Application of the Design Thinking Approach to Process Redesign at an Insurance Company in Brazil

José Ricardo Cereja, Flavia Maria Santoro, Elena Gorbacheva, and Martin Matzner

Abstract

(a) **Situation faced**: During the review of an information system for medical material purchasing at a Brazilian insurance company, it became clear that part of the process supported by this system was done informally and there was no consensus among the employees about some of the related fundamental concepts and procedures.

(b) **Action taken**: A consulting firm hired by the insurance company to find a solution to these challenges proposed to use the Design Thinking approach to process redesign, by aligning the Design Thinking stages with the phases of the Business Process Management (BPM) lifecycle. A series of workshops that applied various Design Thinking tools was conducted with representatives from all of the company's departments that deal with the purchasing process, as well as a team of information technology (IT) professionals.

(c) **Results achieved**: The Design Thinking approach facilitated the following outcomes: (1) formalization of the employees' perceptions regarding the existing purchasing process, (2) design of a *to-be process* for material purchasing, which was approved by all stakeholders, and (3) formalization of requirements for the new information system for managing the material-purchasing process.

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(d) **Lessons learned**: The case demonstrated the value of applying the Design Thinking approach to process redesign and improvement, adding useful instruments for BPM analysis. The BPM lifecycle phases correspond well with the Design Thinking stages, and Design Thinking techniques match BPM's social-construction viewpoint well.

1 Introduction

The insurance market in Brazil is dominated by a few large companies that operate in various segments and offer insurance services ranging from protection of property and assets to securing events (e.g., funerals) and covering health issues. In an insurance company, each of these segments functions as an individual business or division with its own budget, rules, and value chain, so business processes can differ substantially from division to division. Each of the divisions has its own information system to support its routines related to services (e.g., hospital services, cargo transportation) and products (e.g., cars, computers).

The company described in this case study ("the Insurer" hereafter) is the largest independent insurance company in Brazil. Founded more than 100 years ago, the Insurer currently employs more than 5000 people. In 2014, the company generated R$16.9 billion of revenue (around US$4.2 billion), obtaining a profit of R$548.7 million (US$138 million) and serving about seven million customers.

The health insurance market in Brazil has seen significant changes recently, especially in the process of purchasing raw materials for medical treatments. In responding to these changes, the Insurer reviewed its health insurance information system (a proprietary system developed internally called "Sourcing Saúde") to determine whether it (1) could support great demand from hospitals quickly and adequately, and (2) could help to control the entire purchasing process, from purchase authorization, to acquisition, delivery, and payment to suppliers.

When the Insurer reviewed the features of its health insurance information system, it was clear that part of the material-purchasing process was done informally instead of being implemented through the system. Moreover, there was no consensus among the stakeholders about some of the process's fundamental concepts and procedures that the system must support. These challenges occurred partially because of the absence of a common understanding of which materials did not require authorization—the "Authorization Not Required" (ANR) materials—and the process for purchasing such materials. Therefore, the Insurer employed ADDTECH (http://www.addtech.com.br/en/), a business consultancy that specializes in the areas of business, management, and technology. ADDTECH suggested using Design Thinking techniques to collect requirements for the new information system's features and designing a new process model for material purchasing. This chapter reports on the actions taken and the results achieved.

The chapter is divided into five sections. The initial situation faced by the Insurer is described in Sect. 2. The action taken and the details of the Design Thinking approach application are detailed in Sect. 3. The results achieved in the series of

Design Thinking workshops are discussed in Sect. 4. Finally, lessons learned are presented in Sect. 5.

2 Situation Faced

The insurance market for health services in Brazil is facing many changes. Earlier, the material procurement procedure was implemented when the request for material was created by a doctor, who then forwarded it to a brokerage company, which executed the material purchase and delivery. Each request was marked as either regular for periodic treatments or immediate in case of emergency. An application for authorization of the purchase was sent to an insurance company, and after analyzing required quantities and material prices, the company authorized (or not) the clinical procedure and payment of related expenses.

However, this process allowed issues that insurance companies wanted to avoid. In particular, doctors and hospitals often received commissions from producers of medical equipment and pharmaceutical companies for giving preference (often unjustified) to their products, which resulted in more expensive and, even worse, suboptimal treatment. Insurance companies' decision to take control of this procurement process launched significant changes onto the market. As a result, hospitals are now obligated to send the material requests directly to insurance companies, who are responsible for quotation, selection, approval, and delivery of materials, significantly reducing costs. In addition to initial resistance from doctors and hospitals, who no longer had the decision power on purchasing, the insurance companies, had to create new, robust structures for the purchasing process and develop appropriate information systems to manage and control this process.

Because the Insurer had to restructure its purchasing process, it acquired a new information system for research, quoting, and selection of the most appropriate material. However, the existing internal purchasing process came into conflict with the new system, so the Insurer tried to create a "supra-system" (as part of the internally created "Sourcing Saúde" system) to control the information system and perform operations related to materials analysis, approval, purchase, and payment. However, the initiative was again not entirely successful. The Insurer used the term "supra-system" to reflect that it was a superior information system that incorporated the previous one. However, there was a huge overlap of information stored in the two systems' databases because they belonged to different vendors (Orizon http://www.orizonbrasil.com.br/ and GSMi http://www.gsmi.med.br/) and were not integrated. In other words, there were two information systems in operation, automating two different parts of the same process.

The root problem, though, was that some items that doctors and hospitals requested that were classified as "basic" for certain procedures were released immediately for purchase without being registered in the information system. The entry of these ANR materials was not considered a priority because of the ease of evaluation and approval. However, over time, four major problems emerged:

- ANR materials did not have a standard definition, so deciding a material was an ANR material was subject to the individual interpretation of the professional in charge.
- The share of ANR items increased to 40% of all ordered materials, but because they were not considered relevant to be registered, they were ignored during the development of the "supra-system."
- ANR materials were purchased outside the information system using a manual process and using phone and email for communication and decision-making.
- The number of frauds involving ANR materials increased.

Therefore, the Insurer assigned to its information technology (IT) team the task of collecting the requirements necessary for the development of an updated, improved, unified information system that could fulfill two primary objectives:

- Make the material purchase process efficient and consistent, excluding the intermediate information system.
- Include management of ANR materials in the information system in order to eliminate manual and uncontrolled actions.

The IT team first used traditional procedures, such as meetings and interviews, to elicit the information necessary to meet these objectives. More than 100 meetings were held over nine months with representatives of all departments involved in the purchasing process (e.g., the departments responsible for material analysis, authorization, and payment). These meetings failed to result in a satisfactory outcome, because people could not communicate their problems and needs in a clear and effective way. Therefore, the Insurer decided to hire the ADDTECH consultancy to help in gathering requirements for the development of information system functionality, encompassing the needs of all departments involved in the purchasing process.

ADDTECH proposed using the Design Thinking approach (Meinel and Leifer 2011) to address the problem. To make participants active in designing the desired purchasing process, a series of workshops were held. At that time, the ADDTECH team incorrectly assumed that the issues related to the definition of ANR materials and their incorporation into the purchasing process had already been resolved internally.

