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Business process management approach to assessing the publication activity and bonuses accrual of employees and postgraduates: the case of top Russian university

Roman Nalobin

Project Work

presented as partial requirement for obtaining the Master's Degree Program in Information Management

NOVA Information Management School
Instituto Superior de Estatística e Gestão de Informação
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Business process management approach to assessing the publication activity and bonuses accrual of employees and postgraduates: the case of top Russian university

By

Roman Nalobin

Project Work presented as partial requirement for obtaining the Master’s degree in Information Management, with a specialization in Information Systems and Technologies Management

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ABSTRACT

This thesis presents a comprehensive analysis of the Academic Bonuses Accrual in one of Russia's top universities. Several approaches have been suggested and developed to enhance process efficiency. One of them is business process management which encompasses a combination of qualitative and simulation analysis. The qualitative analysis involves the thorough documentation and understanding of process activities, stakeholders, inputs, outputs, and rules. This analysis provides a solid foundation for further investigation. Building upon the qualitative analysis, a simulation model is developed to simulate the process flow and evaluate key performance metrics. The simulation incorporates probabilities, processing times, resource allocation, and work schedules to represent the process dynamics accurately. The simulation results reveal valuable insights into resource utilization, process completion, time metrics, and resource waiting times. Furthermore, what-if analyses are conducted to explore hypothetical scenarios and their potential impact on process outcomes. These analyses allow decision-makers to identify areas for optimization, allocate resources effectively, and streamline the process flow to enhance overall efficiency. This thesis serves as a valuable reference for process improvement and decision-making in the context of the Academic Bonuses Accrual process within a university setting.

KEYWORDS

Business Process Management; Higher Education Sector; Process modeling; Process Analysis; Information Management; Business Process Redesign

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LIST OF ABBREVIATIONS AND ACRONYMS

BPM – Business Process Management

BPMN – Business Process Model and Notation

BPR – Business Process Redesign

BVA – Business Value-Adding

IT – Information Technology

ITS – Information Technologies Systems

KPI – Key Performance Indicator

LMS – Learning Management Systems

MDM – Master Data Manager (the system of reference books)

NVA – Non-Value Adding

S&P – Salary and Personnel

SRPSC – System for Recording Publications of the Scientometric Center

TPS – the Toyota Production System

TQM – Total Quality Management

VA – Value-Adding

VAA – Value-Added Analysis

WoS – Web of Science

1. INTRODUCTION

Higher education institutions, like any other business, must stay ahead of the curve and adapt to a constantly changing landscape. With various technological, economic, environmental, political, and social factors at play, higher education must find ways to evolve and remain competitive. Business Process Management (BPM) is one solution that can help these institutions navigate these complexities and instabilities in the modern world. BPM offers the methods, techniques, and principles that higher education institutions need to stay competitive. With a focus on continuous improvement, institutions that embrace BPM can better manage change and stay ahead of the competition. For example, a study by Antonucci et al. (2020) found that only 1% of organizations undergoing digitalization initiatives had the BPM capabilities required to maximize their value. The study further confirmed that organizations with a strong focus on BPM are more likely to benefit from digitalization.However, the academic literature indicates that BPM comes with its own set of challenges. Although BPM has been positively associated with organizational success (Hung, 2006; Škrinjar et al., 2008), not all BPM initiatives are successful. Studies by Trkman (2010) and Bai & Sarkis (2013) found that 60-80% of BPM initiatives yield unsatisfactory results. These conflicting findings may be due to a lack of academic coverage of the factors that contribute to BPM implementation or a lack of understanding of these factors by practitioners. The higher education sector, in particular, may struggle to determine the value of the BPM (Vergidis et al., 2008).It is critical to note that the value of BPM must be evaluated in the context of the dynamic business environment. BPM is used in a wide range of industries and business contexts, and its application must be tailored to the specific circumstances of each institution (Dumas et al., 2018). The academic community has recognized the importance of context-oriented BPM and is actively researching ways to address the diverse circumstances that higher education institutions face (Anastassiu et al., 2016, 2016; vom Brocke et al., 2021).

1.1 CONTEXT

In recent years, there has been an increased focus on the development and implementation of process-driven systems in higher education. Scientists have examined various aspects of these systems, including how formal rules and processes provide a framework for assessing the efficiency of educational systems (Hamza, 2010) and how process-driven administrative systems can improve understanding and concentration on particular tasks (Zhang et al., 2012). One important direction in the field of BPM in higher education is assessing the publication activity of university employees. This is a critical factor in determining compensation and satisfaction among researchers (Rowley, 1996). Several studies have investigated the use of BPM techniques to evaluate the publication activity of university employees, such as the prototype called BPMoQualAssess proposed by Kahloun (2020). However, the successful implementation of such frameworks depends on several success factors, including an understanding of the organizational and sociocultural background, clear vision and support from senior leadership, and the smart use of IT (Alibabaei et al., 2009; Bologa et al., 2009; Kohli & Hoadley, 2006). Despite the importance of these success factors, higher education institutions often face resistance to change and a high failure rate in the Business Process Redesign (BPR) (Alibabaei et al., 2009). This resistance may stem from internal politics, bureaucratic procedures, and traditionalism (Jarvis, 2013). To overcome this challenge, it is necessary to promote open communication, emphasize the broad picture, and sustain stakeholder' trust (HENGST & VREEDE, 2004; Keup et al., 2001).

Indicators of publication activity are one of the criteria for evaluating the effectiveness of the scientific activity of the university. The Ministry of Education and Science of Russia, as well as various world ratings (THE, QS, ARWU, SIR) and national ratings (NRU, RAEX), use the number of publications of the organization indexed by international databases as criteria for calculating the university's indicators in the rating. The most significant publications are in the scientometric databases Scopus and Web of Science. The university has developed a system of academic bonuses to increase publication activity and quality control. The challenge of accurately and efficiently assessing the publication activity of a university can be a complex and time-consuming task, especially for larger institutions with numerous faculty and researchers. The process of publication assessment typically involves collecting, storing, and analyzing data from various sources, such as academic journals, conference proceedings, and databases. In addition, the process requires a well-defined framework for evaluating the quality and impact of the publications.

This thesis focuses on a higher education institution, with over 10,000 students and faculty. Education University is known for its commitment to social responsibility and has a strong focus on sustainability, diversity, and equity. The institution identified its macro processes several years ago but has not fully embraced BPM and lacks a culture of continuous improvement. This suggests that there is room for improvement in Education University's organizational processes. The University under this study assesses the publication activity of their employees in order to evaluate their research and academic productivity. The assessment is typically carried out as part of a regular performance evaluation process and can influence decisions regarding promotions, tenure, and other important academic and professional milestones. Evaluation of publication activity can be of one of two types: competitive and monitoring. Competitive evaluation of publication activity is carried out within the framework of any intra-university competitive and other procedures that provide for publication activity as one of the decision-making criteria. The specifics of such an assessment of publication activity are recorded in the relevant local regulations of the university. The monitoring assessment of publication activity is carried out annually at the end of the year. The subject of evaluation of publication activity is verified publications of an employee that meet certain criteria and are prepared by an employee for a certain period. As part of the annual monitoring and competitive evaluation, publications for the last two full years preceding the evaluation year.

The following employees are evaluated for publication activity:

1) Employees of the teaching staff of the university and its branches (including employees hired on the international labor market);
2) Researchers of the university and its branches, including heads and deputy heads of scientific (research) departments (including employees hired on the international labor market);
3) Research trainees.

The goal of this thesis is to optimize a selected process at the University under study by achieving the following objectives:

O1: Discover and model the most relevant process at University;

O2: Analyze the process to identify areas for improvement;

O3: Develop and implement a BPM solution to optimize the model;

O4: Evaluate the results of the BPM solution and its impact on Education University's efficiency.

This thesis is valuable both from a practical and academic perspective. It aims to improve the efficiency of Education University and deepen our understanding of context-focused BPM. By addressing the specific conditions at Education University, the thesis will provide insight into how to address different circumstances in general and contribute to the academic literature on BPM. By taking a step towards embracing BPM, Education University can demonstrate its commitment to staying ahead of the curve and leading the way in sustainable, efficient, and responsible higher education practices.

In trying to achieve the above mentioned goals, thisthesis organizes in five sections: (i) introduction, (ii) theoretical background, (iii) framework, (iv) results, (v) business implications, and (vi) conclusions. The purpose of the introduction is to offer the reader a basic grasp of the stated objectives, the value and relevance of the conducted study, and the background of the company. The theoretical background provides a theoretical context for the project's application areas. The following topics were investigated in this chapter: The concepts of BPM, including its techniques, possible benefits, barriers, and critical success factors, the BPM lifecycle and its various stages, and enterprise process management and its concepts, along with an overview of business process and BPM maturity models. The chapter on the framework describes the metrics that will be measured throughout the thesis, the notation language that will be employed, and a brief comparison of potential tools. The objective of the fourth chapter, results and business implications, is to provide the various outcomes of the research performed on the process in question by following the different stages of the methodology, as well as to demonstrate the organization's maturity assessment with regard to BPM initiatives. In the fifth and sixth chapters, conclusions and summaries of the completed study are presented.

2. THEORETICAL BACKGROUND

2.1 HIGHER EDUCATION SECTOR

The higher education sector is a vital part of society, playing a key role in providing education, training, and research opportunities to individuals. This sector is dynamic and constantly evolving to keep up with the changing demands of society and the economy. Changes will occur more frequently, with greater intensity, and in a more competitive, international setting. The information technology (IT) revolution will significantly change universities, reshaping the responsibilities, needs, and expectations of students, academics, and administrators (Azizi Ismail, 2010). The system of higher education continuously changes; therefore, there is a requirement for the creation of new methods of training. The development of a control algorithm for forming the most effective individual educational trajectory is a very actual challenge (Kalmykova et al., 2017).

In determining the architecture of traditional higher education intuitions, there are three tiers; which are categorized as strategic, operational, and control. The strategic level sets objectives for key functions such as teaching and learning, research and innovation, financial management, and student services. The operational level carries out these objectives through activities such as program offerings, employee recruitment and development, student counseling, and research project planning. The control level comprises resources for executing operational functions and is mainly software for functions such as leave management, salary payment, and online registration. The enterprise and operational levels are integrated through enterprise management software, while the operational and control levels are integrated through Learning Management Systems (LMS) and Information technologies systems (ITS). This integration enables information to flow between levels but is still incomplete (Telukdarie & Munsamy, 2019).

It is common knowledge that higher education has external assessment instruments like international accreditations, which is notably visible in the field of scientific research. Reputation and recognition are dependent on quality; thus, institutions actively engage in the accreditation race. To ensure validity in the market for higher education, universities place great emphasis on their intellectual output. It is evident in the creation of academic policies intended to stimulate publication activities (Veretennik & Okulova, 2022). The results of scientific activity published in monographs and articles are aimed at creating new opportunities for progress in society and economic growth; therefore, states implementing economic and scientific, and technical policies support the development of science. The problem of measuring the publication endeavors of research institutes and universities is one of current and continued importance (Bellis, 2009). Scientific publications serve as the primary metric for assessing the performance of scientists, research groups, organizations, and nations, despite its limitations being criticized in the literature (Abbott et al., 2010; Binswanger, 2015; Moed & Halevi, 2015). Despite the existence of alternative indicators and the challenges posed by limited availability of articles in recognized scientific citation indices, publication counts remain a central element in most performance evaluation systems. They are considered in critical areas such as recruitment, promotion, funding decisions, and recommendations regarding the continuation or closure of research groups (Agarwal et al., 2016). The global scientific landscape has experienced substantial transformations in recent years and decades, characterized by a significant increase in the annual number of scientific publications and a concurrent rise in personal and institutional performance, potentially influenced by the growth in scientific collaborations both in number and scope (Abramo et al., 2017).

In 2006, the compensation system for researchers in the Russian Federation underwent significant changes with the implementation of a pilot program aimed at improving quantitative performance evaluation (Ascheulova & Kolchinsky, 2010). This initiative brought about a transformation in the State Academies of Science, incorporating project management principles and modifying the administration of public research organizations. To assess performance, key performance indicators (KPIs) were introduced, primarily based on planned articles published in peer-reviewed journals. The state agency and the Russian Academy of Sciences conducted a comprehensive performance evaluation of research institutes between 2013 and 2016, utilizing the results to determine funding allocations for these institutions (Kosyakov & Guskov, 2019). Consequently, this quantitative approach to performance measurement has spurred increased interest in scientometric research within Russia, prompting scientists and administrators to prioritize scientific citation indices, journal indicators, and metrics (Guskov et al., 2016). Kosyakov and Guskov (2022) proposed a new methodology for scientometric assessment that is designed to eliminate negative consequences such as inflation of scientific output, low citation rates, and a disproportionate number of publications in low-rated journals.

A significant breakthrough stage in the perception of the meaning and values of publication activity in universities is considered to be the formation of ideas about the so-called academic rewarding. On the topic of evaluating the effectiveness of scientific productivity and the productivity of university teachers, researchers and specialists have argued for a considerable amount of time, with some arguing against evaluating the significance of scientific publications to determine the productivity of a researcher or university professors (Hallonsten, 2021). The personal motivations of the authors of scientific publications cover a fairly wide range – from the search for new solutions and new knowledge in their scientific field of research or scientific interest, awareness of their importance in science, promotion in the university hierarchy, increasing the reputation rating in the professional environment to increasing personal monetary benefits in the form of salary increases, additional monetary payments for the number of publications and the level of scientific journals where they are published, opportunities to apply for grants, etc. Kasatkin (2022) estimated the monetary value of scientific publications considering the fact that, on the one hand, universities establish a certain reporting system that allows them to solve their strategic tasks, and on the other hand, a scientific publication is presented as an asset that can be evaluated based on well-known approaches to business assets. Researchers proposed the idea of monetary value that will objectively contribute to the improvement of the incentive system for researchers and teachers of higher education in the format of an effective contract, not only supporting rational motives but also ensuring the achievement of the goals of the development of society and science and the welfare of countries.

2.2 Business Process Management

In the past fifty years, enterprises have dramatically adopted IT. Over time, the utilization of IT has undergone a notable transformation, shifting from primarily providing computational support to implementing more efficient processes. This shift has been influenced by the rapid expansion of globalization and the need for organizations to collaborate within global supply chains. Traditional IT support for such collaborations has proven costly, and the deployment of customized solutions has often fallen short of expectations (Ravesteyn & Versendaal, 2009). As a result, there has been a growing focus on BPM as a domain that offers potential solutions. BPM can be considered a comprehensive management approach that fosters process orientation and improvement within businesses, aiming for greater flexibility in processes and information systems to enhance organizational agility (Weske, 2007). BPM systems facilitate the analysis, modeling, execution, and improvement of both public and private processes within an organization, effectively extending the functionality of legacy systems and enhancing process flexibility. (Hiemstra et al., n.d.; Weske, 2007).

A business process is a specialized sort of process that, as its name indicates, focuses on the stages and actions performed by humans or computers to provide customer value by changing particular inputs into outputs (Davenport, 1993). (Davenport, 1993; Hall & Johnson, n.d.). Nevertheless, it is essential to recognize that this is merely one of many definitions and that the notion, as well as the entire subject of BPM, is marked by ambiguity (Klun & Trkman, 2018).

As a result of fast technological advancement and globalization, businesses are faced with the significant problem of managing their business operations effectively. This requirement was impacted by the increase in orders, the demand for speedier information sharing, and the decision-making process (Ko et al., 2009). This challenge necessitated a variety of solutions from several disciplines, including BPM and Total Quality Management (TQM), Operations Management, Lean, and Six Sigma (Ko et al., 2009).

