Services for drought: the co-creation value of adopting process model as a tool to improve the “Carro Pipa” operation in Brazil

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Abstract

Drought is a major worldwide disaster involving water distribution for a dispersed population in a vast area, which consequently demands the engagement of different stakeholders. While process models contribute to improving disaster and humanitarian operations (DHO), their contribution as a co-creation tool is not discussed in the DHO literature. Thus, this research aims to discuss the co-creation value of using the process model as a tool to improve the drinking water distribution service in response to the drought. The research adopted the case study methodology to investigate Brazil's “Carro Pipa” operation. The main challenges and opportunities include different sources of information, articulation between various stakeholders under the Brazilian government legislation, the autonomy of municipalities in decisions with economic impact and lack of verification to guarantee the shortest route and lowest cost. Moreover, this research demonstrates that the process models – a management tool – facilitate the co-creation for improvement of a DHO as it provides standardised stakeholder analysis, enabling effective improvement through the integration of the service designer and the stakeholders engaged in the operation. Future research can discuss implementing improvements to the service provided by the "Carro Pipa" operation and analyse the combination of process models and other Service Design techniques and tools.

Keywords: disaster and humanitarian operations, humanitarian logistics, stakeholder theory, business process management

Introduction

Recent studies highlight the importance of managing disaster and humanitarian operations (DHO), as disaster impacts are increasing yearly (Behl & Dutta, 2019; Fontainha et al., 2022; UNISDR, 2015). On the one hand, scientific research highlights the need for more effective and efficient DHO (Rauchecker & Schryen, 2019; Resende et al., 2022; Salam & Khan, 2020; Shokr & Torabi, 2017). On the other hand, slow-onset disasters are often ignored and left in the background (Staupe-Delgado, 2019). For instance, an estimate suggests that 55 million people worldwide are affected annually, and approximately 700 million people are at risk of being displaced by 2030 due to the drought in the world (WHO, 2022).

Providing humanitarian assistance to the population affected by disasters depends on the high interaction of different organisations (Heaslip, 2013; Fontainha et al., 2022). Heaslip (2014) exemplifies that humanitarian organisations are currently developing services they can offer each other and adds that the focus on service might enhance the reliability and efficiency of DHO. Besides the organisations, Cardoso et al. (2023) note the importance of considering the beneficiary's perspective when evaluating the performance of DHO. Such plurality of stakeholders is essential to the service design approach as different perspectives are fundamental to adopting co-creation to improve customer experience and services (Joly et al., 2019). Joly et al. (2019) also indicate the importance of bringing different research areas when developing service innovation, which is another characteristic of the service design approach. In this sense, Suoheimo et al. (2020) add that service designers start by understanding the service's fundamentals and problems to decide the best applicable methods and tools for managing the stakeholder and schedule.

Among the different tools considered in the literature to improve DHO, Fontainha et al. (2022) argue that process models contribute to guiding DHO planning, the standardisation of the organisational processes, and a transparent structure to foster stakeholder collaboration in DHO. Although other studies have also explored the analysis of DHO using process models from a managerial perspective (Costa et al., 2017; Moreira et al., 2022), these studies did not explicitly acknowledge the value of co-creation in terms of developing DHO improvements and innovations.

Considering this scenario, this research aims to discuss the co-creation value of using the process model as a tool to improve the drinking water distribution service in response to the drought. The research adopts the case study, a suitable method to deepen the investigation of a phenomenon within its real context (Yin, 2015). Therefore, this research investigates a typical case of disaster response to drought, more specifically, the "Carro Pipa" operation, which is a service response to the

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drought in the northeast region of Brazil, mainly because it is the disaster that most affects the Brazilian population (EM-DAT, 2021; Brazil, 2012).

This paper contains an introductory section describing the research's topic and objective. The second section covers the methodological procedures for developing the case study. The third section describes the “Carro Pipa” operation based on the developed process models and its co-creation value from a service design perspective. The fourth section presents the conclusions and suggestions for future research.