3 Action Taken

ADDTECH proposed applying the Design Thinking approach to gather requirements for the information system that would manage the redesigned purchasing process of materials, particularly ANR materials (Meinel and Leifer 2011; Fig. 1). Design Thinking focuses on finding creative and innovative responses to specific demands (e.g., Brown and Rowe 2008); in this case, it was used to improve the purchasing process through process discovery, analysis, and redesign. The

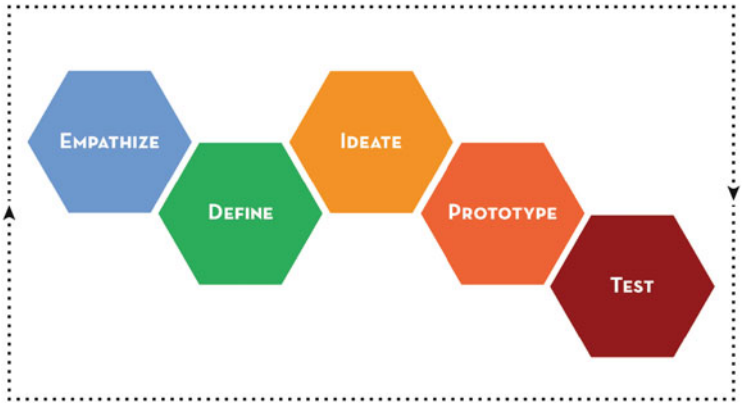

Fig. 1 Design thinking stages (Source: Stanford Design School, http://dschool.stanford.edu/; Brown and Rowe 2008)

Design Thinking approach was followed in several phases of the Business Process Management (BPM) lifecycle (Dumas et al. 2013).

The Design Thinking approach, which brings together a set of practices to address challenges and develop projects or even new businesses, has been characterized as encouraging innovative thinking and leading to an accumulation of distinct ideas about an issue (Brown and Rowe 2008). Collaboration is essential in this process, where members of a multidisciplinary team are stimulated to open their minds to insights and to provide input about their perceptions of the problem and possible solutions. According to Brown and Rowe (2008), the Design Thinking approach can comprise five iterative stages: *empathize*, *define*, *ideate*, *prototype*, and *test* (Fig. 1). The *empathize* stage seeks understanding about the target audience (end users, customers, or clients) for the action. The *define* stage focuses on identification of root causes of a problem to be addressed. Solutions to the problem are developed in the *ideate* stage. The selected solution is then implemented in the *prototype* stage and, finally, assessed in the *test* stage. However, the Design Thinking stages are not linear, but iterative and dynamic, which supports creativity and innovation (Brown and Katz 2011; Dorst 2011; Liedtka 2015; Lydon and Garcia 2015; Rowe 1987; Simon 1969).

The Design Thinking stages can be mapped onto the five phases of the BPM lifecycle suggested by Dumas et al. (2013): The *empathize* stage is related to process discovery, the *define* stage to process analysis, the *ideate* stage to process redesign, the *prototype* stage to process implementation, and the *test* stage to process monitoring and controlling. Figure 2 visualizes and Table 1 describes the mapping of the Design Thinking stages to the BPM lifecycle phases.

The ADDTECH consultancy proposed forming three multidisciplinary working groups (WGs) of members of each of the eight areas that deal with the Insurer's purchasing process. In addition, a project team (PT) of eight members of the IT

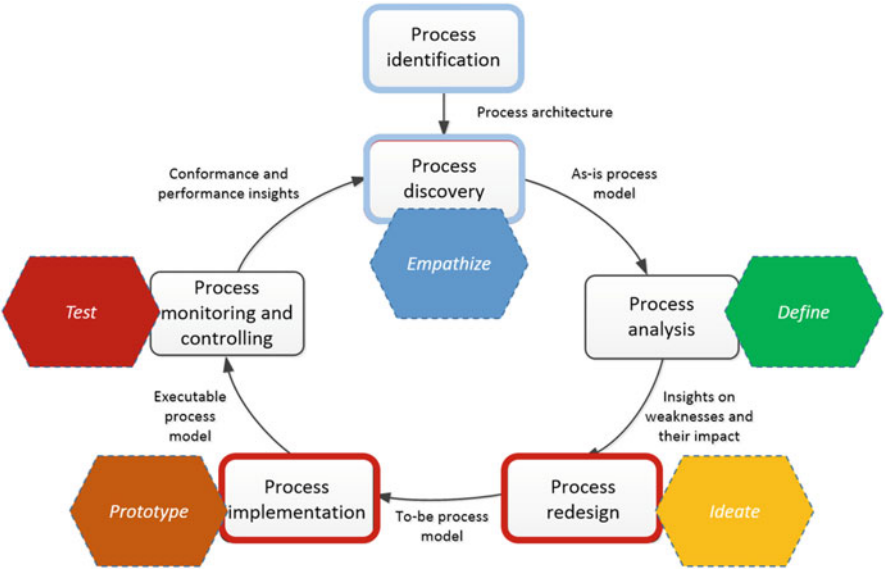

Fig. 2 Correspondence of the design thinking stages (Brown and Rowe 2008) to the BPM lifecycle phases (Dumas et al. 2013)

Table 1 Comparison of the design thinking stages (Brown and Rowe 2008) with the BPM lifecycle phases (Dumas et al. 2013)

Design thinking stage	BPM lifecycle phase	Comparison
Empathize	Process discovery	The *empathize* stage stimulates the discovery of contextual elements that might clarify a process
Define	Process analysis	The *define* stage provides the problem analysis that supports the design of an *as-is* process model
Ideate	Process redesign	The *ideate* stage supports finding creative and implementable solutions to be reflected in the *to-be* process
Prototype	Process implementation	The *prototype* stage comprises execution of the *to-be* process
Test	Process monitoring and controlling	The *test* stage keeps the solution running, acquiring insights into how it could be improved

department responsible for the improvement of existing information system was organized. As a result, the project involved four groups and thirty-two people. Each group participated in a series of Design Thinking workshops (the Sessions) in September 2015. Table 2 summarizes who participated in each workshop and how many meetings took place.

Table 2 Summary of workshops conducted and participants

Workshop	Participants	Number of meetings
Kick-off	All participants	1 meeting
Immersion	PT	3 meetings and 1 visit to the organization
	WG representatives	1 meeting
	WGs	3 meetings (1 for each WG)
Material definition	WG representatives	1 meeting
Process design	WG representatives	2 meetings
Business model	PT and WG representatives	1 meeting
Stories and requirements	WGs	1 meeting with 3 WGs simultaneously
Prioritization	PT and WG representatives	2 meetings
Functionality refinement	All participants	2 meetings
Development planning	All participants	1 meeting

Figure 3 presents the workshops that took place in each Design Thinking stage and the tools applied at each workshop. These tools were inspired by Osterwalder's studies (e.g., Osterwalder and Pigneur 2010), which proposed, among other tools, the Business Model Canvas (Fig. 10), a visual chart template divided into blocks that supports the development of new or documents existing business models. Its elements usually describe a company's or a product's value proposition, infrastructure, customers, and finances. Based on practical needs, ADDTECH extended the Business Model Canvas for a variety of purposes. The canvasses used in this case study, presented and described in Appendix 1 (Figs. 7, 8, 9, 10, 11, 12 and 13), were used to extract and organize the participants' thoughts, leading to the solution development.

Nine collaborative Sessions took place and all followed a similar structure. First, the Session facilitator, an ADDTECH representative, created empathy among the participants by clarifying what results the Session was intended to achieved and using what tools. The main idea and goal of each canvas was explained and the tasks to be performed were clarified. For each task, a strictly defined period of time was set and controlled by the facilitator, an approach called timeboxing. The goal of timeboxing is to speed the work and encourage the participants' cognitive processes. Then the facilitator described the brainswarming technique, which elicits ideas about ways to achieve a goal or address a problem, taking into consideration the available company resources. Members freely expressed their thoughts by writing them on sticky notes, which were then placed on part of a canvas. Next, the facilitator guided the participants in selecting, organizing, and synthesizing the ideas placed on the canvas. The solution that came up was adjusted until a consensus among all Session participants was achieved. Additional information about the workshops conducted and the tools applied is provided in Appendix 1.

