


# Business Process Modeling Supporting the Requirements Elicitation of an Audit System: An Experience Report

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## ABSTRACT

Requirements elicitation is a highly relevant part of the software development process. Due to the several techniques that exist to perform it, it is necessary to understand the complexity of this activity for it to be well performed, thus ensuring the quality of the final product. In addition, it is also worth emphasizing that the existence of well-defined processes is essential for the stakeholders' needs to be correctly identified in the initial stages of the software development process. This paper presents an experience report of the requirements elicitation and business process modeling teams. The teams used the best practices and reference frameworks to understand, model, and perform business process enhancements to the Brazilian Unified Health System General Audit Office (AUDSUS) audit system by using the business process model and notation (BPMN). Thus, all software requirements were specified based on the modeled business processes, providing a faster software development process and a more efficient information flow between stakeholders and the teams involved.

## KEYWORDS

Audit System, Process Mapping, Requirements Elicitation

## 1. INTRODUCTION

In recent years, most countries that constitute the Organization for Economic Co-operation and Development (OECD) have implemented an extensive reform plan that introduces improvements in the services provided by public administrations in order to ensure their efficiency and quality while

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addressing the citizens' needs (Bergmann et al., 2016). However, the incidence of fraud in public service delivery causes users (i.e., citizens, investors, stakeholders, and decision-makers) to mistrust most audit agencies (Zhu et al., 2022).

Auditing is an indispensable element of a regulatory system whose purpose is to reveal deviations from the rules and violations of the principles of legality, efficiency, effectiveness, and economy (Axelsen et al., 2017; Zhu et al., 2022). Furthermore, auditing the public sphere is also essential for public administration since managing such resources is a matter of trust and needs to be managed correctly (Awuah et al., 2022).

In Brazil, the National Audit System within the Unified Health System (SUS) was regulated through Decree nº 1.651 of September 28, 1995. The National Audit System is coordinated by the Unified Health System General Audit Office (AudSUS), an entity within the Brazilian Health Ministry structure. Given that the changes in knowledge function and nature resulting from information technology require constant updating in organizational resources for monitoring, controlling, and producing auditing activities in the public sphere, the Audit System (SISAUD) was instituted on December 4, 2002, representing an advance in modernizing health auditing, socializing information and promoting greater integration among the three spheres of the National Audit System: Federal, State, and Municipal (Melo & Vaitsman, 2007).

Almost twenty years have passed since the institution of SISAUD. Recently, the AudSUS team identified the need for the development of a new system, presenting as determinants the following factors: 1) the Need for an audit tool compatible with new technologies available in the market, such as Artificial Intelligence; 2) Integration of available solutions for strengthening the audit activity; 3) Incorporation of tools that streamline and subsidize the planning and execution stages of the audit activity; 4) Redefinition of control, planning and production mechanisms of the AudSUS workforce; 5) Use of new technologies that allow the execution of remote work with quality; 6) Use of more robust technologies in the execution of the audit activity.

According to previous studies, the quality of software depends on the correct understanding of the end-users and stakeholders' needs, i.e., the quality of the software requirements (Atoum et al., 2021; Behutiye, Karhapää et al., 2020; Behutiye, Seppänen, et al., 2020; Montgomery et al., 2022; Olsson et al., 2022). Thus, requirements elicitation and specification need to be aligned with business needs in order to meet stakeholder expectations (Ferrari et al., 2021; Karhapää et al., 2021; Montgomery et al., 2022). Therefore, the traditional approach to eliciting requirements through interviews, questionnaires, workshops, and prototyping, is being replaced or complemented by techniques in which the requirements elicitation occurs more precisely to the process in which the software will act (Canedo & da Costa, 2018; de Mendonça et al., 2017; de Sá Mussa et al., 2018; Leão et al., 2019).

One of the techniques used in the case study presented in this paper is Business Process Modeling (BPM), which has been heavily studied in the literature (Batra & Bhatnagar, 2017; Franco, 2011; Trkman et al., 2016; Umar Ong & Ameen, 2016), along with other techniques (Gambo et al., 2015), or different development methods (Ordoñez et al., 2015). BPM can be employed in many fields, such as military purposes (Demirörs et al., 2003) and geospatial manipulation (Sedelmaier & Landes, 2014) to support requirements elicitation. However, there is a lack of papers that analyze the use of BPM in the software development of specific systems with specific needs, such as audit ones.

Therefore, our work is aimed at addressing whether Business Process Modeling functions as an enabler in the identification, analysis, and specification of requirements through the development of a nationwide auditing system as an experience report. The processes mentioned in this work (Audit Planning, Audit Execution, and Monitoring Audit Recommendations) were modeled using Business Process Model and Notation (BPMN) through meetings held with the AudSUS stakeholders' team and a group of researchers from the process mapping and requirements elicitation teams. The result of the process mapping was used as the primary input in eliciting software requirements for the development of the new Audit system, called e-AudSUS, which is currently still its late stages of development and validation.

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