Research Methodology

The research adopts the case study according to the six steps defined by Yin (2014) and described as follows:

- Plan: this research focuses on understanding and improving how stakeholders act together in the service of drinking water distribution in response to drought based on process models and its co-creation value;
- Design: The research investigates the “Carro Pipa” operation in response to drought in Brazil;
- Prepare: The research protocol involved official “Carro Pipa” operation reports and semi-structured interviews to capture aspects of co-creation in the service provision through the development and validation of process models;
- Collect: Two interviews were carried out during 2022, the first with a professional working in the Defense Ministry (DM) responsible for the disaster response at the beginning of the operation and the second with the current head of the “Carro Pipa” operation. Data from reports and official documents were collected in 2022, although mostly retrospectively;
- Analyse: the research structures the data according to the Business Process Management approach, developing a process model of the current situation (also known as the "AS IS" process model) to identify potential improvements in the service. The research considers the pattern-matching technique to compare the case of the “Carro Pipa” operation with the process model developed by Fontainha et al. (2022); and,
- Share: This step considers the audience of service designers in the ServDes conference.

Results, analysis and discussion

This section presents the “Carro Pipa” operation through process models followed by the analysis and discussion of the main findings.

Stakeholders’ activation in the "Carro Pipa" operation

Drought has been recorded in northeastern Brazil since the 16th century (IPEA, 2009) and is the most frequent disaster in Brazil (EM-DAT, 2021; INMET, 2021). The response to this disaster received the name "Carro Pipa”, which involves the service of drinking water distribution to municipalities affected by drought and started in 1998 (Brazil, 1998). Nevertheless, only in 2005 did DM and the Ministry of Integration, currently the Ministry of Integration and Regional Development (MIDR - acronym from the name in Portuguese), standardise the operation nationally. The interviews indicated that there is already a new update of the “Carro Pipa” activities under evaluation. The operation receives recurring demand from municipalities affected by the drought, and in 2021 it cost R$ 536 million, employed 480 military personnel per day, served approximately 1.8 million people, 495 municipalities, and distributed 760 thousand m^3 of water per month through 3,443 pipe workers (Brazil, 2022).

Considering the specificities of the “Carro Pipa" operation identified in the operational reports and validated in semi-structured interviews with the professionals involved in this service, we developed the process models in Figure 1 and Appendix A. Figure 1 provides an overview of the process models for the stakeholders’ activation in the service provided by the "Carro Pipa" operation, and Appendix A presents each model with more details. The first part of the figure addresses the adapted model at the generic level, followed by the partial level and the last part at a specific level.

