanding the customer and its context, and proceeding to the orchestration of different elements, with the purpose of finding new opportunities of value-creation, the process being an iterative one [16]. The focus is not only on *what* is being designed, but also on *how* it is designed: through understanding, visualizing, designing for user experiences [17] and finally experimenting through prototyping. Therefore, SD has been divided into stages that follow on the Design Thinking phases: *exploration, ideation, reflection* (prototyping and testing), *implementation*. SD adopts a service perspective, focusing on service as an overall solution for value co-creation. Furthermore, SD adopts a service system approach, taking into account the different components of the service system (people, technology, processes, interactions) [18], but also the interactions between them. On this basis, new research questions have arised such as how should SD methods continue evolving in order to support organisation change, including the transition from concept towards implementation [4]. Furthermore, the same study refers to the development of service networks and systems as one of the priorities in terms of service design, defining several research areas that emerge from it, such as building service

systems which are adaptive and flexible enough to respond to dynamic environments or creating modularized service system architectures. The same authors argue that there is a need for better integrating multidisciplinary contributions for designing complex systems.

The examination of BPR and SD literature shows that, while SD is human centered, putting customers at the core of both analysis and design and trying to enhance the customer experience, BPR revolves around the organization and aims at reducing costs, obtaining more efficient and effective processes. SD focuses on the service system as a conglomerate of entities such as processes, people, technology and their interactions, while BPR concentrates on the process as object of work. The integration of the 2 approaches can be materialized through a method that builds on previous research effort as follows. Firstly, SD methods offer flexible, visual and user-friendly models of analysis and modelling across multiple actors from multiple networks (Service Design for Value Networks-SD4VN method [19]) and across different service levels: concept, system, encounter (Management and Interaction Design for Service-MINDS method [12], MultiLevel Service Design-MSD [18]) that can tackle organizational problems and process redesign. However, they have been rarely applied in business reengineering contexts. Secondly, the BPR field offers several future research opportunities that can be addressed through integration with SD: offering more human-centered focus and a holistic approach [15], the derivation of a method from similar methods rather than focusing only on "best practices" and "innovation principles" [2].

3 Methodology - Design Science Research (DSR)

DSR is a research approach that offers a pragmatic world-view, focusing on the analysis and understanding of organizational phenomena in context and on advancing the research field by developing and evaluating artifacts which solve business/organizational problems and advance the existing knowledge base [20]. As stated in [21], the DSR approach is a bridge between design, relevance and rigor, supporting real-world problem solving through development of valid knowledge. For the purpose of the present paper, a new Design Artifact will be developed, thus extending the DSR theoretical foundations and contributing to the DSR knowledge base. The new method developed through DSR makes use of SD and BPR models and techniques and was exercised in a business environment. The DSR stages [22] were followed as presented below.

For the **Problem identification**, literature review on SD and BPR provided the theoretical framework and the support for identifying the research gaps. For the **Definition of objectives**, following on the insights from literature review, the research challenge established was developing a new method that integrates SD and BPR. The method would advance the field of Service Design by making the transition towards implementation of technology enabled services, while building on future research opportunities from the BPR field: offering a holistic approach, using redesign catalysts and tools derived from similar methods. As

far as the **Design and development** phase is concerned, the new method was built following on previous research effort: integrating existing SD methods and BPR analysis and modelling techniques. As **Demonstration**, the new method was applied in a business environment, aiming at improving the business process of Pre-Sale from a software development company. The application of the method includes a Qualitative approach [23] used to understand the experience of the different actors for the exploratory study. Regarding **Evaluation**, the method's process of work was cross-checked with the support of a BPR framework, while its relevance in business context was assessed through feedback from the business environment.

4 Service Design for Business Process Reengineering Method (SD4BPR)

SD4BPR is a method developed through DSR methodology, aimed at enabling the analysis and redesign of business processes with a SD approach. Being a service design method, it is based on the design thinking stages, iterating between exploration, ideation, reflection and implementation. Also, it focuses on a service system perspective, offering a holistic view over the process while being oriented towards creating customer experience value. SD4BPR's approach is contained in 3 stages that integrate the SD stages and, implicitly, the design thinking stages: Exploration is represented by Mapping the AS-IS process, Ideation and Prototyping are represented by Modelling the TO-BE process, while Implementation is tackled in Implementation Possibilities (Table 1).