BPM is defined by Pyon et al. (2011) as a discipline that directly supports business processes by employing a collection of methods to design, evaluate, and govern operational processes involving various actors, including people, applications, documents, and the organization. According to Lemańska-Majdzik (2015), it is vital to embrace the customer's perspective while taking a process-based approach, as the end objective of the processes is to establish a structure for the organization that leads to the generation of value for the consumers. BPM offers the organization tools to boost its effectiveness and efficiency, is a major contributor to its performance and competitiveness, factors that every company must have to survive and grow, and is becoming an increasingly vital component for its innovation and transformation (vom Brocke et al., 2014).

As stated previously, BPM is not the only discipline concerned with performance enhancement. BPM is said to have been influenced by TQM (Stravinskiene & Serafinas, 2020). This discipline, however, focuses more on the goods and services themselves, whereas BPM focuses on the development of the processes that generate these products and services. BPM further contrasts with operations management in that, although sharing various approaches for operation optimization, including modeling and simulation, OPM focuses on regulating current processes without modifying them, whereas BPM modifies existing processes in order to improve them. In addition to adopting Lean Six Sigma methods, BPM has also adopted Lean Six Sigma practices. Since Lean is a set of practices that focuses on the elimination of activities that do not add value to the customer, an orientation that can also be found in BPM, an example of which is the value-added qualitative analysis, which will be discussed later, and since Six Sigma is a set of practices that focuses on the reduction of defects, techniques of this nature can also be found in BPM by applying waste analysis, which has the same objective (Dumas et al., 2018)

The benefits of BPM are stated to extend from the enterprise level, where they enable compliance improvement through process monitoring because organizations face compliance risks due to incorrect or inappropriate response times, to the process level, where they facilitate overall cost control and possible cost reduction by assessing the costs of processes and activities within those processes. BPM also helps customers by enhancing satisfaction through process efficiency, which includes matching time expectations and enabling price reductions via cost reduction. The advantages to management may be viewed as a continual refinement of plans and predictions made possible by the ability to make medium- and long-term adjustments. Having well-documented processes enables process actors to have a better grasp of the whole organization's process map and relationships (ABPMP, 2013).

According to Jeston and Nelis (2014), an organization may explore BPM for a variety of reasons and triggers. The organization itself, management, personnel, customers/suppliers/partners, goods and services, processes, and IT all contain these drivers and triggers. In terms of the organization, abrupt and quick expansion, as well as the requirement to fulfill compliance and regulatory standards, may provide challenges that need managers to exercise greater control over their operations. Indicating their dissatisfaction with key parts of their process lifecycles, employees might potentially prompt a corporation to pursue a BPM strategy. Customers, suppliers, and partners may raise discontent with services, whether due to unavailability or personnel ineptitude. If products and services are complicated, or if there is a lack of business agility, e.g., long lead times to market, then business agility is poor. The process quality is low, and a significant amount of rework is being performed. There are too many superfluous process handoffs. Concerning IT, the company may introduce new systems, such as CRM or ERP systems, or an entirely new IT infrastructure.

It is important to note that, according to Dumas et al. (2018), there are some critical barriers to BPM success, namely the focus on the use of BPM tools, methods, and techniques rather than the business goals, where organizations misplace the aforementioned techniques and lose sight of their strategic objectives. Another obstacle is that organizations may dismiss other management disciplines that may be beneficial to them rather than employing them to strengthen BPM. Due to the holistic nature of BPM, if organizations treat each process and each BPM project separately, it can lead to issues, such as participants being unclear on the project's objectives and customers needing to interact with the organization through different processes that are constantly changing. People tend to resist change. This obstacle is not exclusive to BPM. However, it is a factor that should always be considered when beginning a BPM endeavor.

In all BPM-related scenarios, the implementation of the BPM lifecycle is crucial. This framework encompasses the necessary steps to be followed when carrying out BPM initiatives (Macedo de Morais et al., 2014). While business processes are typically perceived as having a distinct beginning and end (vom Brocke et al., 2014), BPM lifecycle models ensure continuity through the incorporation of feedback loops (Trkman, 2010). Previous studies (Bernardo et al., 2017; Macedo de Morais et al., 2014) have indicated that the six-step model presented by ABPMP serves as a comprehensive reference. The first step involves planning and strategy, where the project's overarching characteristics are defined. The second step entails analysis, which includes mapping the business context. The third step focuses on design and modeling, generating new process specifications. The fourth step encompasses implementation, encompassing activities such as training and various evaluations. The fifth step involves monitoring and control, where resources are manipulated to ensure the achievement of process goals. Finally, the sixth step revolves around refinement, which entails the co-creation of new process specifications (Macedo de Morais et al., 2014). Process mapping is one of the strategies for process improvement that provides a "visual help" for process analysis and improvement. Not the same as data flow diagrams or flowcharts is process mapping. It is a structure that illustrates the relationships between activities, individuals, data, and objectives. Process mapping, like all other process optimization methods, has been utilized by both manufacturing and service firms and has shown helpful (Siha & Saad, 2008).

Business process modeling enables a shared comprehension and analysis of a business process. A process model can provide an in-depth comprehension of a process. Through its business processes, an enterprise can be analyzed and integrated; therefore, the significance of accurately modeling its business processes. Using the appropriate model requires considering the objective of the analysis (Aguilar-Savén, 2004). Through a comparison of seven different models with the reference framework, it becomes evident that there is a convergence in the processes of design and modeling, execution, and monitoring and control, albeit with limited emphasis on strategic alignment. Looy et al. (2014) further argue that most lifecycle models primarily focus on modeling, deployment, and optimization, neglecting other crucial areas related to organization management. Initially rooted in the IT field (Chountalas & Lagodimos, 2018), the concept of BPM lifecycle primarily addressed IT-centric aspects of processes (vom Brocke et al., 2014). However, recent research has highlighted the need for a more holistic approach to BPM (Looy et al., 2014). Houy et al. (2010) assert that independent of nomenclature and the number of processes, there is minimal conceptual variance between different lifecycle models (Macedo de Morais et al., 2014).

A model given by Dumas et al. (2018) is significant in light of the convergence of lifespan models seen in the literature. The authors introduce seven stages - process identification, discovery, analysis, redesign, implementation, and monitoring (Figure 1) - that collectively represent the means to maintain the continuity of positive outcomes delivered by business processes and the generation of the greatest possible organizational value.

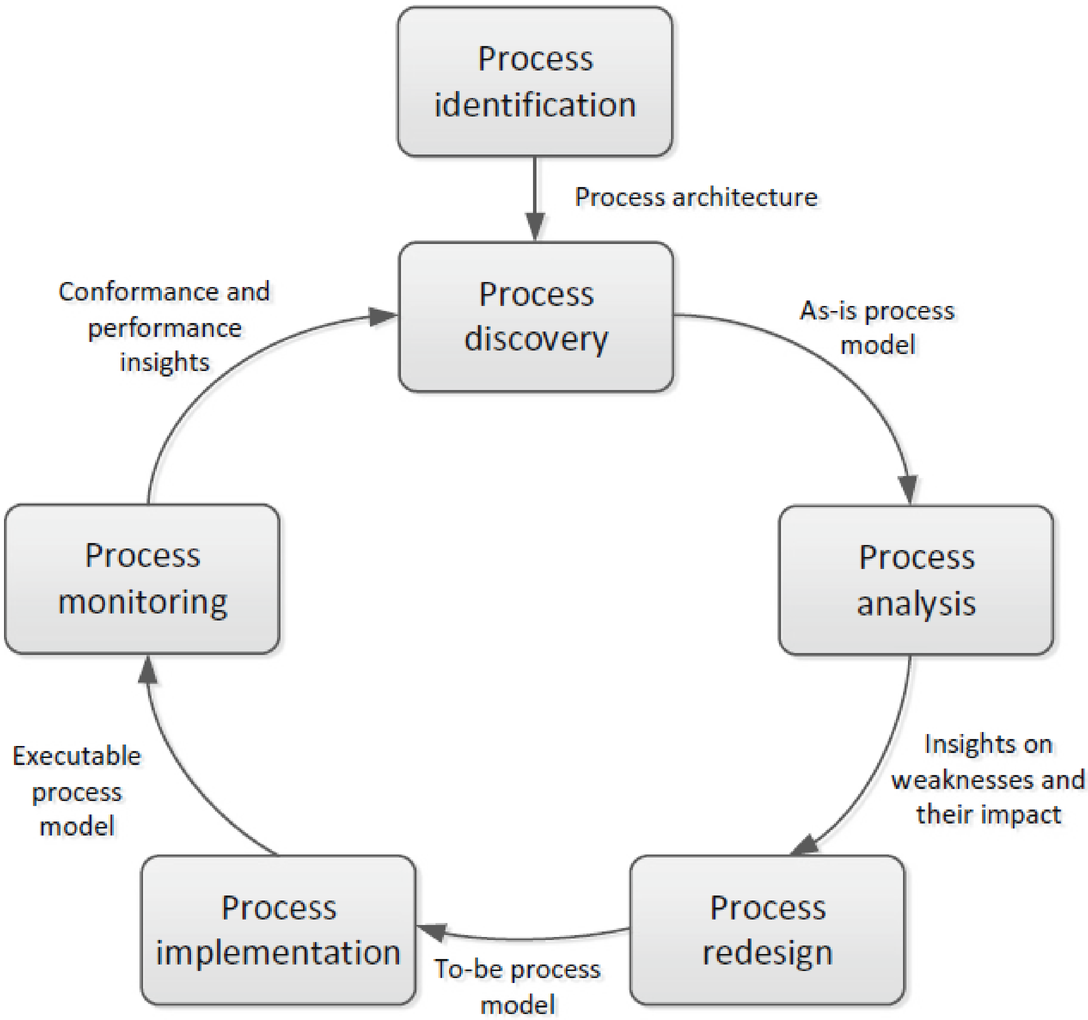

Figure 1 – The BPM lifecycle. Source – Dumas et al. (2018, p. 23).

The initial phase involves defining the overall process architecture and selecting a suitable process, while the subsequent phase focuses on understanding the execution of work in the selected processes, resulting in one or more "as-is" process models. These models are then analyzed to identify deficiencies and opportunities for improvement. In the following step, these insights are used to develop an enhanced version of the process, known as the "to-be" process model. The third phase encompasses the implementation of the "to-be" model, which requires organizational change management and process automation, including adjustments to existing IT systems or the development of new ones. The final step involves ongoing monitoring and evaluation of the operational processes against predefined performance indicators. Any identified inefficiencies and improvement opportunities are fed back into the definition phase, leading to a cyclical nature of the model. It is important to note that while the model may not fully align with Burlton's (2010) strategic activities as utilized by de Morais et al. (2014) or explicitly address all the sub-areas described by Looy et al. (2014), Dumas et al. (2018)'s lifecycle extends beyond the activities typically covered by other BPM lifecycle models. The model is considered comprehensive due to its emphasis on strategic alignment, inclusion of organizational management-focused issues, such as change management activities and consideration of various stakeholders throughout the lifecycle. Hence, it is chosen for the subsequent project.

2.3 Previous Research on BPM in higher education

In recent years, scientists have concentrated on the development and implementation of process-driven systems in higher education. Ravesteyn and Versendaal (2010) described the collaborative effort of two educational and scientific institutions, the HU University of Applied Sciences and Utrecht University, in developing a BPM course that not only imparts theoretical knowledge but also allows students to gain practical experience with the BPM system and implement issues. Hamza et al. (2010) examined how formal rules and processes provide a framework within which institutions of higher education can establish and monitor the efficiency of their educational systems. Abdous (2011) offered a conceptual and operational framework for higher education business process reengineering. The implementation of the methodology enabled us to identify inefficiencies, reduce paper handling, increase efficiency, and implement operational improvements at the university, while simultaneously reducing academic workload and total cost.

Zhang et al. (2012) proposed a process-driven model for administrative management systems in higher education to address the challenges faced by the majority of universities. Scientists identified processes, divided the routine of educational administration into tasks, and assigned an executor to each task. Researchers created a prototype of an administrative system for higher education using the Bonita open solution. The concept demonstrated how the process-driven administrative system for higher education enables users to comprehend the processes in which they are involved and concentrate on particular tasks. Duarte and Martins (2013) investigated the organizational structure of Algarve University (Portuguese), then modeled the business processes of one of its services, Academic Services. Approximately fifty processes were analyzed and modeled using a graphical representation of the Business Process Model and Notation (BPMN). The process analysis enabled the identification of certain improvement opportunities and revealed the variety of relationships between the sections of this service as well as the links connecting them to other university departments and external entities. In order to operate higher education institutions, Kahveci and Taskin (2013) designed a model that combines strategic management with process management. Using Sakarya University as an example, the planned management system is presented. On the basis of a case study of collaboration improvement in higher education, Vuksic et al. (2014) studied the effectiveness of incorporating the simulation modeling technique for process performance management. Using a case study methodology, this paper presents simulation modeling for process performance management at the University of Zagreb, Croatia, with the aim of enhancing collaboration. Green et al. (2013) examined the process architectures developed by the application of the Riva technique (Ould, 2005) to the University of Bath and the University of the West of England. The process-driven semantic approach described by Paralic et al. (2013) made it possible not only to model but also to assist the operationalization of specified portions of generic educational processes as electronic services. Kahloun (2020) proposed a prototype called BPMoQualAssess for evaluating the quality of business process models. They conducted a case study with a process in the field of higher education to test their prototype. The prototype consists of two steps, where first, a model is obtained with the BPMN language and second, a set of measures are determined to define the quality of the BPM. The prototype allows experts to add metrics and threshold values for continuous learning.

One of the important directions in the field of BPM in the higher education sector is assessing the publication activity of university employees. As demonstrated by Kosyakov and Guskov (2019), the rise in publication frequency can largely be attributed to an increase in the number of active authors. This growth is predominantly driven by the staff of higher education institutions and academics who have not previously disseminated their research findings in international database-indexed journals. One of the main factors in assessing publication activity is that the compensation systems practice in the organization should be acceptable for the organizational environment and appropriate for the sort of individuals so that it would satisfy the researchers (Rowley, 1996). Against the backdrop of the resistance to change that characterizes higher education institutions and the high rate of failure of BPR in the industry (Alibabaei et al., 2009), it is important to emphasize that the successful implementation of this framework depends on a number of success factors (Bologa et al., 2009). Three main variables were discovered among these factors:

1) An in-depth awareness and familiarity with the organizational and sociocultural background, as well as the organization's dynamics and politics, are required (HENGST & VREEDE, 2004). Understanding the organizational culture and dynamics is crucial for facilitating the adoption of business process reengineering and anticipating potential barriers and opposition (Keup et al., 2001). This in-depth understanding is vitally important in the area of higher education, as Jarvis (2013) acknowledges that certain colleges are mired down by internal politics, bureaucratic procedures, and traditionalism.
2) Success requires a clear vision, senior leadership involvement, and support (O’Neill & Sohal, 1999; Upadhyay et al., 2011). Indeed, consistent support from leadership is essential to the entire implementation and longevity of the new process. The absence of leadership was cited

by Hammer and Champy (2009) as a significant factor in the failure of other BPR efforts. Likewise, a challenge to obsolete institutions, procedures, and practices may be met with intense opposition from stakeholders. Resistance to change is ubiquitous in higher education; therefore, it is necessary to "prepare the environment for change" by promoting open communication, emphasizing the broad picture, and sustaining trust among administrators, professors, and students.

3) The smart leveraging of IT as an enabling, dynamic, and scalable instrument (Kohli & Hoadley, 2006) is the third essential factor to address. Throughout all phases of the BPR process, technology plays a crucial role as an enabling tool, especially in identifying innovative and efficient alternatives to existing methods. Otherwise, there is the possibility of leveraging technology to replicate and sustain obsolete processes and procedures. Therefore the BPR team must have a full awareness of the capabilities and limitations of the various technologies engaged in the reengineering process.