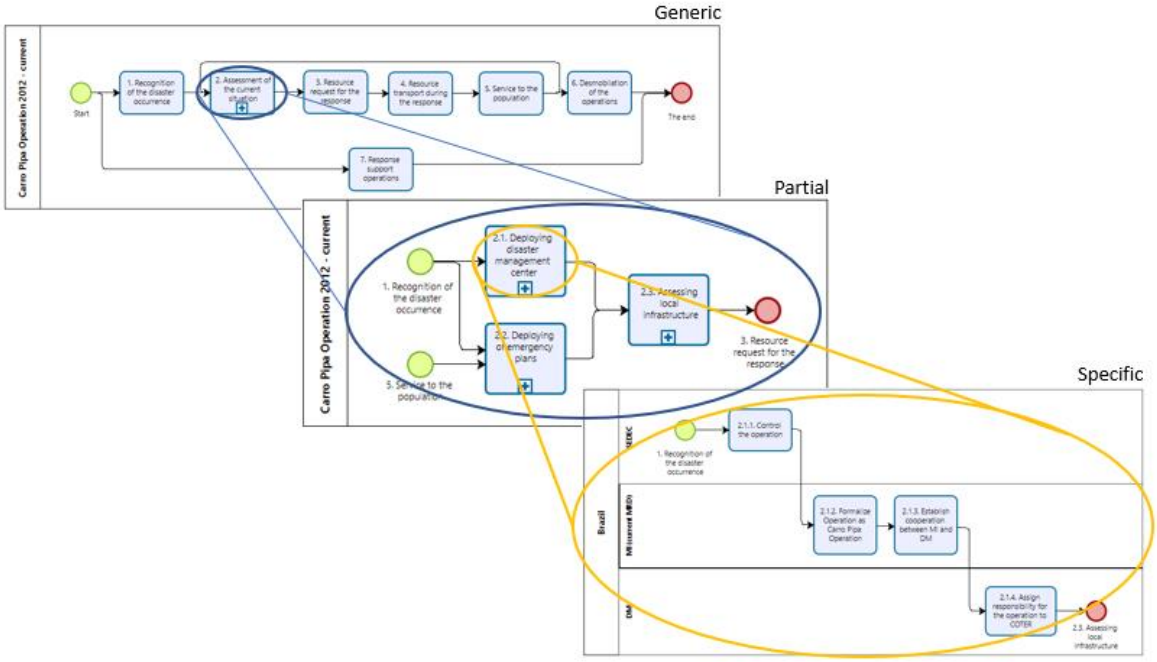

Figure 1. Overview of the "Carro Pipa" process model structure

Based on Fontainha et al. (2022), the adapted model at the generic level model is composed of seven processes, as indicated in Appendix A. The second general level process - Assessment of the current situation - is characterised by the stakeholders' activation when providing the humanitarian relief service in a disaster response, which is of fundamental importance for the success of the operation (Rauchecker & Schryen, 2019; Resende et al., 2022; Salam & Khan, 2020; Shokr & Torabi, 2017).

The adapted model at the partial level for the "Assessment of the current situation", based on Fontainha et al. (2022), presents three processes in the “Carro Pipa” operation, which is also detailed in Appendix A. These processes indicate the initial actions performed to serve the final beneficiary, such as the actions taken by the municipalities to request its inclusion in the "Carro Pipa" operation service.

There are three models at the specific level, each comprising different processes in the service offered by the "Carro Pipa" operation. At this detail level, the models reveal that the State Infrastructure Department evaluates the documents and decides whether to agree with the municipality's request. The MIDR, through the Secretary of Defense and Protection (SEDEC – acronym from the name in Portuguese), assesses the need to include the municipality. When SEDEC authorises the inclusion of the municipality in the "Carro Pipa” operation, it contacts the Land Operations Command

(COTER – acronym from the name in Portuguese), which passes this demand to the National Office (based on interviews).

It is worth noting that this research developed process models at the specific level, representing an advance from Fontainha et al. (2022), as the original work only discusses the process models at the general and partial levels. In this sense, as the process model goes to the specific level and the discussion on the service goes into more detail, the co-creation appears more explicitly. For instance, these co-creation elements embrace the simultaneous reflection between a researcher (i.e., a service designer) and professionals along the semi-structured interviews regarding the current situation of the service in search of improvements and innovations.

Main analysis and discussion

Although the structure of the “Carro Pipa” operation dates back to 1988, the professionals involved in this service still seek improvements. Aligned with their intentions, the analysis of the process models detailed in Appendix A enables the identification of the following challenges and opportunities:

- collection of information from different sources, with the need to detail the data multiple times;
- articulation between MIDR, DM and Armed Forces (AF) under formal regulations;
- autonomy for municipalities in more technical decisions that imply economic expenses (e.g., the definition of water collection points, supply points and cisterns, which are the basis for calculating the operating cost), while DM and Armed Forces perform executive functions that do not imply economic consequences, only compliance; and,
- lack of verification with municipal agents to guarantee the shortest route and lowest cost.

These issues are consistent with those already observed in the engagement of the military in DHO, as presented by Fontainha et al. (2022), Moreira et al. (2022) and Costa et al. (2017). Therefore, the process models described in this work might contribute to the improvement of the “Carro Pipa” operation with a potential direct impact on the beneficiary, the primary stakeholder in disaster response, as argued by Cardoso et al. (2023).