Since business processes are fully built constructs that have become problematic over time or are in need of adaptation to new ways of work or new technology developments, their understanding requires deconstruction. Therefore, the Mapping the AS-IS stage involves an exploratory study based on interviews and documentation review. Problem analysis and Root-cause analysis BPR techniques have been chosen in order to guide the interviews and to extract insights from the documentation, therefore supporting the first step of the process deconstruction. This will result in an identification of the main components of the process, structured with the help of a Mind Map and of a series of improvements suggested by the participants. Switching towards a SD system perspective, the process is split into goals, activities, actor interactions and artifacts in order to understand the correlations between the different components. Furthermore, each activity is deconstructed to the action level. From a organisational point of view, the interactions between processes and, implicitly, between actors from different networks are as important as the processes themselves and can hold valuable information about sensitive points. In order to obtain a full characterization of the process, both the positive and the problematic points are defined based on the previous deconstruction. In this way, the analysis stage of SD4BPR treats the process as human-centered system, while investigating the specific improvements points of the processes being redesigned and what is their impact on the broad process.

In order to ensure consistency between the strategic business level, the system application level and the technology level, SD4BPR's process involves a multi-level design phase, building on the MSD method [12]. Furthermore, to make the step forward towards implementation proposals (key aspect BPR) for achieving better designed technology-enabled processes/services (one of the main research directions in SD), SD4BPR follows up on MINDS method [12], using Interaction Design models. Finally, since BPR asks for solid implementation proposals based on limitations and technology possibilities, SD4BPR includes a stage focused on exploring available technologies and matching them with both the requirements and the constraints of the business environment.

Table 1. Process of the SD4BPR method

SD4BPR phases	Process	Models/techniques
Mapping the AS-IS process	Exploratory study (interviews, content analysis)	Qualitative approach [23]
	User experience understanding (process break-down)	Mind Map Customer Experience Modelling Service Experience Blueprint
	Identification of problems, setting objectives	Problem Analysis Root-cause Analysis
Modelling the TO-BE process 1. *Service Concept* 2. *Service System* 3. *Service Encounter*	Idea generation (on gathered insights)	Requirements per user profile
	Idea validation/ transformation (feedback meetings)	Service System Architecture
	Graphical representation of (non-)functional requirements	Wireframes Functional and Non-Functional requirements
Exploring Implementation Possibilities	Implementation analysis (technologies on the market/already used by the company)	Cross-check of tools and service requirements

4.1 Mapping the AS-IS Process: Qualitative Exploratory Study

Sample Definition. For the empirical study, 8 semi-structured interviews were conducted with 4 Pre-Sale members involved directly in the process, 4 Pivots from adiacent teams, involved indirectly in the process. Also, a workshop and 3 feedback sessions with 2 Pre-Sale members and the team leader were held. The sample was defined following the guidelines of Qualitative approaches [23], taking into consideration the significant actors, the relevance of these actors in the process and their availability. Since the Pre-Sale team has a daily, close communication and collaboration with the Sales, Development and Implementation

teams, it was considered relevant for this study to interview pivots who have direct contact with a Pre-Sale member and, consequently, indirect impact on the final proposal.

Data Analysis. All the semi-structured individual interviews were recorded and then were transcribed and analysed using the NVivo 11 software which is dedicated for the qualitative analysis of data. Firstly, the content of the interviews was coded: divided in relevant categories with associated labels that summarize the category. A mind map of the nodes created using coding was generated in order to better visualize the node structure and test its coherence against data. Several cross-queries have been run between categories to identify their relationships and dependencies. A series of internal documents and in-use artifacts were also analysed as part of the qualitative study (ex: templates, process and workflow documentation, KPI monitoring dashboards, e-mails). They represented resources of information for the preparation of the interviews guidelines, for the better understanding of the AS-IS Pre-Sale process and also indicators for the identification of improvement points. Field notes were collected during every visit at the company in order to complement the data analysis with information from spontaneous remarks or observations.

4.2 Mapping the AS-IS: Business Process Break-Down

In order to have a complete overview of the process, a conceptual model is developed, **Customer Experience Diagram**, the result of combining Actor Network Map [24] with Multiactor activities and interactions [25] (Fig. 1). SD4VN Method [19] was chosen as support since it offers many to many interaction analysis, mapping the actors across different networks. This mapping model represents with more accuracy the context of a business process or the organizational environment itself. It supports the understanding of which are the main activities of the process, who is involved in executing them and through which means they are carried out. In terms of interactions, the diagram is centred on the Pre-Sale agent, mentioning with who he/she directly interacts in order to carry out the activities specified. For each activity, an ideal goal has been established and associated in the diagram in order to better perceive the desired outcome of the different parts of the process (making use of Root-cause analysis, Outcome analysis).