Several authors have not only outlined the key success factors for BPR implementation but also pinpointed the reasons for its failures. Aggarwal (1998) identified failures attributed to managerial characteristics such as a lack of humility, reluctance, crisis management, high costs, and a lack of vision. Hammer and Champy (2009) identified various reasons for failure, including the absence of a process-oriented perspective, inflexible processes, exclusion of employees from decision-making, appointment of individuals without a proper understanding of BPR, technological constraints, project design focused solely on cost reduction and downsizing, weak teams, and breakdowns in communication. This study emphasizes the importance of adopting a fresh perspective, purpose, and customer focus when initiating reengineering efforts. Singaporean businesses encountered several challenges in implementing their BPR programs, including insufficient financial and human resources, limited IT capabilities and expertise, lack of support from organizational members, absence of a clear strategic vision, rigid organizational structure, and the absence of a BPR champion (Ranganathan & Dhaliwal, 2001). Additionally, it should be noted that other factors contributing to failures in BPR implementation include a lack of top management support and funding (Al-Mashari & Zairi, 1999), employee resistance (Ranganathan & Dhaliwal, 2001), IT-related challenges (Al-Mashari & Zairi, 1999; Ranganathan & Dhaliwal, 2001; Smith, 2003), as well as ineffective BPR teams, poor project management, and communication difficulties (Smith, 2003).

3. FRAMEWORK – THE BPM LIFECYCLE

The chosen approach for achieving the predetermined goals of this thesis was based on the BPM lifecycle recommended by Dumas et al. (2018), as cited in the literature review. The thesis incorporated the primary stages of this approach, namely Process Identification, Process Discovery, Process Analysis, and Process Redesign. However, due to time constraints, the Process Implementation and Process Monitoring and Control phases were not included in the study. Nevertheless, the project proposes improvement measures for the implementation process, even though the actual process redesigns were not directly implemented. To develop the business process models, a decision had to be made on the most suitable tool among the available options. The focus was on selecting a Bizagi Modeler tool that provided an easy-to-use and comprehended approach to business process modeling. Bizagi Modeler is designed to be user-friendly, employing an intuitive drag-and-drop approach. It follows a freemium business model, providing free access to a range of suitable capabilities. It also includes a simulation view that enables quantitative analysis of the simulation, allowing for a better understanding of various metrics such as simulated cycle times and resource utilization. Furthermore, it allows import and export to interoperable formats, including XDPL, facilitating integration with other BPMSs. Bizagi provides a cloud service to store different created models as well. In the subsequent sections, detailed information will be provided on each phase of the model, along with the specific actions undertaken within its framework during the course of this research investigation.

3.1 PROCESS IDENTIFICATION

The lifecycle commences with the Process Identification phase, which involves identifying the processes within an organization, establishing their relationships, and defining the business problem. As organizations often lack sufficient resources to apply BPM to every process in detail, it is crucial to prioritize a subset of processes (Cho & Lee, 2011; Dumas et al., 2018). Process prioritization involves multiple approaches, such as importance (business impact), which focuses on the significance of each process to the organization's strategic objectives, dysfunction, which considers processes that present frequent problems, and feasibility, which assesses how likely a process can be managed successfully. Additionally, process performance metrics and measures should be established in this phase, which can range and depend on each organization and process. These metrics can include cost-related metrics, time-related metrics, and error-related metrics that concentrate on the quality of the business process.

After identifying the processes, they can be classified according to Michael Porter’s Value chain model, where core processes are those that directly contribute to the organization's value proposition and customer satisfaction. These processes require careful planning, support, and organizing, which are provided by other types of processes, such as support and management processes (GOŠNIK, 2019). Support processes assist the execution of core processes and may include supply procurement and machine maintenance. However, support processes also aim to help management processes, including accounting and human resources. Management processes provide the means to measure and control quality and ensure desired performance outcomes, which helps with decision-making, guiding, and enabling the organization to achieve its strategic. Finally, the output of the Process Identification phase is a process map or architecture, which represents the identified processes and their relationships.

3.2 PROCESS DISCOVERY

Once processes have been selected, the next step is to gather information to create an "as-is" process model that can be characterized as the discovery stage of the BPM lifecycle. A four-step procedure is employed to model the process.

The process of creating an "as-is" process model, which represents the discovery stage of the BPM lifecycle, involves several steps. First, start and end events are identified to delineate the process boundaries using BPMN notation. Next, activities and events occurring during the process, such as "the article is published" and "the bonuses are received," are defined. The resources involved in the process and their handoffs are identified to establish resource categories and lanes, as well as the sequence of activities. Dependencies between activities, decision points, and execution types are specified using BPMN elements to further define the control flow. Additional elements, including business objects and exception flows, may also be incorporated. The discovery phase has to be conducted with forming a team consisting of domain experts and process analysts who will be responsible for the processes. Information can be gathered using evidence, interview, or workshop-based methods. A combination of these methods is proposed, and once enough data has been collected, the process can be modeled using the BPMN language.

For University under study, process discovery is conducted using the four-step procedure outlined above. Document analysis, observation and interview-based techniques are used to collect necessary information, and assumptions about the process are formulated and tested during semi-structured interviews. After sufficient data is collected, the process is modeled in Bizagi. Quality assurance activities focus on ensuring syntactic, semantic, and pragmatic quality. The process model is then approved by the process owner. Overall, the discovery phase aims to produce a comprehensive model that accurately reflects reality and is easy to use and maintain.

3.3 Process Analysis

In order to improve an existing business process, it is crucial to have a clear understanding of its current state and how it can achieve strategic business objectives. Process analysis is a discipline that provides this understanding through various means and techniques. Qualitative and quantitative process analysis are two distinct types of process analysis. Qualitative process analysis is based on subjective judgment using non-quantifiable data and often uses tools borrowed from Lean and Six Sigma. Value-Added Analysis (VAA) is a common tool used in qualitative process analysis, which aims to remove nonessential process tasks or waste. To apply this technique to a process, the process is first modeled and mapped, and then the process activities are decomposed into specific steps. According to Dumas et al. (2018), the next step is to clearly identify the customer of the process and the positive outcomes they seek. Steps that contribute to these outcomes are considered “value-adding” steps (VA), while steps that do not directly contribute to positive outcomes for the customer but are necessary or valuable for the business to function well, with fewer issues or due to regulatory requirements, are called “business value-adding” (BVA) steps. The third and last category is the “non-value adding” (NVA) steps, which are all the steps that do not fall into either of the aforementioned categories. An evaluation of each NVA step is then made to understand if and how it can be eliminated. Waiting times should be eliminated entirely whenever possible, as they are considered simple waste. Waste analysis is the technique of looking at the process and identifying the “waste” that exists in them. There are seven different types of waste, which are transportation, motion, inventory, waiting, overproduction, overprocessing, and defect. An eighth waste was later defined as “Unused Talent” when the Toyota Production System (TPS) was adopted in the Western world. Waste analysis originates from Lean or TPS.

Quantitative analysis techniques are used to complement qualitative analysis in the context of BPM, and they are concerned with analyzing the conduct of the process and different performance measurements. These performance measures can be defined in three dimensions: time, cost, and quality, with a fourth dimension, flexibility, coming into play when considering the issue of change. Flow analysis is a set of quantitative analysis techniques that enables the calculation of the time and cost dimensions of a process. The calculations for this type of analysis are made by following a set of rules regarding the BPM model created in the discovery phase. Another widely used method for qualitative process analysis is process simulation, which helps in the verification, validation, and optimization of process models and designs. The simulation requires certain information to be able to run computer-based business process simulations. However, Van der Aalst (2011) warns that organizations should not misuse this technique by not paying enough attention to the integrity and correctness of the produced business process models, and conducting simulations on models that assume idealized versions of the current and real process makes no sense and can be derogatory.

A combination of both qualitative and quantitative methods will be utilized for University under study. The initial step will be to conduct value-added and waste analyses, which will be carried out by the process analyst. Qualitative observations will be supported by quantitative data acquired through the use of Bizagi software for simulation purposes. Furthermore, the context of the chosen process, as determined during the identification phase, will also be taken into consideration during the analysis to determine the most relevant insights that should be considered in the redesign phase.

3.4 PROCESS REDESIGN

During the analysis phase, various ideas and suggestions are generated for redesigning a business process. The process redesign phase takes these ideas and existing business process models as inputs to propose several approaches for optimization. However, organizations often miss potential redesign options, so it is important to use specific methods to allow for better redesign decisions. The output of this phase is a "to-be" business process model, encapsulating the improvement suggestions.

Redesigning a process involves difficult trade-offs between each performance measure dimension, making it challenging to enhance every dimension simultaneously. There are various process redesign methods, including transactional and transformational methods, analytical and creative methods, and inward-looking and outward-looking methods. The Heuristic Process Redesign is an example of a transactional, analytical, and inward-looking methodology. This method evaluates and identifies possible improvements to the "as-is" business model using a list of redesign heuristics. Heuristic Process Redesign is useful when the current process is known and the performance objectives are set. The method prescribes selecting a set of heuristics and applying them to generate multiple scenarios of the improved process. Afterward, these scenarios are compared to determine the most optimal solution. Once the "to-be" model is developed, the next steps include process implementation and monitoring.

For the University under study, Heuristic Process Redesign is a suitable approach due to its numerous redesign principles and the need for transactional methods. The most relevant heuristics will be selected based on the analysis stage's output and contextual factors from the identification stage. After generating multiple scenarios of the "to-be" model, a simulation will compare and identify the optimal solution. The following steps involve refining the conceptual model into an executable model for a Business Process Management System (BPMS) and monitoring its performance using predefined procedures and tools.

4. RESULTS

Before starting the project, several meetings were conducted with University's management. The purpose of these meetings was to define goals, strategic plans, as well as to identify problem areas in the process of calculating and accruing academic bonuses for university faculty.

4.1 Process Identification

The first task upon arriving at the University was to study the existing documents detailing the processes implemented within the organization. To gather such information, a series of meetings were conducted with University's employees and management. During the interviews, a structural diagram of the company's processes for the academic bonuses campaign was created (Figure 2).

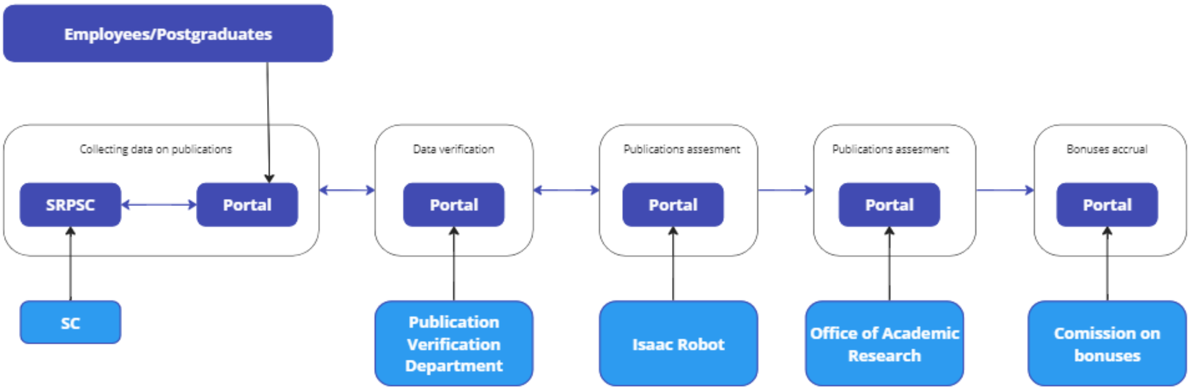

Figure 2 – High-level processes. Source – Made by Author
Note. SRPSC – System for recording publications of the scientometric center, SC - scientometric center.

The "Data streams AS-IS" figure (Figure 3) illustrates the various data streams and their purposes in the storage and calculation of academic allowances for publications. Figure also provides a visual representation of the diverse data sources and their interconnectedness, highlighting the flow of processes involved in the calculation of academic allowances based on publications.

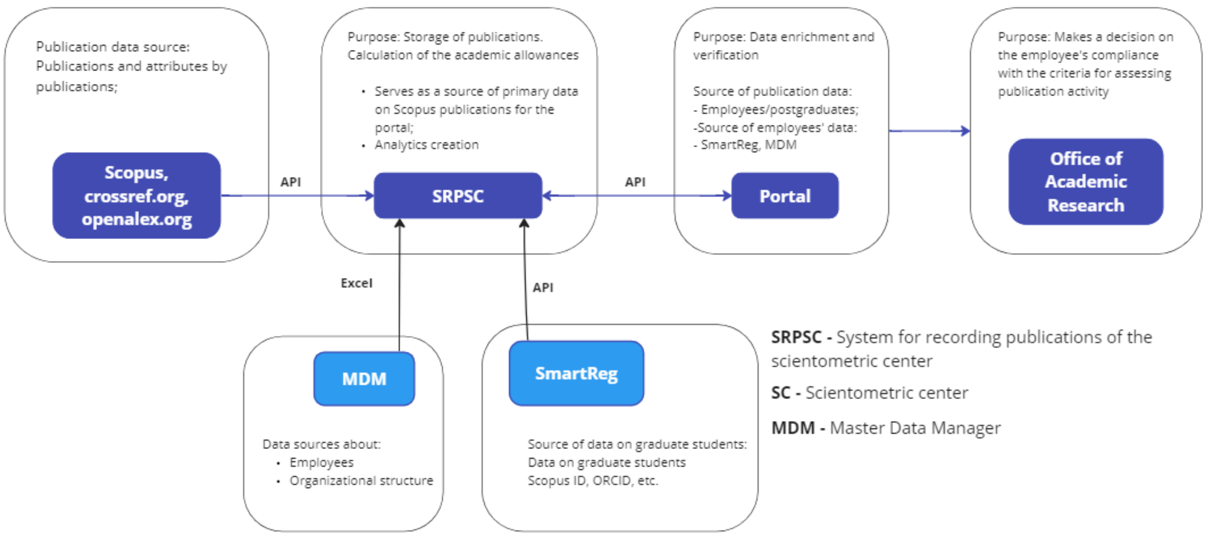

Figure 3 – Data streams AS IS. Source – Made by Author

Table 1 provides an overview of the participants involved in the business process and the respective structural units that take part in the campaign for academic bonuses, along with their specific areas of responsibility. This table offers a comprehensive understanding of the actors and their roles within the campaign, highlighting distribution of responsibilities among various units to ensure the successful implementation of the academic bonus campaign.

Table 1 – Business process participants and the structural units

Actor	**Description**	**Amount**
Scientometric center's Operator	Data Stewart, who monitors the quality of data that comes into the system. and for reference books. Maintains the reference book of scientific papers up to date. Receives publications via API from Scopus, crossref.org, and openalex.org in affiliation with the university. Forms a unified register of publications; synchronizes data on publications from the university's portal.	1
Employee/Postgraduate	An employee or Postgraduate student of the university applying for an academic bonuses.	1
Publication Verification Department (Portal)	Verifies information of the publication activity provided by an employee or a postgraduate student	3

Office of Academic Research	The department of the University responsible for the organization and acceptance of applications and for ensuring the activities of the Commission on Bonuses	2
Coordinator	Has the role of overseeing operations	1
MDM	Master data manager (the system of reference books). Database of employees	-
SmartReg	Database of students and postgraduates	-
Scopus, etc	Unified bibliographic and abstract database of peer-reviewed scientific literature	-
Commission on bonuses	Collegial body making decisions on the appointment of academic bonuses. Makes a decision to suspend the payment of the academic bonuses	1
Portal	An information system (corporate website) consisting of a personal account in which the user uploads his data on publications for their evaluation and accounting for bonuses, as well as a database for storing publications.	-
University committee	The highest authority for assessing the publication activity of employees and postgraduates. Consideration of cases in respect of which the Publication Verification department and the Office of Academic Research could not make a decision, or if the authors do not agree with the decision taken	-

4.2 Process Discovery

As mentioned in the literature review of this thesis, the process discovery phase can be divided into four distinct steps. The first phase of this procedure entails recognizing the start and end events in BPMN that mark the process boundaries. For the studied process, these boundaries are defined as follows - the start is the initiation of the AB campaign, and the end is the accumulation of academic bonuses. Since the company had never undertaken a project of this nature before, it did not have any existing business analysts or BPM experts. Consequently, for this thesis, the author served as the sole business analyst on the team. For process discovery methods, interviews and document analysis were chosen as using both methods encompass advantages of each other. An evidence-based approach such as examining documents, and logs have a high level of objectivity and provide unbiased data on how a process works, while interview-based methods provide rich insights into the process as well as offer the opportunity to have immediate feedback whenever process-related aspects are unclear.