Analysing the “Carro Pipa” operation through process models demonstrates that this traditional managerial tool contributes to intermediating co-creation to improve this

service. Thus, this research also corroborates with (i) Joly et al. (2019), which also state that other areas of research can create service value and improve the experience of beneficiaries based on co-creation and (ii) Suoheimo et al. (2020) in which they highlight the importance of understanding problems to improve the services. Therefore, besides contributing to the practitioners and all stakeholders involved in this service, this research reinforces the benefits of the close relationship between managerial and service design areas through the usage of process models.

Conclusions

Drought is the disaster that most affects Brazil and tends to intensify over the years. Considering this, this research adopted the case study methodology to discuss the value of using the process model as a co-creation tool to improve the drinking water distribution service in response to the drought – particularly the “Carro Pipa” operation.

During the data analysis stage of the case study, AS IS process models were developed at three levels of detail, focusing on the activation process of the military stakeholders responsible for part of the service provision. It was possible to identify as main problems: (i) collection of information from different sources, with the need to detail the data multiple times; (ii) articulation between MIDR, DM and AF; and (iii) autonomy for municipalities in more technical decisions that imply in economic expenses; and (iv) lack of verification with municipal agents to guarantee the shortest route and lowest cost.

This research contributes to analysing a real case, reflecting on potential improvements in the drinking water distribution service. Although the research presents a single case, the analysis and results can serve as a basis for planning other drought issues in countries where water distribution service is possible. Moreover, this research reinforces the relevance of the process models as a tool to enable co-creation in identifying and proposing improvements in a service design approach – bringing a specific example for the argumentation of Joly et al. (2019). In this sense, we argue that DHO professionals should consider more explicitly the co-creation value of the process models when looking for DHO improvement and innovation. Moreover, this research offers insights of specific complexities involving DHO that can be considered by the Service Design community, such as the plurality of stakeholders from public, private and other social groups and also the beneficiary.

Thus, future research might investigate beneficiaries' perceptions to improve the “Carro Pipa” operation, covering a broad range of stakeholders in a co-creation perspective of service design. Future research might also discuss implementing improvements suggested in this research and analysing other disaster response services for comparison purposes. Lastly, future research might consider the combination of process models and other traditional Service Design techniques and tools, such as personas, to better promote the co-creation with the different stakeholders when discussing improvements in drinking water distribution.

Acknowledgements

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Appendix A

Appendix 1 presents the detailed models at the Generic, Partial and Specific Levels adapted from the Reference Process Model for Disaster Response Operations by Fontainha et al. (2022), illustrated in Figures 1-5.

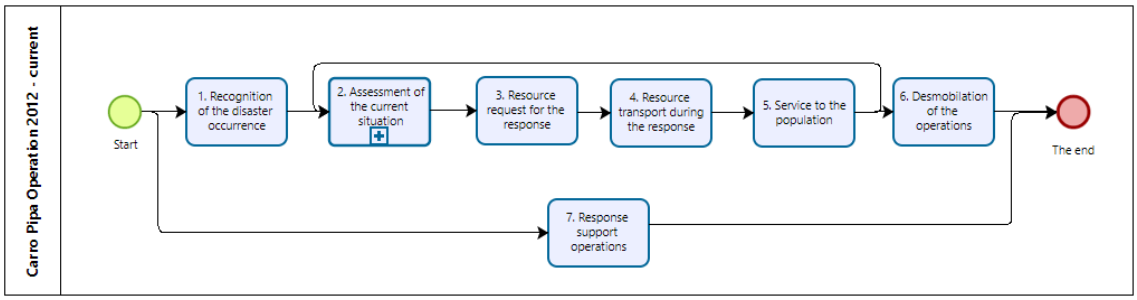

Figure 1. "Carro Pipa" process model at generic level. Source: Adapted from Fontainha et al. (2022)