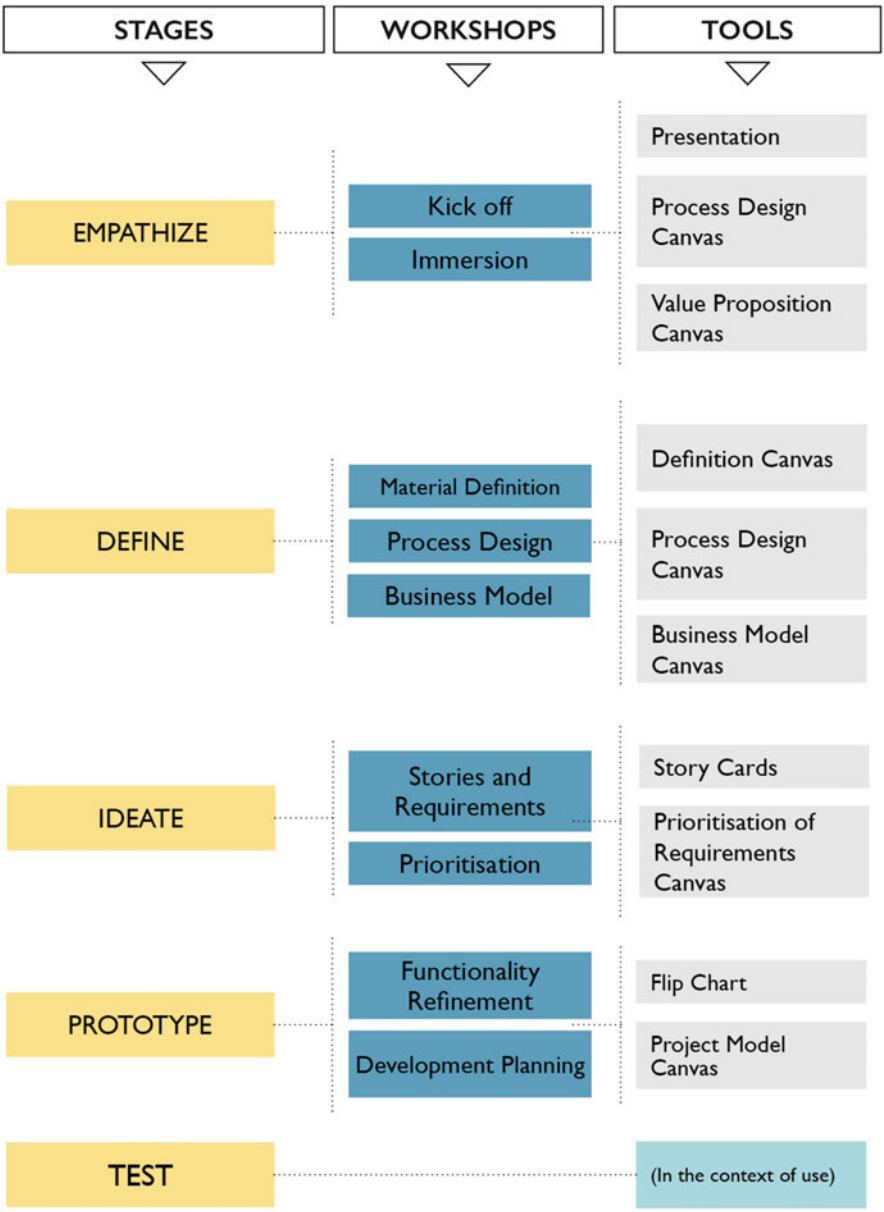

Fig. 3 Workshops and tools applied at each design thinking stage

3.1 Action Taken During the *Empathize* Stage

The actions performed during the *empathize* stage correspond to the BPM lifecycle's process discovery phase. According to Dumas et al. (2013), it is necessary first to understand how a business process operates in order to represent it in a model properly. Therefore, multiple stakeholders with differing but complementary skills might collaborate on this task, which typically involves communication and information-gathering.

In this case, the *empathize* stage was intended to establish a consensus on the issue the Sessions were to address. It was important to understand not only the wishes and needs of the *clients* (members of the three WGs), but also issues other than those presented a priori. In order to clarify the problem, the *immersion* workshop was conducted after the *kick-off* workshop. (See sub-section "Workshops Conducted and Tools Applied During the *Empathize* Stage" in Appendix 1 for additional details.)

3.2 Action Taken During the *Define* Stage

The actions performed during the *define* stage correspond to the BPM lifecycle's process analysis phase. According to Dumas et al. (2013), the identification and assessment of the opportunities for process improvement take place during the process analysis phase. In the *define* stage the information acquired in the *empathize* stage is analyzed and synthesized, and the participants generate insights and patterns that help to define the problem context.

At the beginning of the *define* stage, the groups agreed that the purchasing process of ANR materials (the ANR process) was critical enough to be incorporated into the purchasing information system. Since this process was not contemplated in the as-is process model designed during the previous stage (Fig. 4), the Session schedule was adjusted to include the activities related to the ANR process design and its incorporation into the purchasing process, supported by the information system. As a result, three workshops were performed during the *define* stage: the material definition workshop, the (desired) process design workshop, and the business model workshop (Fig. 3). (See sub-section "Workshops Conducted and Tools Applied During the *Define* Stage" in Appendix 1 for additional details.)

3.3 Action Taken During the *Ideate* Stage

The actions performed during the *ideate* stage correspond to the BPM lifecycle's process redesign phase, which is typically informed by the ideas and directions elicited during the process analysis phase. Process redesign is not always conducted in a systematic way but is instead a creative activity (Dumas et al. 2013). Similarly, the *ideate* stage is the most creative stage of the Design Thinking process.

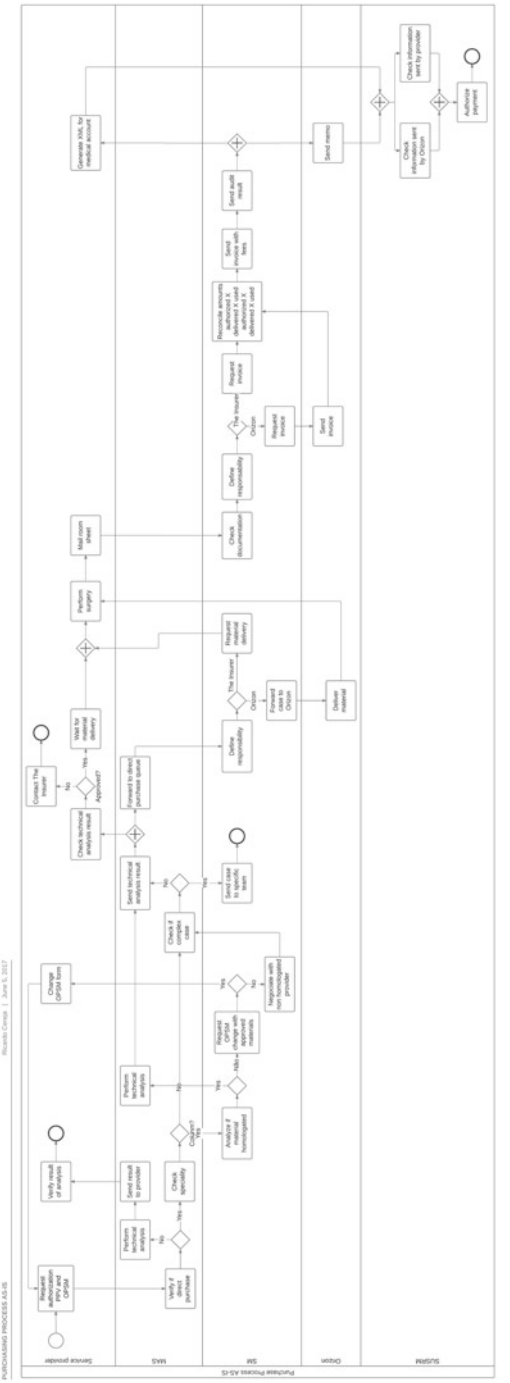

Fig. 4 *"As-is"* purchasing process

After the collection, organization, analysis, and synthesis of all relevant information, as well as the immersion into the context and root causes of existing issues, creative solutions that address the clients' needs and desires emerge. The Stories and Requirements workshop and the Prioritization workshop were conducted during this stage. (See sub-section "Workshops Conducted and Tools Applied During the *Ideate* Stage" in Appendix 1 for additional details.)