The next tool used by the SD4BPR is an adapted **Service Experience Blueprint** (Fig. 2). Building on the Value Network System Architecture model from the SD4VN method, SD4BPR uses an adapted version blueprint for better understanding of the AS-IS process through illustrating the frontstage and backstage actions of the process and their orchestration on different lanes, for different actors. By decomposing the process to its very specifics, the problematic points that delay the process or that make it unnecessarily difficult can be identified and signalled regardless of their nature (actors, artifacts, interactions), in a Root-Cause Analysis approach. SD4BPR concludes the exploratory study

through a clear summary of the positive aspects, respectively of the problems identified in the process. Based on these, the objectives of the process improvement are defined and motivated with arguments, becoming guidance of the future solution. This follows both BPR and SD approaches, setting the baseline for the design phase.

4.3 Modelling the TO-BE Process

Building on the MSD [18], the SD4BPR modelling of the To-Be process is conducted on 3 service levels, making use of conceptual models and graphical representations while keeping the consistency between the strategic and the operational level of the business process.

For **Designing the Service Concept**, several **user profiles** are defined. These are associated with **service requirements** based on the results of Mapping the AS-IS process, keeping the human-centered approach while generating the essential functionalities. Therefore, the service concept can be the concept of the business process itself or of a support system.

For **Designing the Service System**, the **Service System Architecture(SSA)** is used, turning the requirements into activities and showing if these activities are supported by people or technology. SD4BPR builds on the SD4VN [19] version of the SSA, showing the interrelated actions of multiple actors, along with how these are supported. This can be the process itself or a process support system (technology enabled service), but it needs to be contextualized by showing the workflows of the people who execute the tasks and also the workflows of the people who support the executions of the tasks.

For **Designing the Service Encounter**, the focus is on the aesthetics and interactions of service interfaces, therefore, the encounter is considered between the different parts of the business process or between the users and the technology-enabled system that supports the business process. Since the SD4BPR is focused on better designing technology-enabled services/processes, the service encounter is represented graphically through **Wireframes**, offering a visual perspective of the user-technology interface interaction (visually signalling the proposed functionalities). Wireframes have been used in the MINDS Method as well, for a better integration between service design and user interaction fields, with the same aim of innovating technology enabled services [12], therefore are considered relevant for supporting the integration between SD models and BPR models.

These models were chosen for their flexibility in adapting to different analysis and modelling contexts and for their suitability to describing business processes. Also, their integration was meant to be a derivation process in two opposite directions. Firstly, from broad to very specific, deconstructing the process layer by layer through conceptual models that follow on the level of detail: Mind Map (categories) → Customer Modelling Experience (correlated components) → Service Experience Blueprint (workflow of actions, interactions and tools). Secondly, from specific to broad, reconstruction of the process through conceptual models that can enrich the design with a new perspective: Use cases (functional actions

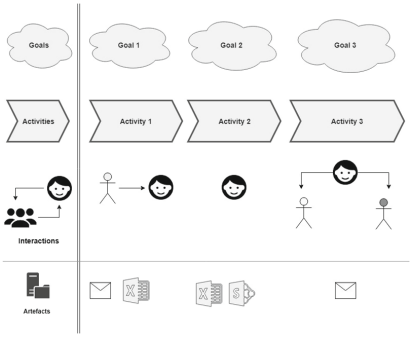

Fig. 1. Adapted customer experience modelling.

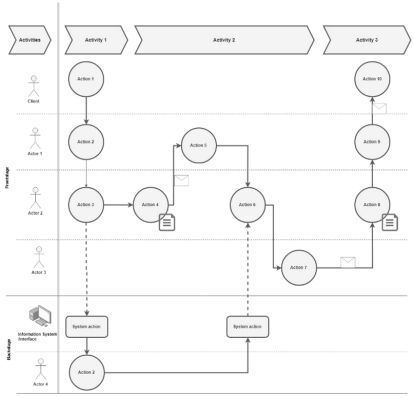

Fig. 2. Adapted service experience blueprint.

available for each user role) → Service System Architecture (orchestration of actions from service system perspective) → Wireframes (visual representation of overall system). Therefore, SD4BPR offers a well structured yet enough generalizable analysis and design package of SD and BPR models and techniques that transition smoothly into deconstruction and/or (re)construction of processes or services.