To gather the required information for understanding and modeling the process, several steps were taken, primarily involving document analysis and interviews with the process actors. Chronologically, the initial step was document analysis. This approach was chosen due to various factors, including gaining an initial understanding of how the organization perceived its processes, researching and analyzing the organization's internal documentation storage and distribution practices. By conducting document analysis as the starting point, it became evident in some instances, upon meeting with senior management and process actors, that the documents were somewhat outdated and contradicted one another. They contained obsolete activity descriptions and referred to documents and files that no longer existed.

The interviews primarily involved two specialists from the Publication Verification Department, the Office of Academic Research, and a project manager who was responsible for Portal development. The focus of these interviews was to create the final AS-IS models, requiring a comprehensive understanding and identification of process boundaries, activities, events, resources, handovers, control flows, and any additional elements. When interviewing the upstream strategy was used since it helped us to manage extracting process knowledge from the expert by following the flow with the sequential unfolding of the process. This approach was valuable in comprehending for understanding which decisions are taken at which stage. However, during the interviews, some challenges were faced. As different tasks are assigned to specialized resources it was necessary to conduct interviews with experts from multiple domains. These experts possessed an abstract understanding of the overall process and a detailed understanding of their tasks, making it challenging to reconcile their perspectives. This fragmented process knowledge necessitated multiple iterations in the process discovery phase, involving feedback, approval, and endorsement from the domain experts and the process owner.

Another challenge in process discovery came from the fact that domain experts had low knowledge in business process modeling languages. This distinction between domain experts and process analysts highlights that domain experts struggle to create process models or interpret models created by others or to comprehend the constructs of a modeling language like BPMN. This lack of knowledge complicates the process of seeking feedback on a draft process model. Consequently, it became necessary for the author to explain the content of the process model in detail and translating it into natural language.

Once the process boundaries were defined, the next step involved identifying the different activities, intermediate events, and process gateways in the process flow, along with the responsible resources and their handoffs which was the third step. This information provided the basis for defining pools and lanes and determining the allocation of activities and events to these components. The fourth phase entails the identification of the control flow. The control flow is defined by the handoffs created in the previous step. These handoffs provided identification of order dependencies, decision points, concurrent execution of activities and events, and potential rework and repetition as well as decisions taken outside the process. Finally, in step 5 we enriched the current business process model by additional elements such as data objects, data stores, and their relations to activities, exception flows, or compensation handlers. The final AS-IS business process model is depicted in Figures 2-5.

Syntactic Quality and Verification provided by Bizagi software that can automatically check structural and behavioral syntactic rules of the created process. Structural rules relate to the way the various model elements are connected with each other while behavioral rules relate to the way a process model can be instantiated (Dumas et al., 2018). Semantic Quality and Validation were assessed by domain experts who took part in the interviews during the process discovery. The usability of a process model was also checked by experts during the interviews and workshops.

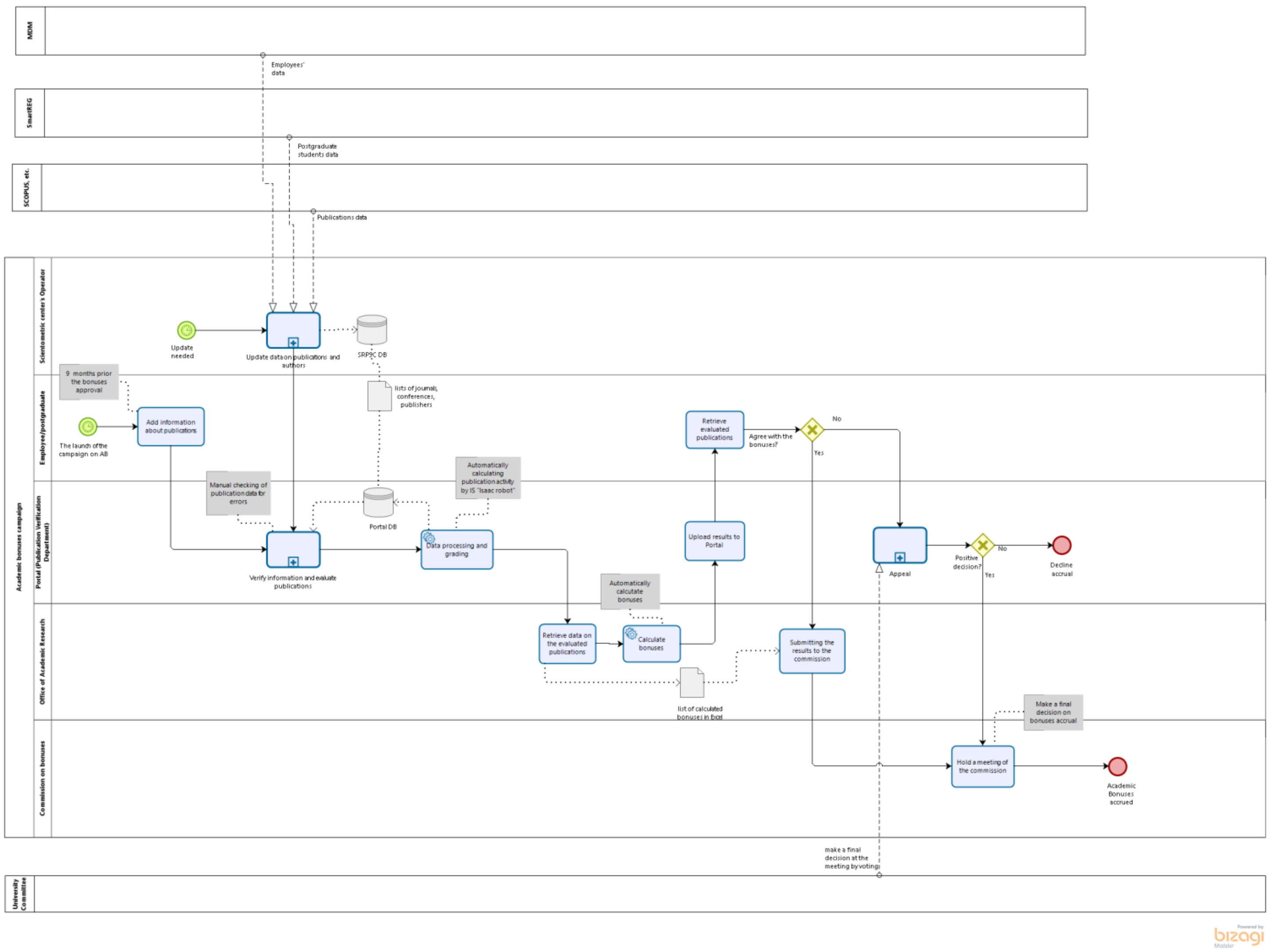

Figure 4 – " Academic bonuses campaign " process model ("As-Is"). Source – Made by Author

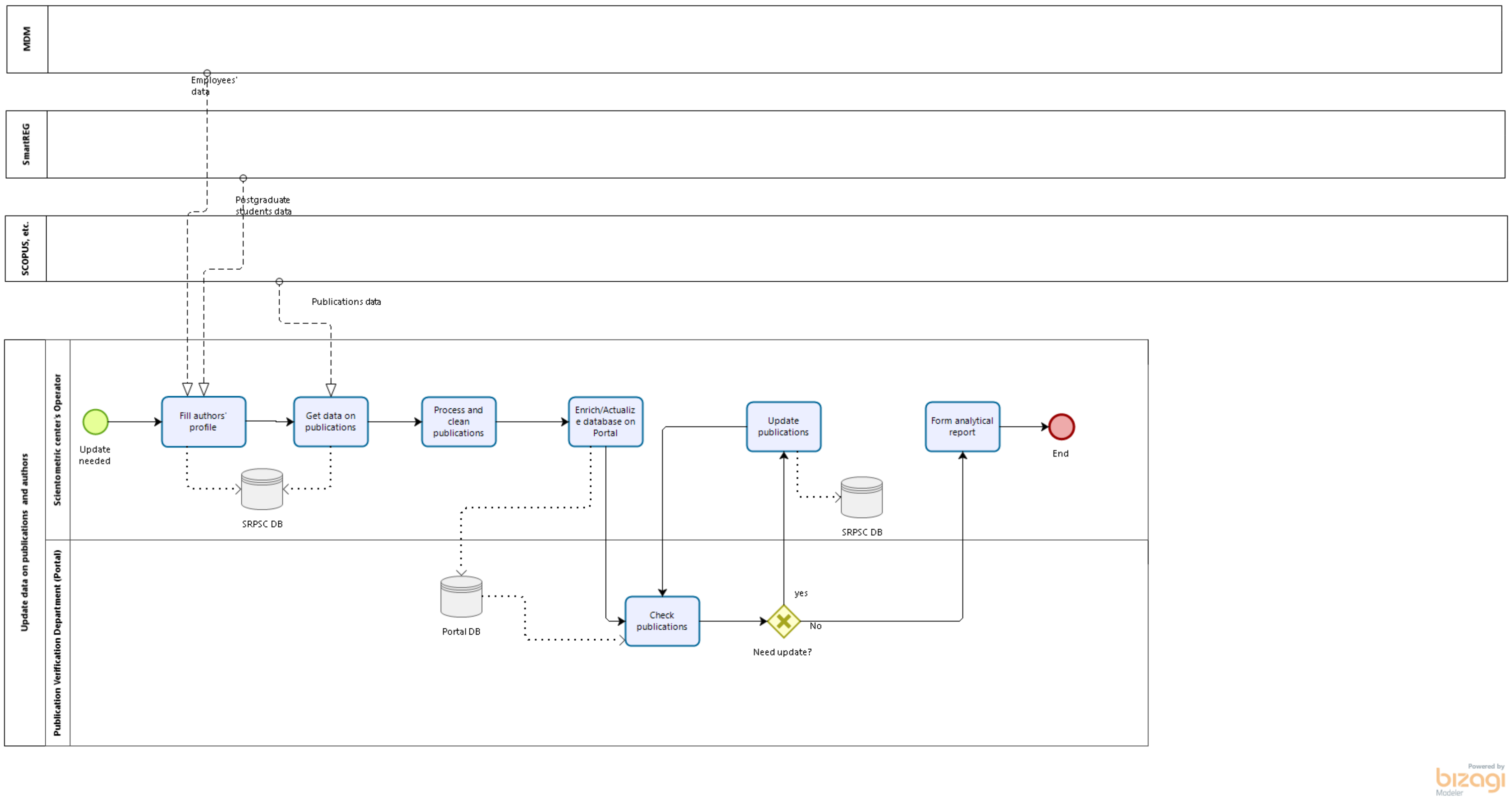

Figure 5 – " Update data on publications and authors" sub-process model ("As-Is"). Source – Made by Author

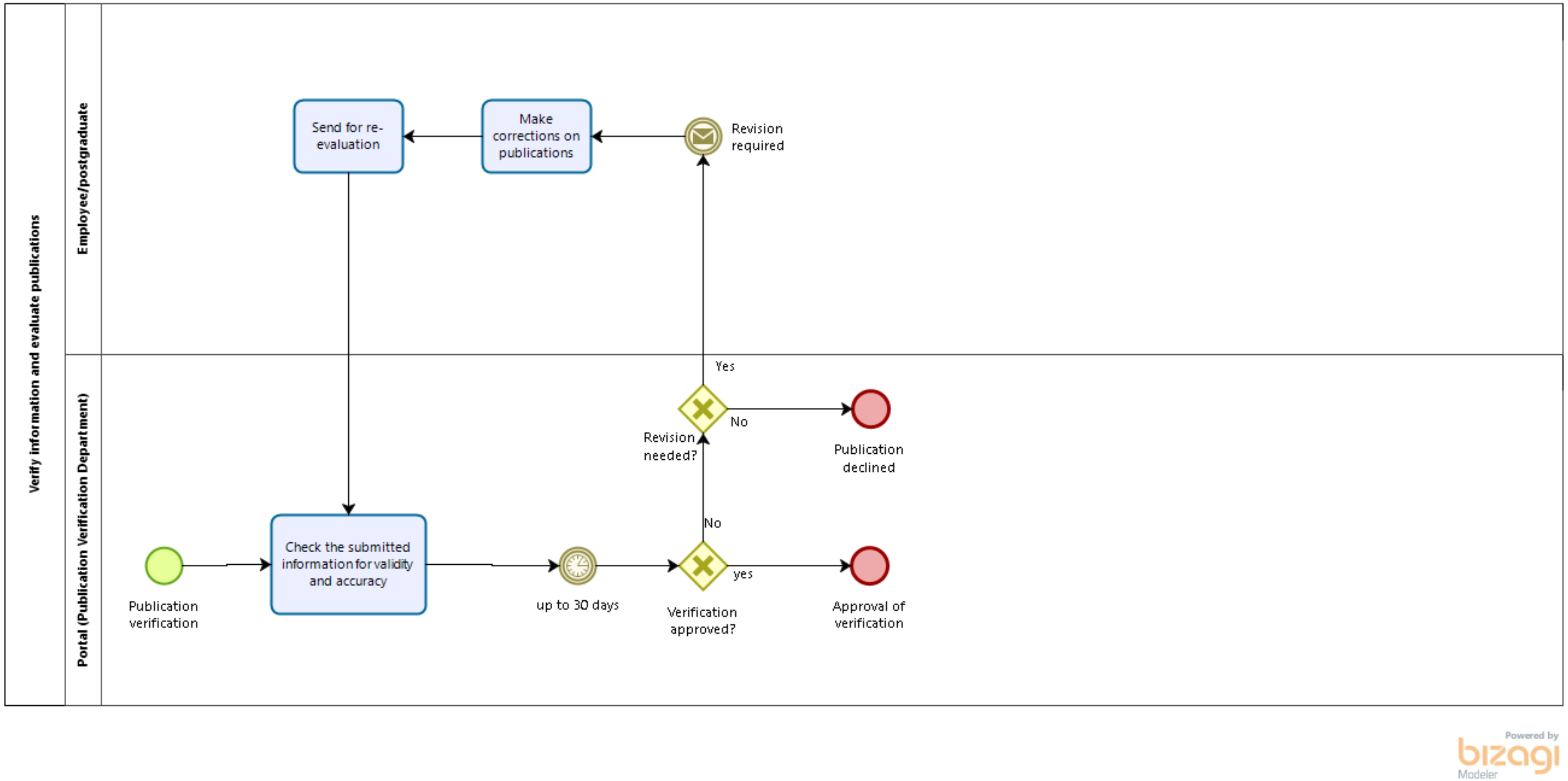

Figure 6 – " Verify information and evaluate publications" sub-process model ("As-Is"). Source – Made by Author