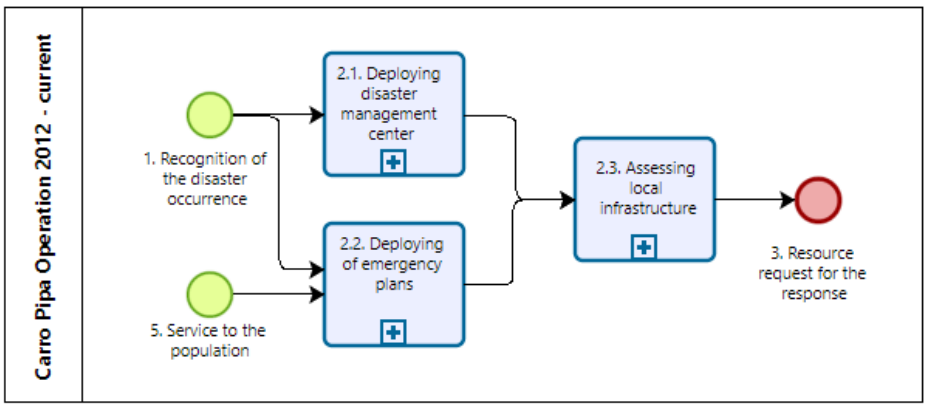

Figure 2. "Carro Pipa" process model at partial level – "2. Assessment of the current situation". Source: Adapted Fontainha et al. (2022)

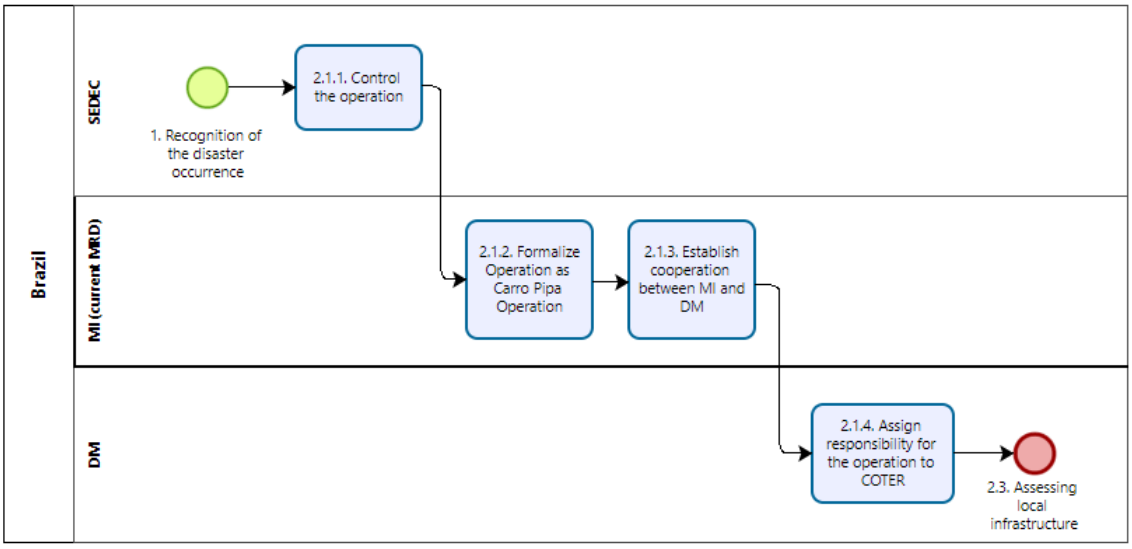

Figure 3. “Carro Pipa” process model at specific - “2.1 Deploying disaster management center”. Source: The authors