3.4 Action Taken During the *Prototype* Stage

The actions performed during the *prototype* stage correspond to the BPM Lifecycle's process implementation phase. According to Dumas et al. (2013), the process implementation phase comprises the execution of the to-be process by bringing into practice the necessary changes in how the work is done (organizational change management) and in the IT systems (process automation).

During the *prototype* stage, WG representatives validated and brought into force the outcomes of the previous Sessions. Together with the PT, during the Functionality Refinement workshop and the Development Planning workshop they discussed the final list of the features (with priorities) to be implemented by the information system. (See sub-section "Workshops Conducted and Tools Applied During the *Prototype* Stage" in Appendix 1 for additional details.)

3.5 Action Taken During the *Test* Stage

The actions currently being performed during the *test* stage correspond to the BPM Lifecycle's process monitoring and controlling phase. This stage closes the "cycle" and serves as a basis for the new loop of Design Thinking. Once the implementation is completed, continuous monitoring and controlling of the process execution is required in order to determine whether any adjustments are needed (Dumas et al. 2013).

In the Insurer's case, the *test* stage is still underway. Many of the main features have been implemented and validated, but comprehensive results of implementing and monitoring the redesigned purchasing process are yet to be reported.

4 Results Achieved

This section summarizes the outcomes of the workshops that were related to each Design Thinking stage (*empathize*, *define*, *ideate*, and *prototype*), as well as those of the overall case.

4.1 Outcomes of Applying the Design Thinking Approach

In the *empathize* stage, applying the Process Design Canvas (Fig. 7) resulted in the as-is process model of the existing purchasing process (Fig. 4). Table 3 in Appendix 2 lists the acronyms used in the model. As a next step toward the to-be process, the Value Proposition Canvas (Fig. 8) generated 133 requirements to be met by the new information system.

During the *define* stage, the Definition Canvas (Fig. 9) was used to facilitate the inclusion of the participants' perceptions and opinions about ANR materials, resulting in a common definition: "ANR is a specific concept for materials that facilitates the provision of the services that streamline the authorization process." Then a task force was assigned to identify all the materials covered by this definition in order to add them to a single ANR database.

Members of WGs could then formulate the desired purchasing process's characteristics by again using the Process Design Canvas (Fig. 7). As a result, the to-be purchasing process (Fig. 5) and the sub-process for procurement of ANR materials (Fig. 6) could be modelled. The to-be process improved the as-is process in three primary ways: It included the formalized model of the process flow for procurement of ANR materials, the process was optimized by identifying and eliminating unnecessary activities, and the to-be process anticipated the automation of parts of its flow, which ensured the new workflow's quality and security.

Finally, in order to determine the value of the information system to its users, future users, and the company as a whole, value propositions (requirements), direct customers, aspects of user support service, key activities and features, and key partners were formalized using the Business model Canvas (Fig. 10).

During the *ideate* stage, the requirements and associated features to be implemented in the information system were further structured and prioritized. With the help of the Story Cards tool (Fig. 11), the initial set of 133 requirements that was revealed during the *empathize* stage was reduced to 43 key requirements. Table 4 in Appendix 2 presents the final list of requirements. In order to decide what requirements should be implemented, the related features were ranked using the Prioritization of Requirements Canvas (Fig. 12). The ranking was done based on the value a feature brought to the overall improvement of the information system, as well as the levels of difficulty and effort required for its implementation.

In the *prototype* stage, the PT discussed the features to be implemented with the representatives of the working teams. As a result, all participants had a shared understanding of the system's desired functionality. The PT then used the Project Model Canvas (Fig. 13) to visualize the elements required to manage the software implementation project. Finally, the prototypes of the new features that corresponded to the to-be process were developed.