4.4 Exploring Possibilities of Implementation

SD4BPR is meant to evolve Service Design methods towards focusing more on the implementation part of the design process.Therefore, the purpose of this phase is to propose well defined possibilities of implementation of the designed solution, taking into consideration technology opportunities, business constraints and limitations. These are considered redesign catalysts, used by the SD4BPR in order to advance the BPR methods, since they support a more complete exploration of process alternatives, as stated in the future research possibilities from [2]. Therefore, a research effort on existing technologies as well as an analysis of the business constraints is conducted, generating two alternatives: one focused on the existing market technologies and their latest developments and one focused on the implementation of the system/process through tools/technologies already used by the company. The possibilities of implementation are presented at a conceptual level and are matched with the requirements and objectives generated previously.

5 Application Results

This section will present the results of the DSR demonstration phase: the method was applied in a business environment, namely for the improvement of the Pre-

Sale process at Glintt, and several artifacts were generated. Because of confidentiality reasons, the results of this cannot be explicitly shown, but they will be briefly mentioned in order to support the purpose of this paper, as empirical work. The first stage, *Mapping the AS-IS process*, was focused on the results of the interview coding and the modelling of the Pre-Sale process in its current state. The outputs of this stage are a brief process description, based on the tree categories, an activities workflow, a **Customer Experience Diagram**. This helped contextualize the Pre-Sale components of different natures (people, existing physical/digital tools, time-consuming activities, desired goals, unilateral/bilateral connections) for better understanding of the core elements and the intermediate outcomes. Each activity was broken-down into touchpoints in a **Service Experience Blueprint** (MINDS Method, MultiLevel Service Design). The difference between Frontstage actions and Backstage actions was illustrated (manually performed versus system support actions). The artifacts used were associated to each touchpoint or to the transition they serve. To conclude the Exploration stage, the core problems were identified for the Pre-Sale process and the solution objectives associated were defined.

5.1 Modelling the TO-BE Process

Workshop. A workshop was conducted, with the purpose of co-designing the format and content of a Pre-Sale file, the participants being 3 members of the Pre-Sale team. The final output of the workshop was redefining the concept behind the file as a sub-process of the Pre-Sale process which could benefit from several tools, used on-request, or on a continuous basis.

Support System. Based on the results of the AS-IS phase, 4 user profiles or personas have been identified as relevant for the Pre-Sale services: Pre-Sale admin, Pre-Sale member, Sales Agent, Pivot. For each of them, dedicated functionalities have been formulated into use-cases. These have been translated into frontstage and backstage actions and have been orchestrated in a **Service System Architecture**, showing how the actions are supported by the different service interfaces. Figure 3 illustrates a possible continuous logical flow, but the actions can be executed concurrently as well, depending on the situation. Taking into consideration user feedback, a series of functional and non-functional requirements have been identified as base for a Pre-Sale support service system. The visual representation of the service solution that would support the Pre-Sale process was made through **Wireframes**. The Wireframes (Figs. 4 and 5) were developed with the help of Balsamiq software (free trial) and are considered low fidelity prototypes of the system being designed. This option was chosen in order to be able to develop and easily modify the wireframes according to user feedback, focusing on structure, functionality, content and not on graphics or aesthetics.

Possibilities of Implementation. For identifying the most suitable possibilities of implementation based on market technologies, a review of existing tools/technologies has been made. The design catalysts taken into consideration were the level of development of the technologies, their features and their capabilities of matching the requirements generated in the previous phase. The tools/technologies have been divided into the three categories suggested by the requirements: Document Management, Business Intelligence and Project management.