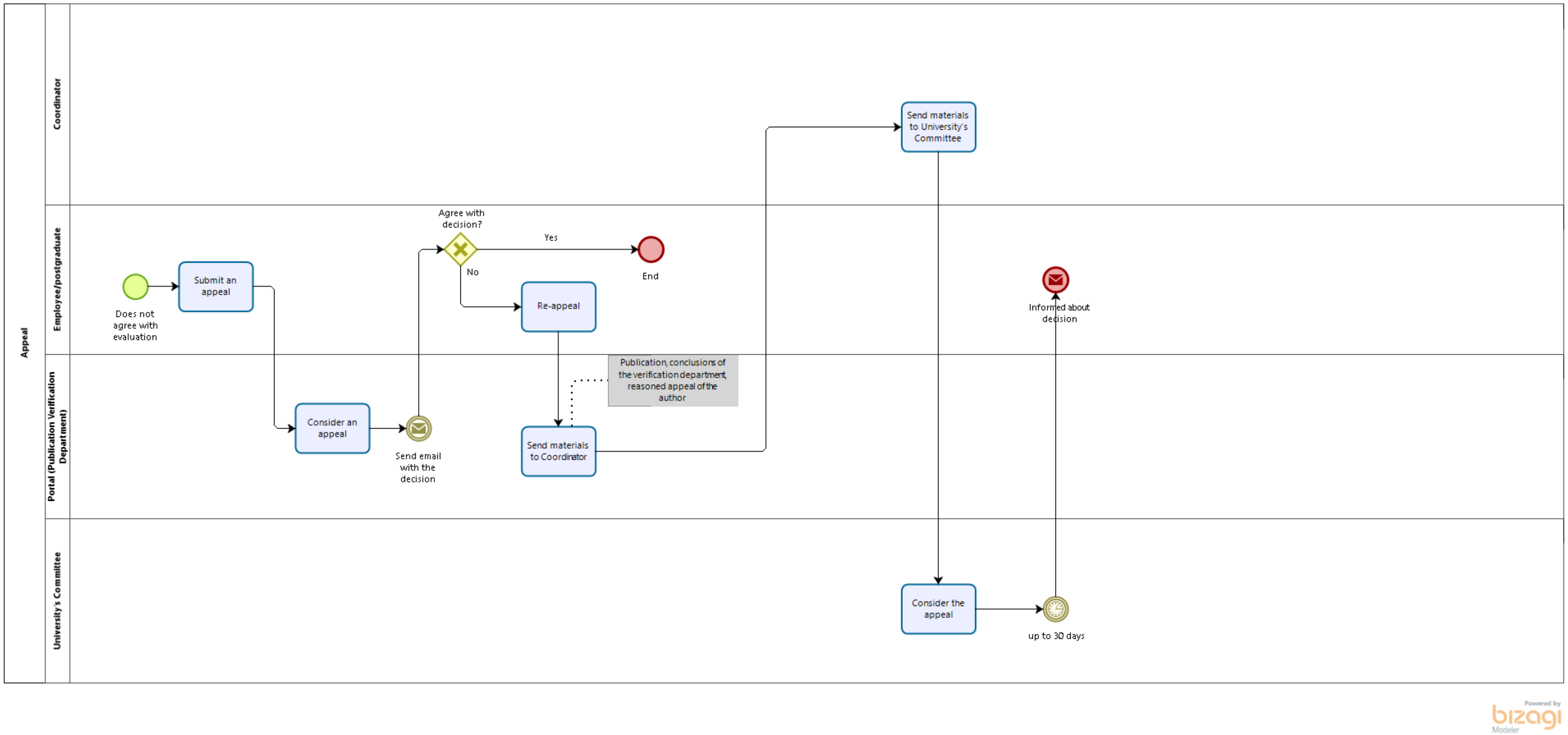

Figure 7 – " Appeal" sub-process model ("As-Is"). Source – Made by Author

4.3 PROCESS ANALYSIS

This chapter provides an overview of the analysis performed on the Academic bonuses accrual process. Initially, qualitative analysis techniques, including Value-added analysis, Waste analysis, Issue register, Cause-effect diagram, and why-why diagram, are employed. Subsequently, the focus shifts to quantitative analysis methods, specifically Simulation.

4.3.1 QUALITATIVE ANALYSIS

The objective of the Qualitative analysis is to categorize each individual process step based on the customer's perception of value addition within the context of the standard process flow. To identify unnecessary stages of the process and sources of waste, two methods were used in this thesis, value-added analysis and waste analysis.

Value-added analysis

To perform value-added analysis it is neccessary to break down each task of the business process into steps, such as a preparation step, an execution step, and a handoff step. After that, each step has to be classified into one of three following categories presented in the Table 2.

Table 2 – Categorization of Business analysis steps

Category	Description
VA	This category refers to steps that generate value or enhance customer satisfaction
BVA	This classification encompasses a step that does not directly add value to the customer, but they are necessary for the business
NVA	This category pertains to a step that does not fall into either of the aforementioned classifications

To identify the relevant steps, the entire business process was navigated through, addressing each task individually, and subsequently assigning classifications of VA, BVA, and NVA. These classifications have been identified and can be found in the Appendix I. The analysis indicates that approximately 36% of the steps are classified as VA, contributing directly to the satisfaction of the campaign's objectives and stakeholders. BVA steps account for about 31% and are deemed necessary for the smooth operation and success of the campaign. The remaining 33% of the steps are classified as NVA, which do not directly contribute to the core objectives but may still be required for supporting activities or compliance purposes.

The Value-Added Analysis conducted on the Academic Bonuses Campaign provides valuable insights into the nature and classification of each step involved in the process. The analysis reveals that a significant portion of the steps can be categorized as VA, which directly contributes to the overall value and satisfaction of the campaign. At the same time certain steps within the qualitative analysis process are categorized as NVA or BVA. These steps do not directly contribute to the overall value and satisfaction of the Academic Bonuses Campaign but are necessary for the smooth functioning and management of the process. Several steps are identified as BVA, which means they are necessary but do not directly add value to the campaign. These steps are included in the Table 2.

Table 3 – Potentially unnecessary steps in Academic Bonuses Campaign model.

Step Number	Title	Justification
2	Update needed	This step is essential for maintaining accuracy and relevance of the data, but it is categorized as BVA as it focuses on updating existing information rather than value creation.
3.2	Get Employees' Data from the Master Data Management (MDM) system	Obtaining employees' data from MDM system is necessary for data integration and completeness, but it falls under BVA category.
3.3	Get Postgraduate students' data from SmartReg	Acquiring postgraduate students' data from SmartReg system is essential for comprehensive analysis, but it is classified as BVA.
3.4	Get data on publications from Scopus and Crosserf.org	Retrieving publication data from external sources is important for obtaining a broader range of publications, but it falls under BVA as it involves data collection.
3.6	Enrich/Actualize database on Portal	Enriching and updating the database on the Portal is necessary for data accuracy and completeness, but it is categorized as BVA as it does not directly contribute to value proposition.
3.9	Check if an update is needed	Assessing the need for updates ensures up-to-date information, but it is classified as BVA as it does not directly contribute to value creation.

3.10	Update publications	Updating publications focuses on maintenance and updates rather than direct value creation, falling under the BVA category.
5.6	Make corrections on publications	Rectifying errors in publications is necessary for accuracy, but it is classified as NVA as it does not involve adding new values.
7	Retrieve data on the evaluated publications	Retrieving data on evaluated publications is necessary for accessing analyzed data, but it falls under NVA as it does not directly contribute to value creation.
9	Upload results to Portal	Uploading evaluated results to the Portal is important for transparency and accessibility, but it is classified as NVA as it primarily involves data transfer.

Automating or eliminating these steps can lead to increased efficiency, reduced human error, and faster processing times. However, it is important to carefully evaluate the feasibility and impact of automation, considering factors such as system compatibility, data security, and stakeholder requirements.

Waste analysis

In the Academic Bonuses Campaign, it is crucial to identify and minimize waste within the process to improve efficiency and optimize resource utilization. Waste analysis is a systematic approach that enables us to identify non-value-adding activities and areas of improvement. This chapter aims to analyze the waste present in the campaign process and propose recommendations for waste reduction and process optimization. The categorization of steps based on the types of waste they generate, including motion waste, waiting waste, and overproduction waste can be found in the Appendix II. Table 4 provides recommendations for waste reduction in the Academic Bonuses Campaign process.

Table 4 – Recommendations for Waste Reduction

Recommendation	**Description**
Automation	Explore the possibility of automating data retrievals, such as employee and publication lists, from relevant systems to eliminate manual effort and waiting time
	Implement automated publication processing and cleaning techniques to minimize over-processing.

	Utilize integrated systems or tools to directly gather data from relevant sources, such as Scopus or Crossref, to minimize manual data entry and reduce errors.
Streamlining Processes	Review revision and appeal processes to identify bottlenecks and streamline them for faster resolution and reduced defects.
	Evaluate the necessity of certain steps, such as manual updates or re-evaluation, and eliminate or optimize them to reduce waste.
Implement real-time verification	Establish a real-time verification system for publications to minimize the need for subsequent revisions or re-evaluations.
	Implement automated checks or validation algorithms to ensure accuracy and validity of submitted information before progressing further in the workflow.
Enhancing Communication	Enhance communication channels between performers, such as the Publication Verification Department, employees, and the Office of Academic Research.
	Improve clarity and efficiency in communication to avoid delays, misinterpretations, and unnecessary waiting in the evaluation process.
Continuous Improvement	Regularly analyze process performance and gather feedback to identify areas of waste and implement continuous improvement initiatives.
	Provide comprehensive training and professional development opportunities to performers involved in the evaluation process to reduce errors and subsequent revisions.
Optimize resource allocation	Evaluate and optimize resource allocation, such as personnel and time, to ensure efficient workflow management.
	Avoid overburdening individuals or departments to prevent inefficiencies, increased waiting time, and potential errors.
Continuously monitor and evaluate performance	Implement a system for ongoing monitoring and evaluation of the academic bonuses campaign.
	Regularly review Key Performance Indicators (KPIs), identify bottlenecks or areas of waste, and take proactive measures to address them.

The waste analysis provides valuable insights into the Academic Bonuses Campaign process, enabling the identification of waste types and areas for improvement. By implementing the recommended measures, including automation, streamlining processes, enhancing communication, and promoting continuous improvement, the campaign can achieve higher efficiency, reduce waste, and optimize the allocation of resources. The elimination of waste contributes to the overall success of the campaign and enhances the satisfaction of participants and stakeholders involved.

Issue Register

This subsection focuses on the identification and analysis of issues within the Academic Bonuses Campaign process. This chapter aims to provide a comprehensive overview of the challenges and problem areas that have been identified during the qualitative analysis of the campaign. The issue register serves as a tool for capturing and documenting these issues, enabling stakeholders to gain a deeper understanding of the existing problems and potential areas for improvement. By examining the issues through the lens of value-added analysis, waste analysis, and other qualitative techniques, this chapter offers valuable insights into the critical issues that need to be addressed to enhance the efficiency, effectiveness, and overall success of the campaign. The Academic Bonuses campaign issue register can be found in the Appendix III.

The Issue Register is crucial for all stakeholders involved in the Academic Bonuses Campaign to collaborate and actively engage in resolving the identified issues. Regular monitoring and updating of the issue register will ensure that the campaign remains responsive to emerging challenges and adaptable to changing circumstances. By addressing these issues head-on and implementing appropriate solutions, we can enhance the overall efficiency, effectiveness, and success of the campaign. Ultimately, the issue register serves as a roadmap for improvement, guiding the campaign toward its goals while minimizing obstacles and maximizing outcomes. Through a concerted effort to tackle the identified issues, we can create a more streamlined and impactful Academic Bonuses Campaign, ensuring that deserving individuals are appropriately recognized and rewarded for their academic achievements.

Cause-effect diagram

A cause-effect diagram, also known as a fishbone diagram or an Ishikawa diagram, is a visual tool used to identify and analyze the potential causes of a specific problem or effect. In the context of the academic bonuses campaign at the University, a cause-effect diagram was created to understand the underlying factors contributing to the identified problem areas in the process of calculating and accruing academic bonuses for university faculty. The cause-effect diagram was developed based on the information gathered from the meetings conducted with the University's management and employees. These discussions helped identify the key problem areas and their potential causes. The cause-effect diagram provided a structured way to visualize the relationships between these causes and the effect, which in this case is the inefficient process of calculating and accruing academic bonuses.

The Ishikawa diagram consists of several main branches representing different categories of causes. These branches are connected to a central line, resembling the skeletal structure of a fish, hence the name fishbone diagram. The main branches identified for the academic bonuses campaign are depicted in the Figure 8 and identified as Process, Data Sources, System and Tools, and Participants.

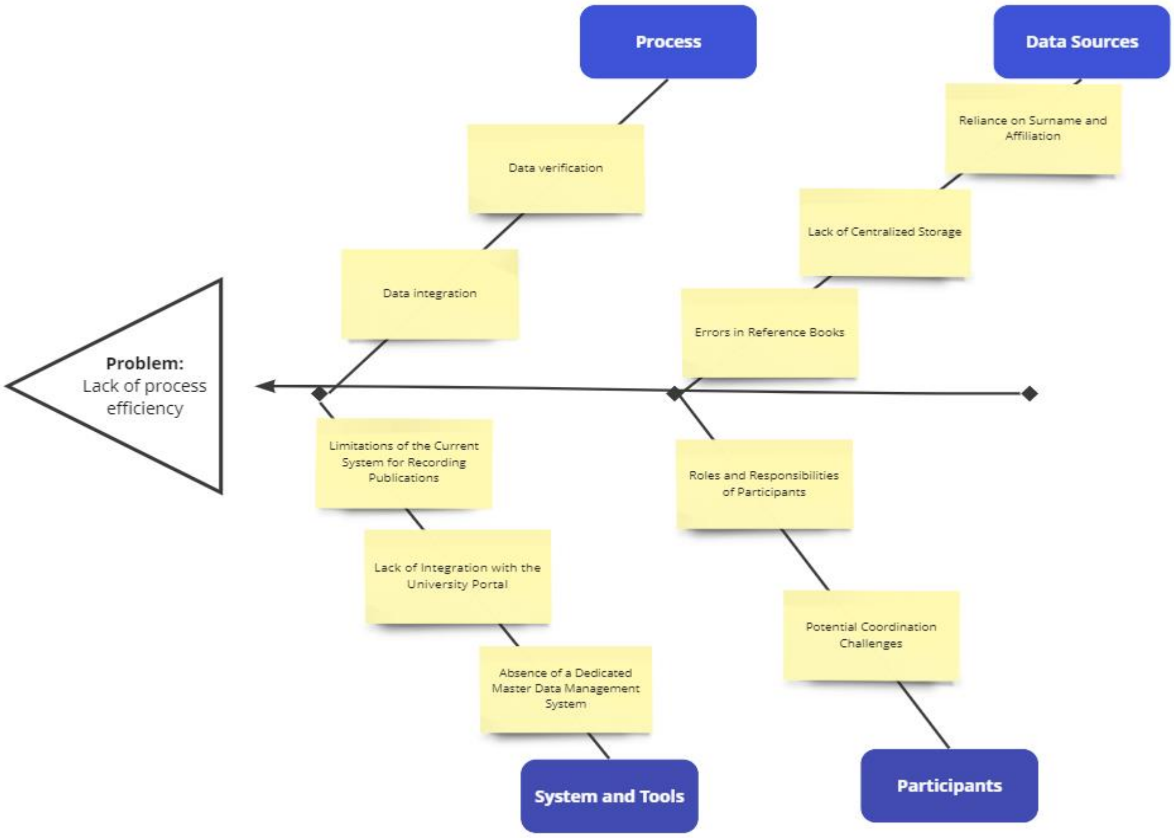

Figure 8 – Cause-effect diagram. Source – Made by the author

The cause-effect diagram allowed for a comprehensive analysis of the potential causes contributing to the identified problem areas. By visualizing the relationships between these causes and the effect, several insights were gained and included in the Table 5.