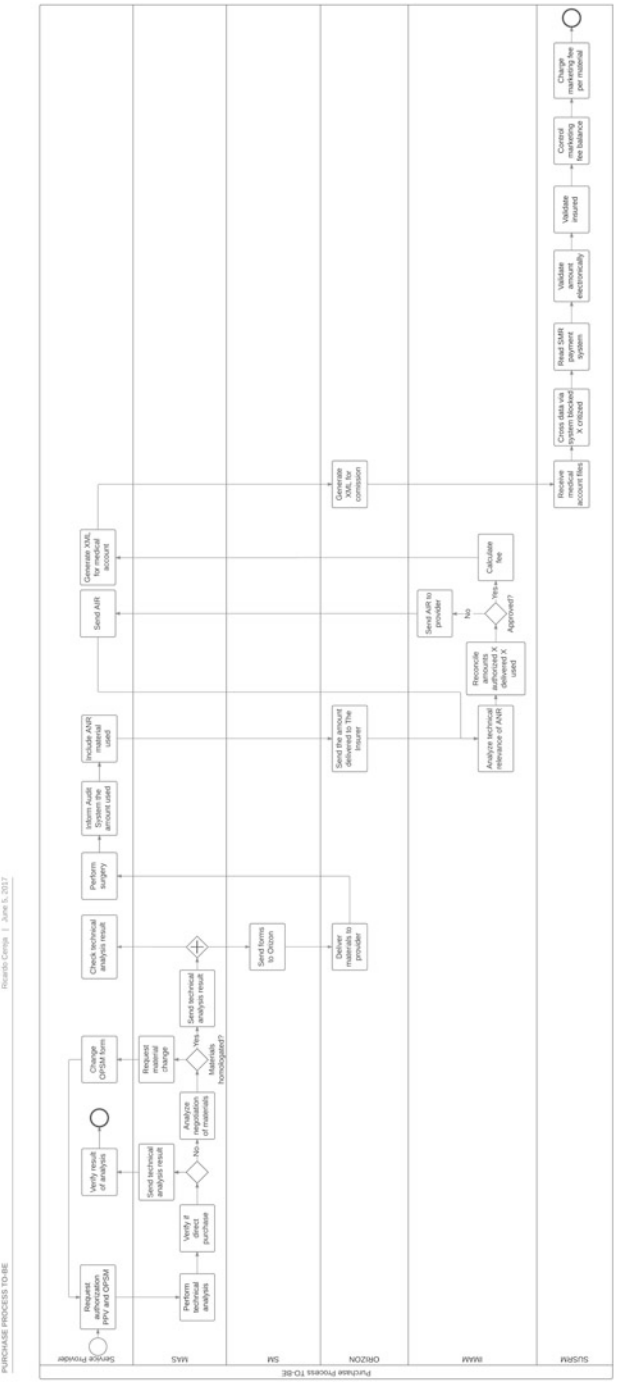

Fig. 5 *"To-be"* purchasing process

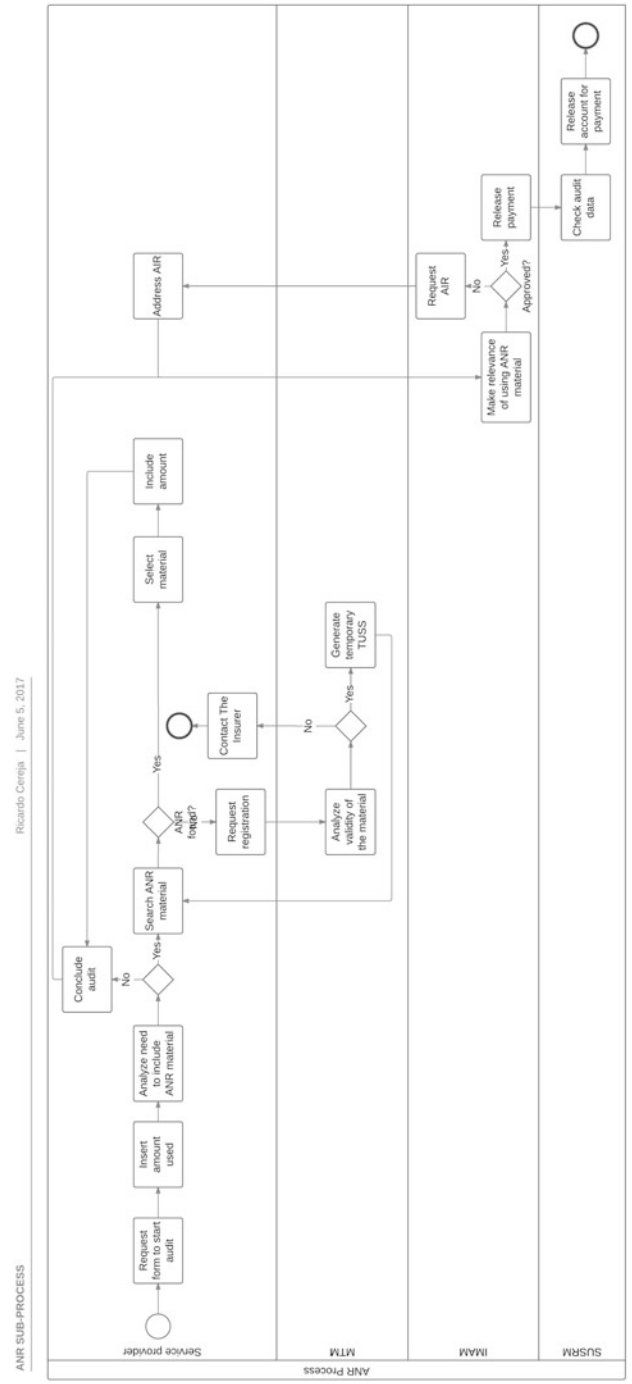

Fig. 6 Process flow for procurement of ANR materials

4.2 Contributions of Applying the Design Thinking Approach

The results achieved during the Sessions addressed the gaps between existing and desired features of the information system in managing the purchasing process and sub-processes. In particular, during one of the first workshops, the absence of a common understanding of what materials should be classified as ANR materials was revealed. Therefore, reaching a common definition of such materials and streamlining the related sub-process for their procurement was accomplished during the Sessions.

The Design Thinking approach that the Sessions followed facilitated the attainment of a considerable amount of useful information for the company. The two major outcomes were formalizing the clients' perceptions regarding the existing purchasing process and the designed to-be process, which was simpler and more objective than the as-is process and included significantly fewer steps to be performed.

The Sessions were initiated after unsuccessful attempts to collect requirements for the improved information system. After more than 100 meetings conducted over more than nine months, neither a definition of ANR materials nor sub-processes for their procurement was specified. The Design Thinking approach made accomplishing this task within a single working day (8 h) possible. The approach supported simultaneous and non-linear actions throughout the Sessions. Analyzing at each step the previous step's resulting information allowed the outcomes of previous steps to be validated and reworked where necessary. Consequently, a robust, co-created solution could be developed with a high chance of successful implementation and adoption.

The requirements and desired features of the new information system that resulted from the Sessions were organized and delivered in a feature-specification document that reflected the wishes and needs of the clients from all of the departments involved in the purchasing process. The clients' recognition of the improvements in the purchasing process is an important result of the Sessions.

The redesigned purchasing process is still being implemented so, although we can report the desired approach's preliminary success by referring to the attained results, we cannot yet draw conclusions on the overall project's outcomes and success. The consulting team from ADDTEC is still following the case and keeping in contact with the IT team that is performing the process implementation. Once the overall project is completed, we will analyze the information system's operation and the employees' reaction to and feedback about using the new procurement process. We will report on the results of this analysis in a future publication.

5 Lessons Learned

This chapter discussed a real-world BPM case of a Brazilian insurance company, the Insurer, which applied the Design Thinking approach to redesign its medical material-purchasing process and derive requirements for further development of its

related enterprise information systems. This case provides organizations with general insights on how to apply Design Thinking to process redesign. Based on the lessons learned from the practical application of the innovative Design Thinking techniques, we can report on three important observations that reflect the overall case:

1. Design Thinking added useful instruments to BPM analysts' tool set, as the case demonstrated the successful application of Design Thinking for process redesign and improvement. The BPM lifecycle phases correspond well with the stages of Design Thinking. Details of the Design Thinking techniques applied in the case are summarized in Appendix 1.

   The initial series of conventional workshops, which required tremendous effort by the Insurer, were unsuccessful in achieving the required change of processes and systems, so the company requested the assistance of the ADDTECH consultancy. The consultants faced a tricky situation, but their novel techniques opened up the company's perspective and allowed it to create innovative and unconventional solutions. While the traditional workshops failed, the Design-Thinking-fueled workshops made a difference and achieved the desired goal.

   A possible cause for the success of Design Thinking techniques is that they are geared toward achieving a consensus in multidisciplinary groups that have been tasked with finding a solution to a design problem. The techniques encourage and facilitate the group members' joint and interactive acquisition of knowledge about the design problem by establishing the feeling that the group can collectively construct a solution.

   These characteristics of Design Thinking techniques match the social-construction viewpoint of BPM, where the design of business processes is understood as a social process that connects actors who jointly envision potential process designs and then negotiate the roles and responsibilities for each sub-process and activity (Smeds and Alvesalo 2003). Such a social-construction perspective requires the people involved to co-operate "despite possible conflicting interests, dispersed knowledge, [and] differing management strategies" (Becker et al. 2013, p. 41). Design Thinking techniques provide ways to promote co-operation, so a particularly promising phenomenon to be investigated in future research is the question concerning why Design Thinking techniques could address two design goals at the same time: finding a novel solution and achieving agreement through the group.
2. The case described here is likely to render a methodological contribution to the Design Thinking approach. Contrary to the common procedure, ADDTECH consultants implemented a "pre-immersion" stage at the project outset, preceding the Design Thinking *empathy* stage. It is likely that this decision was central to the project's success. This stage was created with the intention to extract the domain knowledge that was required to validate the requirements regarding the project's scope and process up front. Thus, the time spent in the later *empathy*

stage was significantly reduced, as that the project work was grounded in maximum objectivity and focus had been assured.

This additional "pre-immersion" stage included activities of three types. First, the consultants performed additional work that focused on clarifying the Insurer's needs and motivation in undertaking the process. Second, they put in place instruments to organize the project's processes and stages. Third, they organized the physical space for the process innovation and design project. A meeting room was exclusively reserved for the interviews and workshops, where the materials produced by the groups were constantly available to be accessed by the participants. The "pre-immersion" stage consisted of conducting interviews and required the physical presence of the facilitator during collaborative workshops. The facilitator socialized with the representatives of all the departments and IT professionals involved in the project and acquired the required information by asking questions in order to understand the operation of the existing information system. While implementation of the "pre-immersion" stage was useful in the reported case, the specific circumstances under which the application of this stage is beneficial and the contribution of this stage to the project success call for a detailed investigation in the future.