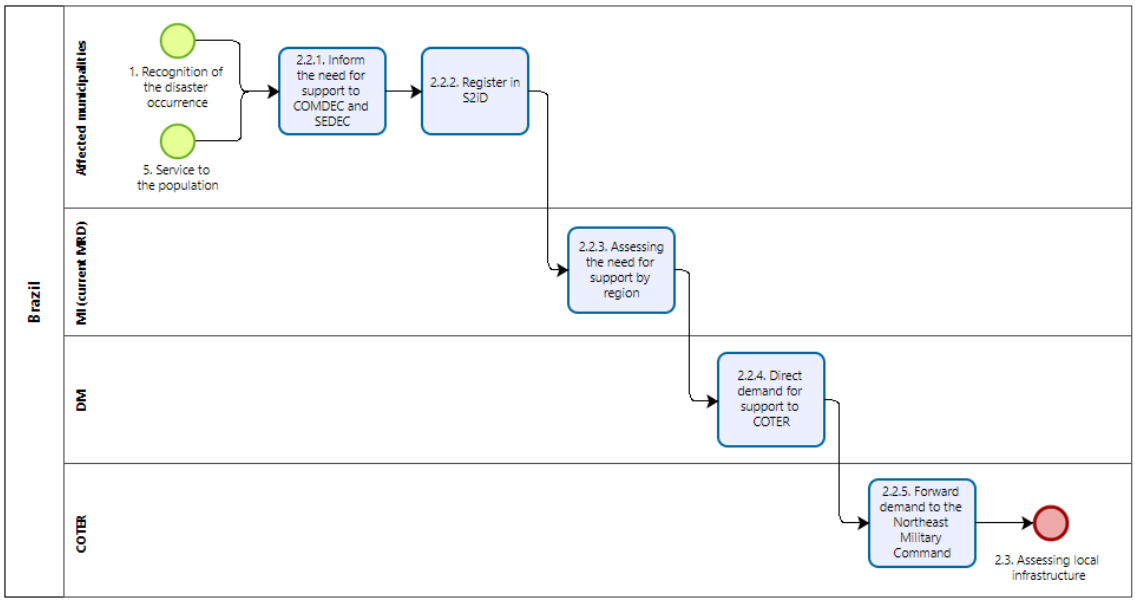

Figure 4. Specific Level process model (AS IS) "2.2. Implement emergency plans" – “Carro Pipa” 2012 – current. Source: The authors

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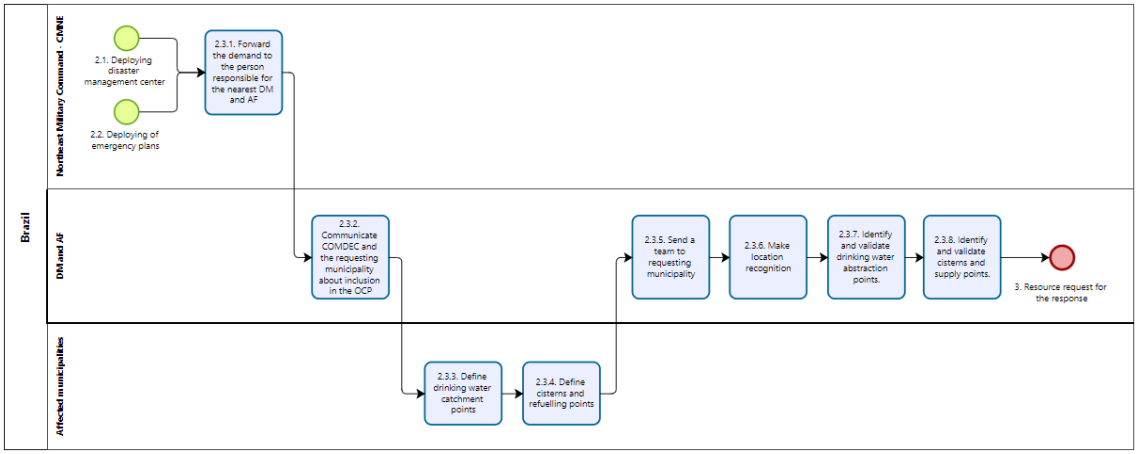

Figure 5. “Carro Pipa” process model at specific - "2.3. Assessing local infrastructure". Source: The authors