Table 5 – Causes and Insights in the Academic Bonuses Campaign Process

Cause	Description
Data Verification	Issues related to the verification of data used in the process of calculating and accruing academic bonuses. This may include inconsistencies in data verification methods, lack of standardized procedures, or insufficient resources.
Data Integration	Challenges associated with integrating data from different sources and ensuring its accuracy and completeness. This can be caused by incompatible

	data formats, manual data entry errors, or lack of automated data integration processes.
Reliance on Surname and Affiliation	The reliance on surname and affiliation as key parameters for retrieving publication data from sources like Scopus and WoS. Factors such as name variations, affiliation changes, or errors in the data sources can impact data retrieval.
Lack of Centralized Storage	The absence of a centralized storage system for publication data. This can result from data fragmentation across multiple databases or departments, difficulties in accessing and updating data, or the need for manual data gathering from various sources.
Errors in Reference Books	Potential errors or inconsistencies present in reference books used for data verification. This can be caused by outdated or incomplete reference books, inaccuracies in data extraction, or difficulties in cross-referencing.
Limitations of the Current System for Recording Publications	Limitations or shortcomings of the existing system used for recording publications. This can include outdated software, lack of functionality to handle specific publication types or metadata, or difficulties in retrieving and updating publication records.
Lack of Integration with the University Portal	The lack of integration between the system used for calculating academic bonuses and the university portal. This may result from manual data transfer between systems, inconsistencies in data synchronization, or delays in accessing relevant portal information.
Absence of a Dedicated Master Data Management System	The absence of a dedicated system for managing master data related to publications and academic bonuses. This can stem from scattered data repositories, lack of standardized data definitions, or difficulties in data governance and maintenance.
Roles and Responsibilities of Participants	Issues related to the clarity, definition, and allocation of roles and responsibilities among participants involved in the process. This can be caused by overlapping responsibilities, lack of role clarity, or inadequate communication and coordination.
Potential Coordination Challenges	Challenges related to coordinating activities among multiple participants involved in the process. This may include bottlenecks in decision-making, lack of effective communication channels, or limited collaboration and information sharing.

Based on the insights gained from the cause-effect diagram analysis, the next steps would involve developing strategies and action plans to address the identified causes. These could include:

1) Implement standardized procedures and guidelines for data verification to ensure consistency and accuracy. This may involve creating a checklist for verifying data, implementing automated verification tools, or establishing a designated team responsible for data verification.
2) Establish a Centralized Data Storage System for publication data that integrates information from various sources. This could involve implementing a database or a digital repository where all relevant data can be stored, accessed, and updated easily. Ensure proper data governance and security measures are in place.
3) Explore alternative methods for retrieving publication data, such as leveraging unique identifiers (e.g., ORCID) or implementing APIs to directly fetch information from Scopus and WoS. This can help improve data accuracy and minimize errors caused by reliance on surname and affiliation.
4) Upgrade Publication Recording System to a more robust and efficient solution. This could involve implementing a dedicated publication management system that supports a wide range of publication types, allows for easy data entry and retrieval, and integrates with other relevant systems.
5) Collaborate with the university's IT department to establish seamless integration between the system used for calculating academic bonuses and the university portal. This integration should enable real-time data synchronization, eliminating the need for manual data transfers and ensuring accurate and up-to-date information for bonus calculations.
6) Provide training sessions and workshops for all participants involved in the process. These sessions should focus on the newly implemented strategies, tools, and systems, ensuring that everyone understands their roles and responsibilities. Foster effective communication channels and encourage collaboration among participants to address coordination challenges.
7) Establish a feedback mechanism to monitor the effectiveness of the implemented changes and gather suggestions for further improvement. Regularly review the process, gather data on KPIs, and use this information to identify areas for refinement and enhancement.

By implementing the steps proposed above, the academic bonus calculation process can become more streamlined, efficient, and accurate. It will help address the identified causes and improve the overall effectiveness of the process, leading to fair and reliable outcomes for the academic community.

Why-why diagram

While performing the analysis of the Academic bonuses accrual process, it is important to understand the root causes of the identified issues. To investigate the underlying reasons behind the problems faced in the process of calculating and accruing academic bonuses for university faculty, a technique called "Why-Why Diagrams" was employed. Why-Why Diagrams, also known as the "5 Whys" technique, is a problem-solving tool that helps identify the underlying causes of an issue by repeatedly asking "Why?" to uncover the root cause. By asking "Why?" multiple times, the aim is to dig deeper into the problem and explore the connections between various factors contributing to the issue. In the case of the Academic bonuses accrual process, Why-Why Diagrams were employed to understand the reasons behind the challenges faced in data verification, data storage, and integration with the university's portal.

The Why-Why Diagrams revealed several root causes for the challenges in the Academic bonuses accrual process. The following steps were followed to create the Why-Why Diagram:

1) Define the problem: The initial problem statement was identified as the challenges in calculating and accruing academic bonuses for university faculty.
2) Ask "Why?" and record the first-level causes: The first "Why?" question was asked to uncover the immediate causes contributing to the problem. For example, "Why is data verification difficult?" The first-level causes, such as reliance on surname and affiliation verification and lack of centralized storage, were recorded.
3) Repeat the process: For each first-level cause identified, subsequent "Why?" questions were asked to further explore the underlying factors. The process was repeated iteratively until reaching a point where the root causes were uncovered.
4) Analyze the connections: Once the Why-Why Diagram was completed, the connections between the various causes were analyzed to identify patterns and dependencies. This analysis helped in understanding the complex interactions leading to the challenges in the process.

The key findings are represented in the Figure 9 below:

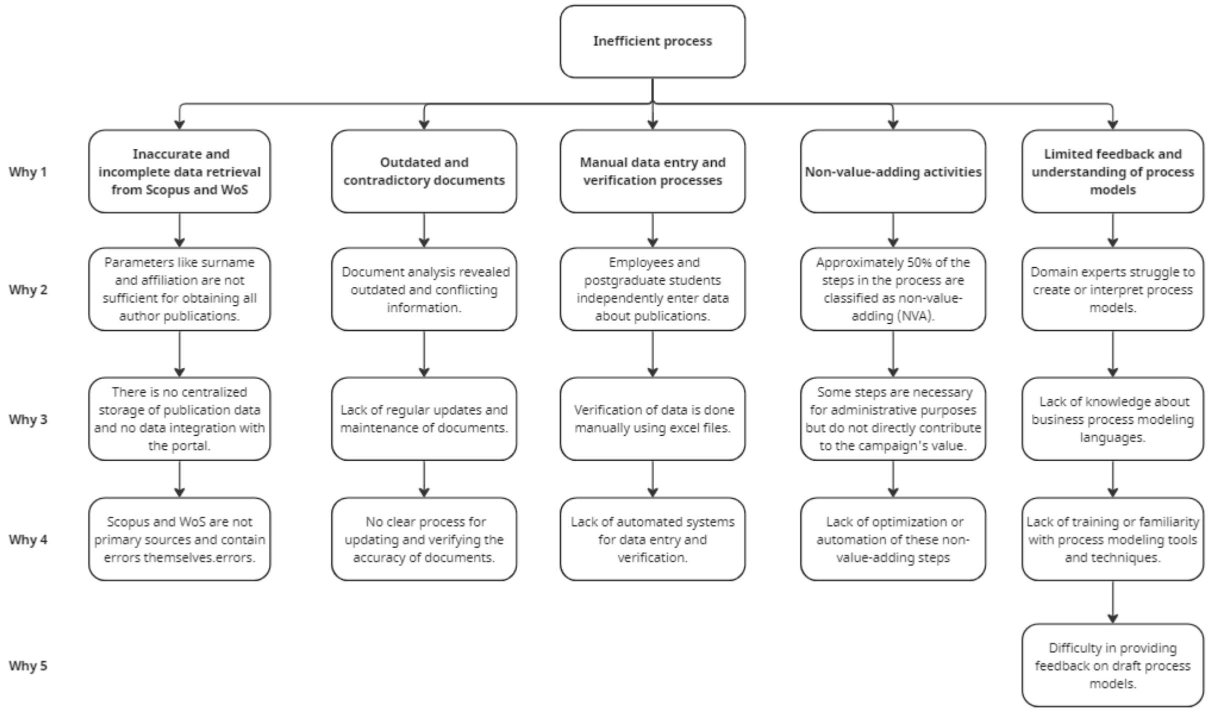

Figure 9 – Why-why diagram. Source – Made by the author

By uncovering these root causes, the Why-Why Diagrams provided valuable insights into the factors contributing to the challenges and can be used to make informed decisions, develop effective solutions, and drive continuous improvement.

4.3.2 Quantitative Analysis

This chapter aims to provide a deeper understanding of the Academic Bonuses Accrual process by applying rigorous mathematical and statistical techniques. This chapter focuses on analyzing quantitative data derived from simulations and measurements to gain insights into the process performance, identify bottlenecks, and explore opportunities for improvement. Quantitative analysis plays a crucial role in process optimization and decision-making, enabling organizations to make data-driven decisions to enhance efficiency, reduce costs, and improve overall productivity. By analyzing the quantitative metrics and performance indicators of the Academic Bonuses Accrual process, it can be possible to uncover hidden patterns, measure process effectiveness, and evaluate the impact of various factors on the process outcomes. In this chapter, the focus will be on the key process metrics, such as instances completed, instances started, minimum and maximum times, average time, and total time. These metrics will provide an overview of the process performance and assist in gaining an understanding of the overall efficiency and effectiveness of the process. Furthermore, task-specific metrics, including minimum and maximum task times, average task times, and waiting times for resources, will be explored. These metrics will enable the identification of specific tasks that may be causing delays or resource constraints, allowing for targeted improvements in those areas. Process simulation techniques using Bizagi Modeler software will be applied in the subsequent sections of this chapter.

In the analysis of the Academic Bonuses Accrual process, various assumptions have been considered. These assumptions cover different aspects of the process, including time assumptions and gateway assumptions. They have been developed based on a comprehensive understanding of the process, consultations with domain experts, and empirical observations. The full list of assumptions can be found in the Appendix IV of this thesis.

4.3.2.1 Simulation

Simulation provides a simulated environment where the Academic Bonuses Accrual process can be modeled and executed, mimicking the real-world interactions and dependencies among tasks, resources, and decision points. The decision to employ simulation in the quantitative analysis of the Academic Bonuses Accrual process is rooted in its capability to capture the intricacies and uncertainties inherent in real-world processes. Running multiple simulations and aggregating the results allows for the derivation of statistical measures and insights that contribute to process optimization and decision-making. In the following sections, the outcomes of the simulation analysis, accompanied by a detailed interpretation of the results, are presented. To simplify the model and focus on key activities, certain steps were removed from the model. The simplified schema (Figure 10) aimed to capture the essential flow of the campaign process while excluding some specific activities.

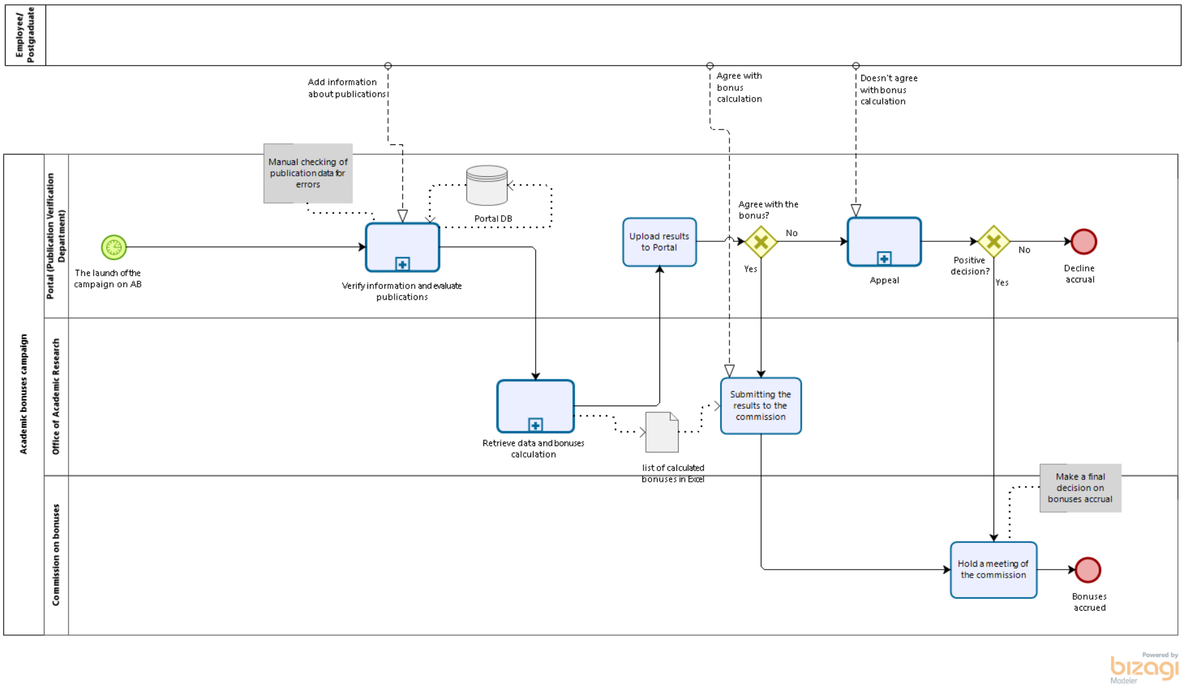

Figure 10 – High-level simulation model. Source – Made by the author

The simulation for the Academic Bonuses Campaign involved four distinct steps. Initially, the validation process was conducted. This included determining the maximum number of instances created, which was set to 900 for this specific simulation and equal the average number of applicants for bonus accrual. Additionally, probabilities were assigned to each exclusive gateway based on flow analysis data. For instance, the probability of a task being categorized as "Submitting the results to the commission" was set at 95%, while the likelihood of "Appeal" was determined to be 5%. The simulation also considered a 5% probability of the "Decline accrual", which is relatively low due to the "Hold a meeting of the commission" activity. The second step involved assigning processing times to each activity within the simulation. Most activities were assigned a truncated normal distribution, with a minimum value of 5 minutes. The start event in the simulation incorporated an inter-arrival time, which was set at one arrival every one minute. The third step involved defining and allocating the available resources to the respective activities that required them. The resources for the campaign consisted of three publication Verification Department (Portal) specialists, two specialists from the Office of Academic Research, and one specialist from the Commission of Bonuses. Each activity was assigned a specific resource. Finally, in the last step of the simulation, the working schedule was defined through the implementation of calendars. The working hours were established as follows: start time at 9 am with the duration of four hours. These calendars were incorporated to align the simulation with the actual working hours of the company involved in the Academic Bonuses Campaign.

By combining the knowledge gained from simulation with the underlying assumptions and the context of the Academic Bonuses Accrual process, the aim was to offer meaningful recommendations and insights that can drive process improvements and enhance overall efficiency. Below are two Figures (Figure 11, Figure 12) presenting the outcome of the simulation.