3. A final observation relates to the flexibility of Design Thinking techniques in making adjustments to their procedure. The case included examples of such modifications after the *empathize* stage, when the understanding, validation, and development of solutions were executed repeatedly until the users' needs were met to a sufficient degree.

Appendix 1

Workshops Conducted and Tools Applied During the *Empathize* Stage

Workshops Conducted During the *Empathize* Stage

Kick-off Workshop

During the kick-off workshop, a facilitator from ADDTECH clarified all aspects of the planned Sessions to the members of all four groups involved. The facilitator presented and discussed the work proposal, reached a consensus about the activities to be performed, and emphasized that participation and engagement in the Sessions was vital for their success. All participants then collaboratively defined the procedures and rules during the Sessions, and the facilitator answered the participants' questions.

Some participants (mostly supervisors and managers) tried to divert the workshop focus to activities with which they were more familiar. As a result, the facilitator had to stop the workshop occasionally to explain again the stages of work and improve cooperation among the participants.

Immersion Workshop

The purpose of the *immersion* workshop was to clarify the problem and its characteristics from the client perspective. Resulting customer requirements could then guide the development of the services to be offered by the information system. During this workshop, it became clear that the WGs had no common understanding of ANR materials, as the participants disagreed on what should and should not be considered ANR materials and how such materials could be registered in the information system. ADDTECH also saw that the existing information system had been developed without a comprehensive understanding of the processes it was intended to support, so it was necessary to review the planned Sessions and work steps to address both the definition and the procurement process for ANR materials.

Tools Applied During the *Empathize* Stage

Process Design Canvas

The goal of the Process Design Canvas (Fig. 7) was to compare the existing information system's features with those the users (clients) wanted. In order to understand the existing process (the as-is process), representatives of each WG described (a) the course of the process, (b) results of the process, (c) resources required to perform the process, and (d) existing obstacles to performing the process. Figure 4 depicts the resulting as-is process model.

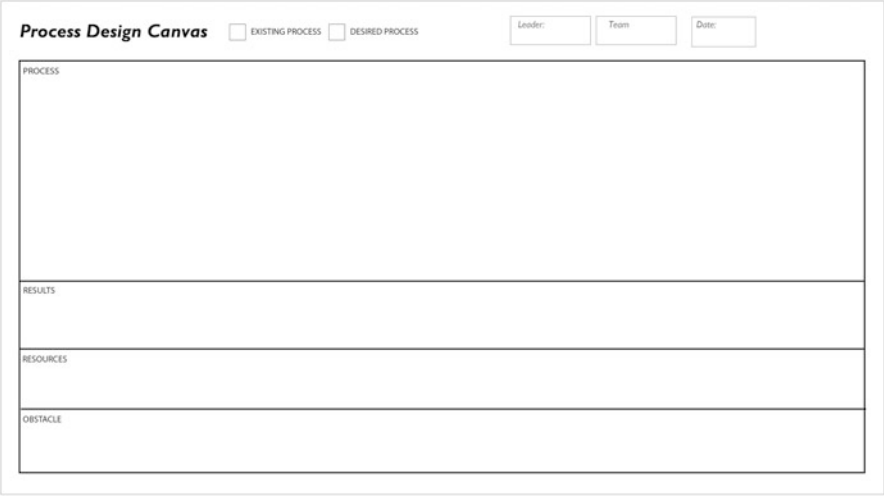

Fig. 7 Process design canvas (designed by José Ricardo Cereja)

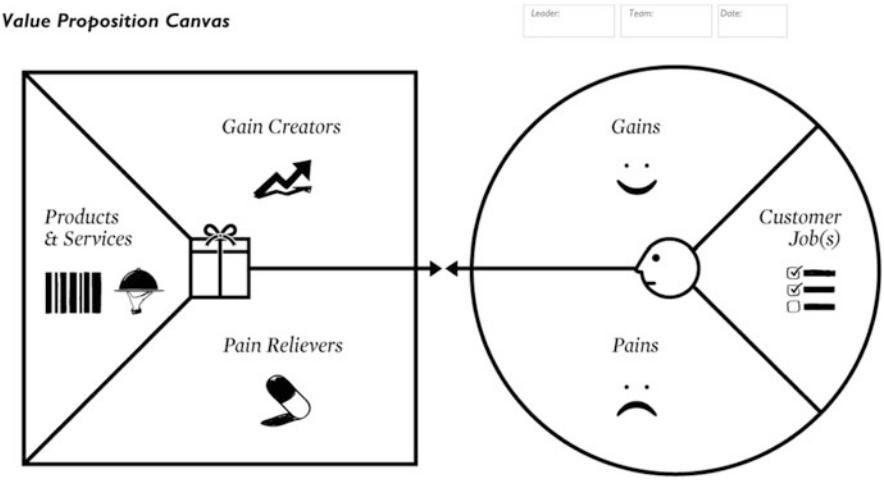

Fig. 8 Value proposition canvas (Osterwalder and Pigneur 2010)

Value Proposition Canvas

The goal of the Value Proposition Canvas (Fig. 8) was to set the path from the as-is process to the to-be process by following the concept that each product or service must deliver value to the customer/user. Members of all WGs participated in the canvas development. First, each participant described (a) current "pains" (difficulties) related to the use of the procurement system and (b) the "gains" they would obtain (or expect to obtain) if the system works optimally. Then the participants described (a) what products or services correspond to customer/user activities specified, (b) what "pain relievers" could address the existing difficulties, and (c) what "gain creators" could support achieving the potential gains specified.

In the next step, the participants used the same procedure to select, cluster, and synthesize the information from all Value Proposition Canvasses. These syntheses were then compared, generating 133 requirements for the desired information system that reflected the users' needs and expectations (called "value propositions"). Information about these value propositions formed part of the Business Model Canvas built in the next stage.

As a result of the previous step, the participants learned the as-is process, agreed on its authenticity, and recognized the need to review the activities and tasks. They also tried to analyze the process's system use, but no one could explain why the system was built as it was and why it had the identified gaps. The use of Value Proposition Canvas revealed (a) the global quality issues that should be addressed by the system, such as agility, accuracy, and reliability, and (b) the features necessary to implement improvements.

The participants faced problems in understanding how to apply this tool. The Value Proposition Canvas should be filled in the following order: (1) user activities, "pains," and "gains" and (2) what products and services can meet the users' activities, what solutions address the "pains," and what generates the "gains." It was difficult for the participants to distinguish these aspects of the issue, so their

responses were analyzed and revised in an iterative way. The confusing responses were clarified and rewritten, and similar responses were grouped.

Workshops Conducted and Tools Applied During the *Define* Stage

Workshops Conducted During the *Define* Stage

Material Definition Workshop
The Material Definition workshop involving WG representatives was not planned initially but was added once ADDTECH realized that there was no shared understanding of ANR materials. These materials had been ordered by email or phone with no prior analysis, authorization or registration in the information system. The aim of the workshop was to reach a consensus among the WGs on the definition of ANR materials.

Process Design Workshop
The goal of the Process Design Workshop involving WG representatives was to design the to-be process, where the information system would be employed to manage the procurement process of all company materials (including ANR materials). Prior to designing the to-be process, participants had reached a common definition of ANR materials and a common understanding of how the procurement process (particularly purchasing of ANR materials) had been performed. The participants could then define the target purchasing process and the features the new information system should have.

Business Model Workshop
The subsequent Business Model workshop involving PT members determined the value that the updated information system was to bring its users, future users, and the company as a whole. Based on this knowledge, the PT could then determine how this value could be delivered in the most efficient way and the associated costs.

Tools Applied During the *Define* Stage

Definition Canvas
The goal of the Definition Canvas (Fig. 9) was to support finding a common definition of ANR materials. For that, WG representatives specified, why ANR materials need to be there. Participants used sticky notes to express their ideas, and then each participant went through and considered all the points made by the whole group and proposed a list of features that might define an ANR material. Finally, WG representatives agreed on a common definition of an ANR material (presented in the Sect. 4).