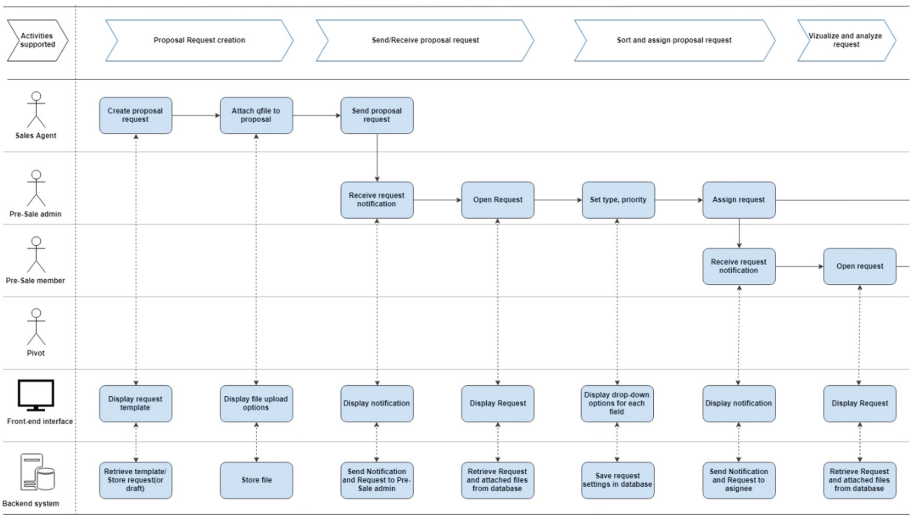

Fig. 3. Extract from the service system architecture of the Pre-Sale support system.

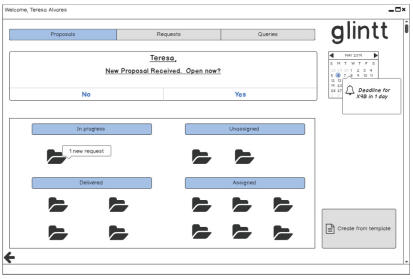

Fig. 4. Wireframe ex: general view Pre-Sale admin.

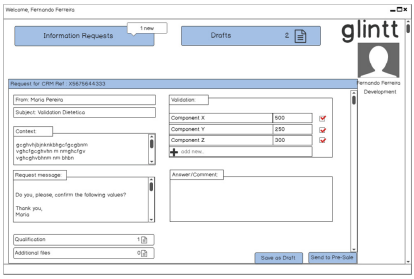

Fig. 5. Wireframe ex: general view pivot.

6 Method Evaluation

Following the DSR methodology [11], the SD4BPR method was evaluated in terms of process of work and in terms of relevance/efficiency for the business environment in which it was exercised. The results of the application are going to be implemented (according to feedback and organisational constraints), validating the artifacts created through applying the SD4BPR in a business environment, which is a good indicator of the potential of applicability of the method. During the application, 3 feedback meetings and one workshop took place. In the meetings, the participants were asked for their opinion on the intermediate results, while in the end of the workshop, they were asked for their opinion on the process of work and final result. The feedback was positive, the materials and intermediate results presented were considered relevant, proving a good understanding of the process. The final result was considered useful in terms of information systematizing and solution proposal for future implementation. The method was also validated using the BPR framework developed by [2], tackling all its dimensions (Aim, Actors, Tool, Input, Technique, Output). The methodological framework is aimed at enabling researchers to develop or evaluate/validate methods focused on business process improvement and it states the need of more methods that build on existing research effort (avoid focusing just on "best practices" or "innovation principles", but also on similar methods).

7 Conclusion and Future Research

This study presents the development of the SD4BPR method which uses constructs from SD and BPR fields, building on existing research effort or suggested research opportunities. Therefore, it offers a multidisciplinary approach, both process-focused and human-centred, generating customer experience value while aiming for better process efficiency and effectiveness. Following a DSR methodology, the method represents the generated artifact, meant to help solving an organizational problem. By applying it in empirical cases, the method itself enables the generation of artifacts that support organizational processes, improving them. SD4BR uses a qualitative approach, offering a well-structured analysis and design process of work, aimed at business process improvement. The analysis component brings together an exploratory study and mapping models in order to identify the positive/problematic points of the process, while the design component covers modelling on 3 service levels (concept, system, encounter).

The method was applied successfully in a business environment, supporting the improvement of Pre-Sale processes inside Glintt. It facilitated the mapping of the current process for analysis purposes and the modelling of solutions based on the results of the analysis. Two artifacts were generated: the model of an informational support system and the requirements of a Pre-Sale subprocess. These artifacts were perceived as relevant and useful. Their actual implementation will mean better time performance for the Pre-Sale process and more dynamic use of tools and more efficient collaboration for the people involved in the process (BPR

desired outcome). Also, the artifacts represent a source of analytical information and can serve as guidance for future implementation, generating customer value (SD desired outcome).

Both the development of the method and its application reveal potential for further integration between SD and BPR. Further research can include how can the method be applied in different organizational contexts from different industries, how can the method be evolved from implementation possibilities to implementation modalities, how should the transition from the AS-IS to the TO-BE process occur in a business environment and how can the method be used for designing this operational process.

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