Scenario information

Name	AS-IS Scenario
Time unit	Minutes
Duration	030,00:00:00

Resource	Utilization	Total fixed cost	Total unit cost	Total cost
Publication Verification Department (Portal)	34,00 %	0	3 263,73	3 263,73
Office of Academic Research	35,90 %	0	2 843,06	2 843,06
Commission on bonuses	59,25 %	0	2 986,27	2 986,27
	Total	0	9 093,06	9 093,06

Figure 11 – Resource utilization. Source – Made by the author

Academic bonuses campaign

Name	Type	Instances completed	Instances started	Min. time	Max. time	Avg. time	Total time	Min. time waiting resource	Max. time waiting resource
Academic bonuses campaign	Process	900	900	5h 56m 20s	23d 8h 31m 33s	14d 21h 47m 49s	13417d 9h 27m 30s		
Upload results to Portal	Task	900	900	4m 53s	6d 9h 44m 43s	3d 17h 12m 34s	3345d 8h 41m 35s	0	6d 9h 39m 6s
ExclusiveGateway	Gateway	900	900						
Hold a meeting of the commission	Task	899	899	14m 34s	14d 17h 40m 55s	7d 11h 14m 17s	6713d 23h 6m 3s	0	14d 17h 22m 13s
Bonuses accrued	End event	899							
Submitting the results to the commission	Task	859	859	3m 36s	9h 25m 46s	4h 20m 45s	155d 13h 11m 21s	0	9h 20m 40s
Positive decision?	Gateway	41	41						
Decline accrual	End event	1							
The launch of the campaign on AB	Start event	900							
Verify information and evaluate publications	Task	900	900	25m 49s	6d 12h 15m 3s	3d 5h 58m 5s	2923d 19h 21m 49s	0	6d 11h 48m 54s
Appeal	Task	41	41	2d 59m 45s	12d 35m 58s	6d 11h 20m 51s	265d 9h 15m 15s	1d 22h 23m 2s	11d 21h 51m 24s
Retrieve data and bonuses calculation	Task	900	900	3m 34s	1d 14h 9m 54s	21m 19s	13d 7h 51m 25s	0	1d 14h 5m 20s

Figure 12 – Academic bonuses campaign simulation. Source – Made by the author

The simulation results reveal important insights into the process performance, resource utilization, and waiting times. It is observed that the Publication Verification Department (Portal) resource has a utilization rate of 34%, indicating moderate utilization. The Office of Academic Research resource has a utilization rate of 35,9%, while the Commission on Bonuses resource exhibits higher utilization at 59,25%. The simulation demonstrates the completion of various instances within the academic bonuses campaign. The number of instances completed and started for each task varies, indicating the progress and execution of different stages within the campaign. The time metrics provide a comprehensive view of the time taken for each task. The minimum, maximum, and average times offer insights into the duration of individual processes, allowing for performance evaluation and identification of potential bottlenecks. The tasks within the "Academic bonuses campaign" process exhibit varying durations. Tasks such as "Verify information and evaluate publications" and “Appeal” have relatively longer durations, with average times of approximately three and six days accordingly. On the other hand, tasks like "Retrieve data and bonuses calculation" have much shorter durations, with an average time of approximately 20 minutes. The average waiting time for resources varies across the different tasks. For example, the "Hold a meeting of the commission" task has an average waiting time for resources of approximately seven days, indicating potential delays in accessing required resources. This is due to the fact that the meeting of the commission takes place after all bonuses have been calculated. In contrast, tasks like "Upload results to Portal" and "Submitting the results to the commission" have shorter average waiting times for resources, indicating smoother resource allocation.

The simulation results provide the opportunity for conducting what-if analyses to explore hypothetical scenarios and assess their impact on process outcomes. By manipulating process parameters, such as resource capacity or task sequencing, the effects on completion time, waiting times, and resource utilization can be evaluated. This analysis enables the identification of potential process improvements and supports informed decision-making to enhance performance. Subsequent sections will delve into the what-if analysis and its implications in more detail.

4.3.2.2 What-if analysis

The What-if analysis for the Academic Bonuses Campaign was conducted to explore hypothetical scenarios and evaluate their impact on process outcomes. By manipulating various factors and observing their effects on performance metrics, insights were gained into the campaign's sensitivity to different variables, facilitating informed decisions regarding process improvements. By leveraging this analysis, resource allocation was enhanced, processes were streamlined, adaptability to changing circumstances was improved, and overall campaign efficiency and effectiveness were optimized.

Scenario 1. Elimination of "Submitting the Results to the Commission" Activity.

This activity typically involves compiling and submitting the final results of the accrual process to the commission responsible for approving and awarding academic bonuses. By exploring the impact of removing this activity, we can evaluate the potential benefits and challenges associated with this change. To analyze the impact of this scenario, the "Submitting the Results to the Commission" activity was removed from the model. This should involve automating the result dissemination or integrating it into a Portal accessible to Commission on Bonuses' employees.

The what-if analysis results indicate the following changes when eliminating the "Submitting the Results to the Commission" activity. The utilization of Office of Academic Research resource decreases from 35.26% in AS-IS Scenario to 31.66% in the What if - Scenario 1. Consequently, the total cost decreases from 2792 EUR in AS-IS Scenario to 2507 EUR in What if - Scenario 1. The utilization of the Commission on Bonuses resource slightly increases from 58.57% in the AS-IS Scenario to 60.24% in What if - Scenario 1. This increase indicates a slightly higher workload for the commission, resulting in a higher total cost of 3035 EUR compared to 2951 EUR in the original scenario. With the elimination of this activity in What If - Scenario 1, the average time for this task reduces to 0.35 minutes compared to 273.58 minutes in the original scenario. Based on these results, the elimination of the "Submitting the Results to the Commission" activity leads to reduced resource utilization for the Office of Academic Research and slightly increased utilization for the Commission on Bonuses. It also significantly reduces the time required for the submission task. However, it has a minor impact on the Publication Verification Department (Portal) with a slightly increased utilization.

Scenario 2. Automation of "Retrieve Data and Bonuses Calculation" Activity.

In the context of the Academic Bonuses Accrual process, an intriguing scenario to explore is the automation of the "Retrieve Data and Bonuses Calculation" activity. This activity involves gathering relevant data, such as academic publications and bonus calculation parameters. By considering the potential impact of automating this activity, we can assess the advantages and challenges associated with this transformation. To analyze this scenario, the simulation model was modified by incorporating automated data retrieval mechanisms and implementing algorithms or software applications capable of performing the bonuses calculation. This would eliminate the need for manual data collection and calculation, streamlining the process and potentially reducing errors or inconsistencies. The what-if simulation results indicate the following changes when automating the "Retrieve Data and Bonuses Calculation" activity. The utilization of Office of Academic Research resource decreases from 35.26% in the AS-IS Scenario to 25.77% in What if - Scenario 2. Consequently, the total cost decreases from 2792 EUR in the AS-IS Scenario to 2040 EUR in What if - Scenario 2. Retrieve data and bonuses calculation: Automating this activity significantly reduces the average time required for data retrieval and calculation. In the AS-IS Scenario, the average time is 23.12 minutes, while in What if - Scenario 2, it reduces to 0.08 minutes. This what-if simulation demonstrates that automating the "Retrieve Data and Bonuses Calculation" activity can lead to improved efficiency, reduced time requirements, and potential cost savings.

In conclusion, the what-if analysis has provided valuable insights into the potential impacts of different scenarios on the Academic Bonuses Accrual process. It has helped identify areas for improvement, such as resource allocation, process optimization, and automation. By considering these findings, decision-makers can make informed choices to enhance the efficiency, effectiveness, and cost-effectiveness of the process. However, it is important to note that the results of the what-if analysis are based on the assumptions and limitations of the simulation model. Real-world implementation of the proposed changes may require further evaluation, testing, and fine-tuning. Therefore, it is recommended to conduct a comprehensive feasibility study and involve relevant stakeholders before implementing any process modifications.

4.4 Process Redesign

This chapter focuses on the process redesign of the Academic Bonuses Accrual process. The purpose of this chapter is to explore the practical application of heuristic process redesign methods to address the identified challenges and improve the performance of the process. The chapter begins by providing an overview of the Academic Bonuses Accrual process and the need for process redesign. It then justifies the use of a heuristic approach and outlines the structure of the chapter. In the context of the Academic Bonuses Accrual process, a heuristic approach is deemed appropriate due to the complex and dynamic nature of the process. Heuristics offer practical guidelines and principles that assist in problem-solving and decision-making, enabling organizations to navigate through complexities and make informed choices. By employing heuristics, we can identify and implement solutions that address specific pain points within the Academic Bonuses Accrual process.

Heuristic approach

The decision to utilize a heuristic approach for the process redesign of the Academic Bonuses Accrual campaign is justified by its practicality and adaptability. The campaign process involves numerous variables and intricate interactions, making it challenging to apply traditional deterministic approaches. The heuristic approach allows for a flexible and iterative process redesign, accommodating the complexities and uncertainties inherent in the campaign. Moreover, the heuristic approach promotes stakeholder involvement and collaboration, enabling a more holistic understanding of the campaign process and its pain points. By leveraging the collective expertise and insights of stakeholders, the heuristic approach fosters ownership and enhances the likelihood of successful process redesign.

The heuristic process redesign method comprises three key stages: Initiate, Design, and Evaluate. Each stage plays a crucial role in understanding the existing campaign process, designing improvements, and evaluating the effectiveness of the proposed redesign. During the Initiate stage, a comprehensive analysis of the current Academic Bonuses Accrual campaign process is conducted. This involves mapping out the workflow, identifying bottlenecks, and gathering feedback from key stakeholders. By analyzing the existing process, pain points and areas for improvement are identified, providing a solid foundation for subsequent redesign efforts. The Design stage focuses on developing innovative solutions to address the identified pain points and improve the campaign process. This involves brainstorming sessions, workshops, and collaborative discussions with stakeholders to generate ideas and design interventions. The solutions can include changes to roles and responsibilities, information flow, decision-making mechanisms, and technology utilization. The Design stage aims to create a redesigned process that is more efficient, effective, and aligned with the campaign's objectives. The Evaluate stage assesses the effectiveness of the redesigned process through pilot projects and simulations. By implementing the proposed improvements on a small scale, organizations can gather feedback, measure performance, and identify any unforeseen issues. The evaluation provides insights into the viability and impact of the process redesign, allowing for adjustments and refinements before full-scale implementation. Based on the analysis of the existing Academic Bonuses Accrual campaign process and the insights gained from the heuristic approach and performance dimensions of the Devil's Quadrangle, it was proposed heuristic-based “To-Be” scenarios for process improvement.

Scenario 1. Time - Parallelism and Case-based Work

In this To-Be scenario, the focus is on reducing the overall processing time of the Academic Bonuses Accrual campaign through the implementation of parallelism and case-based work. Parallelism involves identifying activities that can be executed simultaneously or in parallel, rather than sequentially. Through the utilization of technology, tasks such as “Fill authors’ profile” (Step 3.1), “Get Data on publications” (Step 3.4), can be performed concurrently, significantly reducing processing time. Through implementation of an information system the activities such as “Check the submitted information for validity and accuracy” (Step 5.2), “Fill authors’ profile” (Step 3.1), “Get Data on publications” (Step 3.4), “Submitting the results to the commission” (Step 12) can be automated. Additionally, clear guidelines and prioritization criteria are established to enable the efficient allocation of resources to more complex or urgent bonus allocation cases, ensuring timely processing. The expected outcome of this scenario is a 30% reduction in the overall processing time of the campaign, enabling faster bonus allocation and distribution, thereby enhancing employee satisfaction and motivation.

Scenario 2: Cost - Activity Elimination and Empowerment

To address cost-related challenges in the Academic Bonuses Accrual campaign, the implementation of activity elimination and empowerment strategies is proposed. Activity elimination involves identifying and eliminating non-value-added tasks and activities within the campaign process. Through process analysis and stakeholder feedback, redundant or unnecessary activities are identified and the workflow is streamlined accordingly. By reducing resource utilization and eliminating wasteful activities, cost savings can be achieved. After a thorough analysis of the campaign process, the following NVA activities have been identified for potential elimination:

- Retrieve data on the evaluated publications (Step 7);
- Upload results to Portal (Step 9);
- Retrieve evaluated publications (Step 10);
- Send materials to Coordinator (Step 13.7);
- Send materials to University's Committee (Step 13.8).

The expected outcome of this scenario is a cost reduction of up to 20%. By optimizing resource utilization and eliminating non-value-added activities, resources can be allocated more efficiently, allowing cost savings to be allocated to other critical areas.

Quality – Empowerment, Triage, and Databases combining

To enhance the quality of the Academic Bonuses Accrual campaign process, the implementation of empowerment and triage strategies is proposed. Empowerment, in the context of quality improvement, involves empowering stakeholders to take ownership of the accuracy and completeness of the data and information they handle throughout the campaign process. By fostering a culture of responsibility and accountability, individuals are motivated to ensure the integrity of the information they provide and verify. This empowers them to identify and address any discrepancies or errors, leading to improved data accuracy and quality. Triage refers to the implementation of quality control mechanisms within the campaign process. This includes establishing checkpoints, conducting random audits, and implementing validation processes to ensure the accuracy and validity of bonus allocations.

Additional recommendation is to combine the SRPSC Database and the Portal Database into a single unified database. This consolidation would eliminate the need for separate databases and streamline the data management process. By integrating the data from both databases into one central repository, it would improve data accessibility, eliminate potential inconsistencies or duplication, and enhance overall data integrity. Combining the databases would simplify the process of retrieving and updating information, reducing the time and effort required for data synchronization. It would also eliminate the need for manual data transfers between databases, minimizing the risk of errors or data loss. Additionally, a unified database would provide a more comprehensive view of the academic bonuses accrual process, facilitating better analysis, reporting, and decision-making.

Figures 13-16 illustrate the To-Be models, which incorporate the recommended process enhancements and modifications. The model streamlines the sequence of tasks, introduces parallel processing where applicable, and eliminates non-value-adding activities. By implementing these recommendations, the redesigned Academic Bonuses Accrual campaign process can further improve its efficiency, effectiveness, and overall performance.

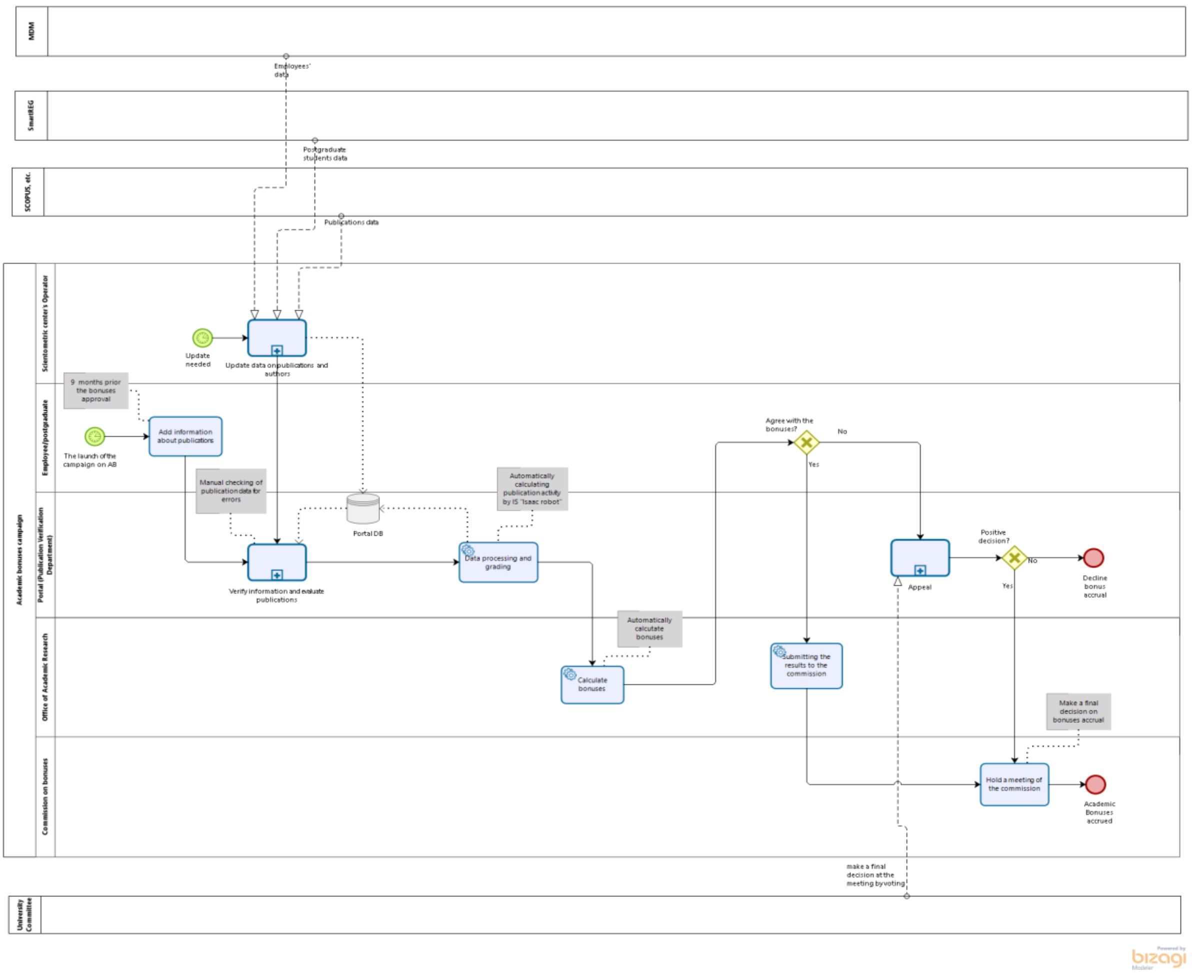

Figure 13 – " Academic bonuses campaign " process model ("To-Be"). Source – Made by Author