This work was first attempted through an open discussion in an effort to include individual perspectives, but it was soon apparent that brainswarming was required. The applied Product Definition Canvas gave the participants the opportunity to present their perceptions and understanding about what ANRs are and what they should be.

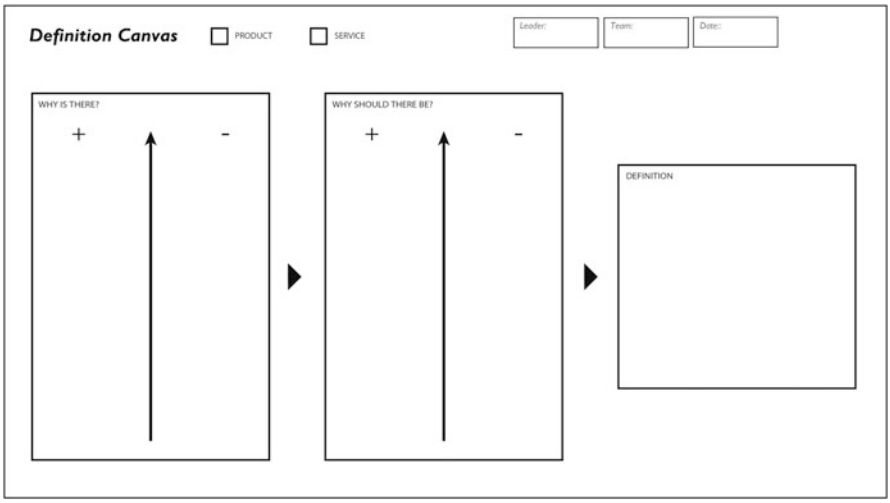

Fig. 9 Definition canvas (designed by the ADDTECH Team)

Process Design Canvas

The goal of the Process Design Canvas (Fig. 7) at this stage was to support the design of the desired material-purchasing process ("to-be process"), with the procurement of ANR materials as one of its sub-processes. Application of the Process Design Canvas followed the same steps as were followed during the *empathize* stage for the as-is process model design. The resulting to-be process and the ANR sub-process are presented in Figs. 5 and 6, respectively.

Business Model Canvas

The goal of the Business Model Canvas (Fig. 10) was to formalize (a) the requirements of the information system, derived from the resulting Value Proposition Canvas developed during the Immersion sessions, (b) the customers who receive direct benefits from using the information system, (c) how user support should be organized, (d) the information system's key activities and the key features required, and (e) partners who would be key to ensuring the system worked properly.

Workshops Conducted and Tools Applied During the *Ideate* Stage

Workshops Conducted During the *Ideate* Stage

Stories and Requirements Workshop

During this workshop, the participants of all three WGs gathered to describe as stories each of 133 requirements that they generated through the Value Proposition Canvas during the *empathize* stage. Each story focused on describing a service that

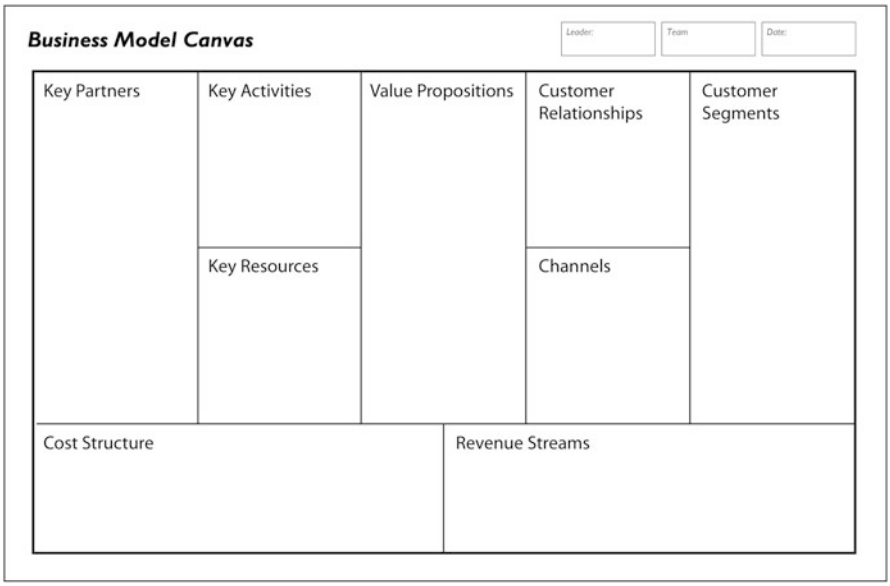

Fig. 10 Business model canvas (Osterwalder and Pigneur 2010)

fulfilled a client need or desire. As a result, duplicate or similar requirements were identified and merged, and the requirements were reviewed and rearranged, resulting in 43 requirements that were fundamental to improving the information system.

Prioritization Workshop

During the subsequent Prioritization workshop, the participants of all three WGs met to analyze the 43 final requirements that had been extracted, grouped, and ranked during the Stories and Requirements workshop. The goal was to identify the most important features that should be prototyped and implemented.

Tools Applied During the *Ideate* Stage

Story Cards

The goal of the Story Cards tool (Fig. 11) was to translate the clients' requirements to the features to be implemented in the information system. Each of the three WGs received about a third of the 133 value propositions identified during the *empathize* stage. The task was to describe the service behind each requirement. The interdisciplinary nature of each WG and the opportunity to communicate with the members of the other WGs facilitated the discussion of the nature of each requirement and ensured consideration of diverse opinions. The check for duplicate or similar value propositions reduced their number from 133 to 80. The stories written for the remaining 80 value propositions contained customer identification (department,

position), the requirement's level of importance to the customer, and the perceived benefit from incorporating this requirement in the information system. In the next step, the PT analyzed and classified the 80 Story Cards and concluded that, in many cases, one solution could address more than one requirement. As a result, the PT defined 43 features that addressed all 80 requirements.

Participants could describe easily who would benefit from implementation of a certain feature but often faced difficulties in formalizing the motivation for implementing this functionality. Although the initial plan was to write individual stories by each participant, in the course of the workshop the participants organized themselves into groups that interacted with each other. This collaborative process accelerated the stories' construction, which were beneficial in understanding the required system features.

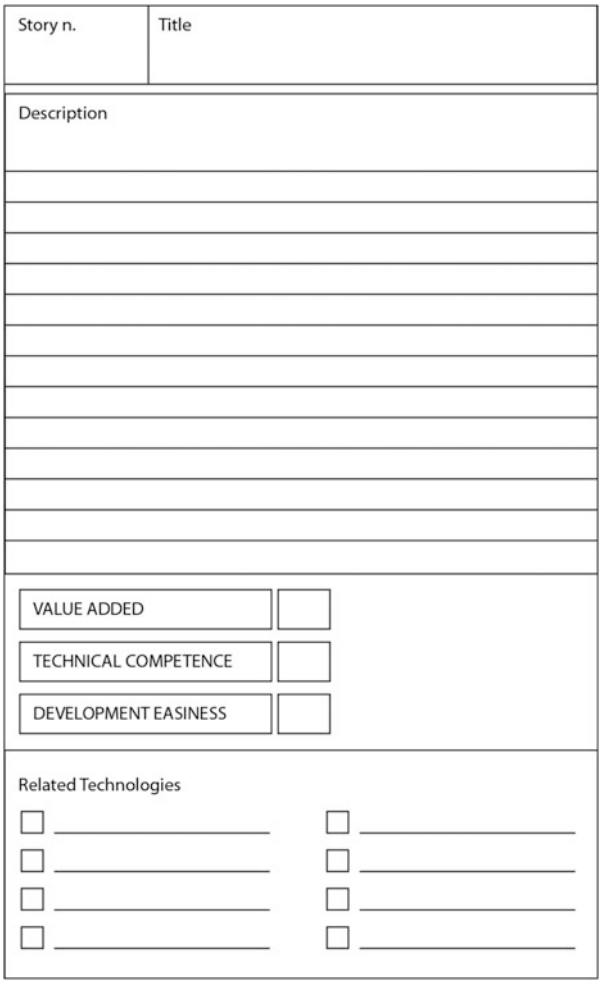

Fig. 11 Story card (designed by the ADDTECH Team)

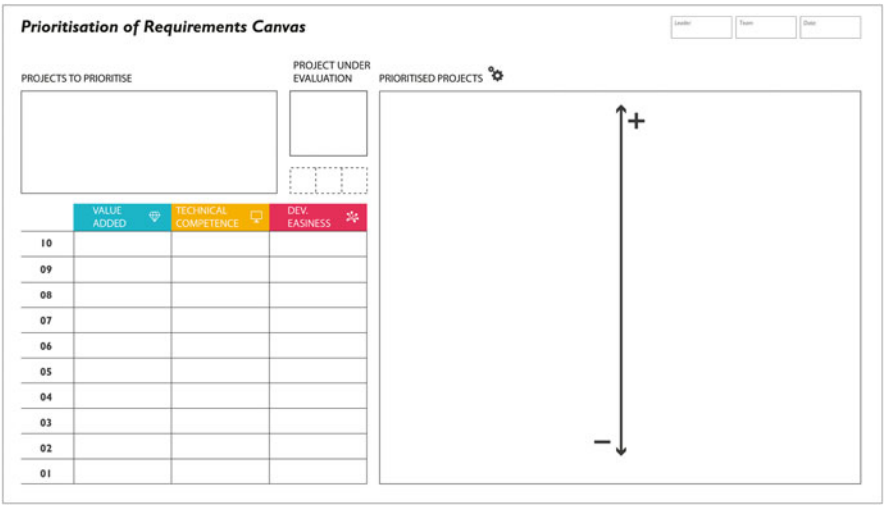

Fig. 12 Prioritization of requirements canvas (designed by the ADDTECH Team)

Prioritization of Requirements Canvas
The goal of the Prioritization of Requirements Canvas (Fig. 12) was to support ranking of the features to be implemented in the information system, based on three criteria:

Added value: the extent to which the functionality a requirement generated improved the overall service the information system delivered.
Technical competence: the level of expertise required from the development team to implement a requirement.
Development easiness: the level of effort (time) required of the development team to implement a requirement.

Workshops Conducted and Tools Applied During the *Prototype* Stage

Workshops Conducted During the *Prototype* Stage

Functionality Requirement Workshop and Development Planning Workshop
Based on the input from the Prioritization Workshop, during the Functionality Refinement workshop WG representatives and the PT jointly categorized each feature's importance as large, average, or small. All participants then discussed

and elaborated on the plan for implementing the feature during the Development Planning Workshop.

Tools Applied During the *Prototype* Stage

Flip Chart

The goal of the Flip Chart was to encourage the participants to express their thoughts on detailing, adjusting, and ratifying the features to be developed and implemented.

Project Model Canvas

The goal of the Project Model Canvas (Fig. 13) was to assist the participants in elaborating on the project plan for implementing the improved information system. The participants placed on the canvas the important attributes to be considered when managing any project, including the work to be done, the timeline, and the effort required. The plan was designed following the agile software-development methodology, where the tasks are accomplished in iterations (sprints).

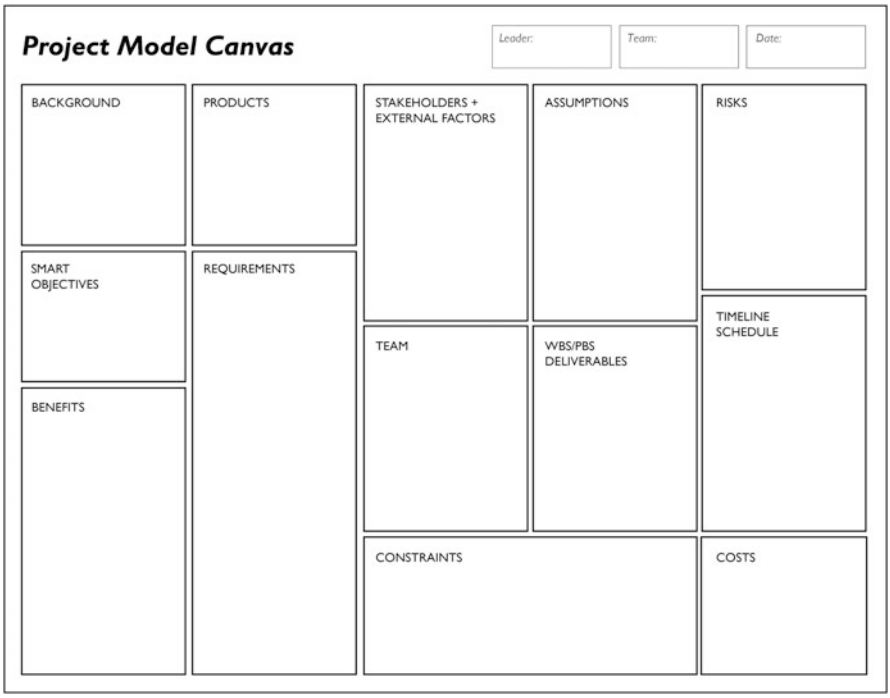

Fig. 13 Project model canvas (Finocchio 2013)

Appendix 2

Table 3 List of abbreviations

PPV: Prior Procedure Verification
SMR: Special Material Request
OPSM: Orthosis, Prosthesis, and Special Material
MTM: Materials Technical Management
SM: Sourcing Management
MMAM: Material and Medicine Analysis Management
IMAM: Internal Medical Audit Management
MAS: Medical Authorization Supervisory
SUSRM: SUS Reimbursement Management
AIR: Additional Information Request
SLA: Service Level Agreement
SHUT: Supplementary Healthcare Unified Terminology
ABC curve: The diagram used to control material types (A is the most valuable material, 20% of the amount; B is intermediate value material, 30% of the amount; and C is less valuable material, 50% of the amount)
ENR: Electronic Note Resource

Table 4 List of final requirements

Register marketing fee
Assign the cases negotiated by analyst
Calculate marketing fee
Register the supplier/negotiate with the suppliers that are not in Orizon
Register reversed prioritized requests
Request ANR materials
Queue requests already negotiated for technical analysis
Monitor based on the analyst case
Cancel SMR
Include ANR materials by provider
Register material
Visualize marketing fee
Register SLA
Check material charged x-audit system
Control values per supplier
Control marketing fee
Receive electronic billing
Reopen PPV
List materials of “direct purchase”
Choose providers of “direct purchase”
Communicate between areas
Visualize unified table with information for electronic validation
Code SHUT

(continued)

Table 4 (continued)

Provide report of material per ABC curve
Audit ANR not registered
Provide reports of inconsistencies between supplier and provider
Alert cases that have not been paid to Orizon
Block sending undocumented attachment
Register previous ANR materials
Calculate costs
Send message of divergence to the provider
Provide management reports
Provide saved values with performance of complex cases
Distribute ANR for analysis
Provide payment statement
Identify direct purchase process
Sort complex cases, CD SAS, CD Orizon
Monitor pending cases
Interface with supplier/audit opinion
Input hospitals with direct purchase right
Communicate with suppliers and providers
Generate complements
Enable disallowance via ENR

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