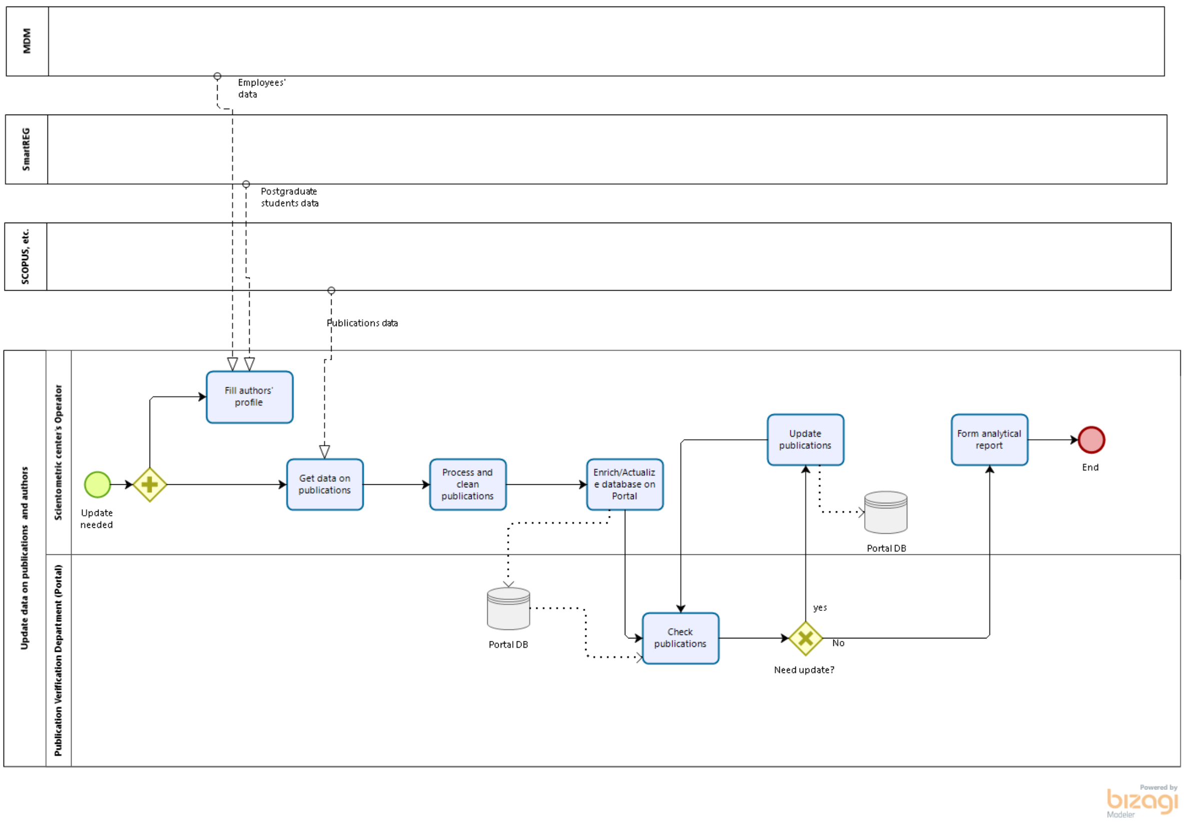

Figure 14 – " Update data on publications and authors" sub-process model ("To-Be"). Source – Made by Author

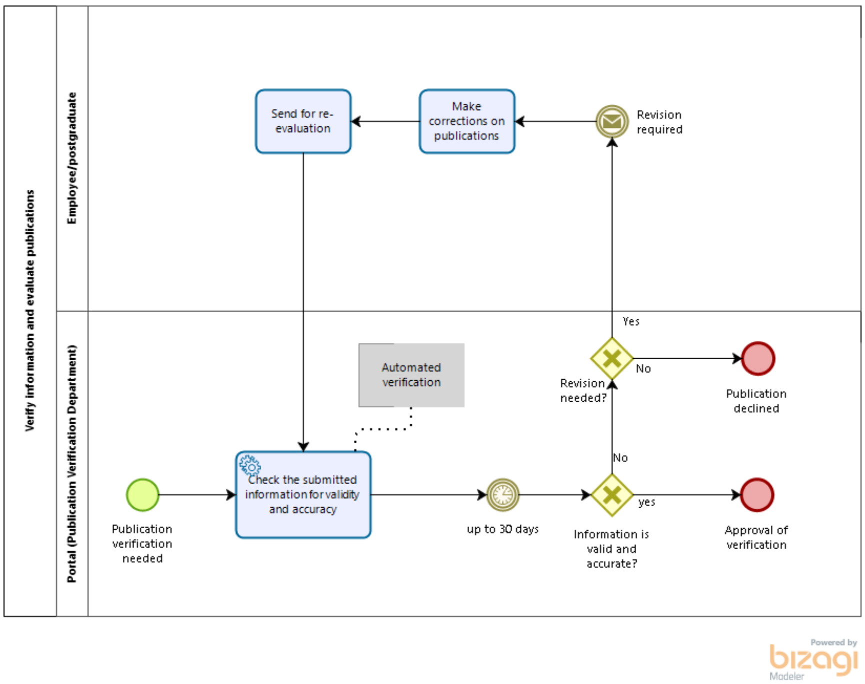

Figure 15 – " Verify information and evaluate publications" sub-process model ("To-Be"). Source – Made by Author

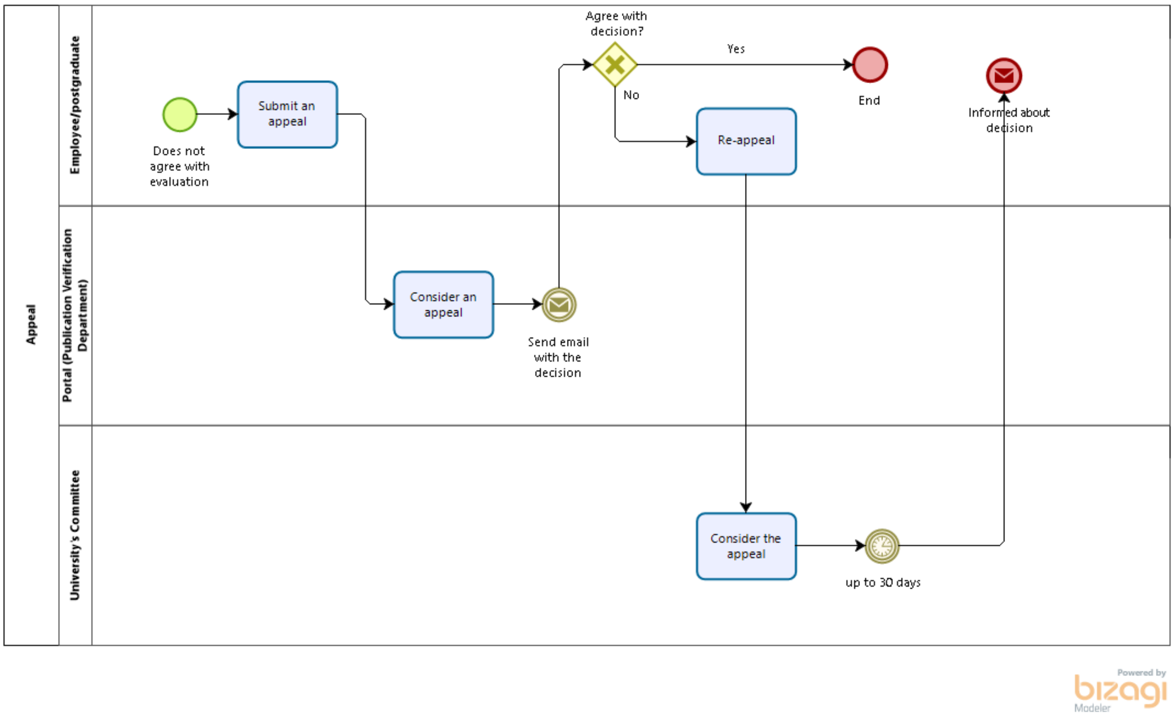

Figure 16 – " Appeal" sub-process model ("To-Be"). Source – Made by Author

4.5 Business Implications

The analysis conducted in previous chapters has identified areas for improvement and potential solutions to enhance the efficiency, effectiveness, and overall performance of the process. This chapter aims to highlight the practical benefits and implications of implementing these changes, taking into account the perspectives of key stakeholders, cost implications, and the impact on organizational outcomes.

One of the crucial aspects of process redesign is considering he cost implications of implementing the proposed changes. While improving efficiency and effectiveness is desirable, it is essential to assess the financial impact and determine if the benefits outweigh the costs. The redesigned process should aim to optimize resource utilization, reduce waste, and minimize unnecessary expenditures. The elimination of non-value-added activities identified in the Academic Bonuses Accrual campaign will result in cost savings. By eliminating redundant tasks, streamlining workflows, and reducing manual interventions, the process can operate with greater efficiency and productivity. This can lead to reduced labor costs, as employees and stakeholders can allocate their time and efforts more effectively. Additionally, automation and integration of systems can contribute to cost savings by minimizing the need for manual data transfer and reducing the risk of errors.

However, it is important to note that the implementation of the redesigned process may require initial investments in technology infrastructure, software systems, and training. These costs should be carefully evaluated and compared with the expected long-term benefits and cost savings. A comprehensive cost-benefit analysis should be conducted to ensure that the financial implications of the process redesign are justified and aligned with the organization's strategic goals.

The redesigned process for the Academic Bonuses Accrual campaign can contribute to several positive outcomes for the organization. Firstly, it will lead to improved accuracy and reliability of bonus calculations, by implementing standardized procedures, integrating data sources, and automating verification processes. It will ensure that the information used for bonus calculations is reliable and up-to-date Secondly, the streamlined process will enable faster turnaround times and reduce bottlenecks. Thirdly, the redesigned process will enhance transparency and accountability, by providing clear guidelines, improving data governance, and establishing effective communication channels.

Overall, the business implications of the proposed process redesign for the Academic Bonuses Accrual campaign are significant. By considering cost implications, and the impact on organizational outcomes, the redesign process aims to improve efficiency, accuracy, transparency, and accountability. Regular monitoring, evaluation, and feedback collection will be necessary to assess the effectiveness of the changes and identify further opportunities for optimization.

5. LIMITATIONS AND FUTURE WORK

Limitations

While the proposed process redesign for the Academic Bonuses Accrual campaign offers numerous benefits and improvements, it is essential to acknowledge certain limitations and constraints that may impact its implementation and effectiveness. The following limitations should be taken into consideration.

The successful implementation of the process redesign relies on the availability of appropriate technological infrastructure. This includes robust software systems, reliable data sources, and seamless integration capabilities. However, it is important to recognize that organizations may face limitations in terms of budget constraints, IT infrastructure, and technical expertise. These factors can pose challenges in adopting and implementing the necessary technology upgrades and integrations required for the redesigned process. Any process redesign initiative involves organizational change, and managing this change effectively is critical for success. Resistance to change, lack of buy-in from stakeholders, and inadequate change management strategies can hinder the adoption and acceptance of the redesigned process. It is crucial to invest in change management efforts, including communication, training, and stakeholder engagement, to overcome resistance and ensure a smooth transition to the new process. The accuracy and availability of data from external sources, such as Scopus and Crossref.org, can impact the effectiveness of the redesigned process. While efforts can be made to improve data quality and establish data governance mechanisms, there may still be limitations in terms of data completeness, reliability, and timeliness. Organizations should be aware of these limitations and implement strategies to mitigate their impact on the redesigned process. The success of the process redesign also relies on the organization's culture and readiness for change. If the organizational culture does not support transparency, collaboration, and continuous improvement, it may pose challenges in implementing the redesigned process. Addressing cultural barriers and fostering a culture that values efficiency, data-driven decision-making, and stakeholder engagement is crucial for maximizing the benefits of the process redesign.

Future work

While the proposed process redesign addresses many of the identified issues in the Academic Bonuses Accrual campaign, there is room for further improvement and exploration. Future work can focus on the following areas. Continuous monitoring and process optimization are essential for ensuring the long-term effectiveness of the redesigned process. Implementing real-time monitoring mechanisms, KPIs, and process analytics can provide valuable insights into process performance, identify bottlenecks, and drive ongoing process improvements. Future work can focus on developing a comprehensive process monitoring and optimization framework to continually enhance the redesigned process. Integrating the academic bonuses accrual process with performance evaluation systems can provide a holistic approach to reward and recognition. Future work can focus on aligning the redesigned process with performance evaluation metrics, ensuring that the bonus allocation is closely tied to individual performance and contribution. This integration can enhance fairness, transparency, and motivation among employees and postgraduate students.

6. CONCLUSION

The aim of this master's thesis was to analyze and redesign the Academic Bonuses Accrual campaign process, which plays a crucial role in allocating academic bonuses to employees and postgraduate students in academic institutions. Through a comprehensive analysis of the current process, including value stream mapping, cause-effect diagram analysis, and quantitative simulation, several key insights and opportunities for improvement were identified. The analysis revealed that the current process suffers from various challenges, such as manual data verification, limited integration with external databases, delays in accessing information, and coordination issues among participants. These challenges result in inefficiencies, inaccuracies, and delays in the bonus allocation process, leading to dissatisfaction and potential biases among employees and postgraduate students. To address these issues, a heuristic process redesign approach was employed, focusing on initiating the redesign, designing the new process, and evaluating its effectiveness. The redesign incorporated principles from the Devil's Quadrangle performance dimensions, including time, cost, quality, and flexibility. Through the redesign, several improvements were proposed, including automating data retrieval, implementing standardized procedures, enhancing integration with external databases, and improving coordination and communication among participants.

In conclusion, the Academic Bonuses Accrual campaign process is vital for fairly and efficiently allocating academic bonuses in academic institutions. Through a thorough analysis and heuristic process redesign, this master's thesis has provided valuable insights, recommendations, and improvements to enhance the process. This, in turn, will contribute to employee and postgraduate students satisfaction, motivation, and the overall success of academic institutions. The findings and contributions of this master's thesis emphasize the importance of continuous process improvement and the value of adopting a structured approach to redesigning complex processes. By embracing process improvement methodologies and leveraging emerging technologies, organizations can navigate the challenges of today's dynamic academic landscape and achieve excellence in bonus allocation and other critical processes.

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APPENDIX I

Academic bonuses campaign Value-added analysis

№	Step	Performer	Classification
1.	The launch of the campaign on AB	-	VA
2.	Update needed	-	BVA
3. Update data on publications and authors sub-process			
3.1	Fill authors' profile	Scientometric center's Operator	VA
3.2	Get Employees' data from MDM	Scientometric center's Operator	BVA
3.3	Get Postgraduate students' data from SmartReg	Scientometric center's Operator	BVA
3.4	Get data on publications from Scopus and Crosserf.org	Scientometric center's Operator	BVA
3.5	Process and clean publications	Scientometric center's Operator	VA
3.6	Enrich/Actualize database on Portal	Scientometric center's Operator	BVA
3.7	Send publications for checking	Scientometric center's Operator	NVA
3.8	Check publications	Publication Verification Department (Portal)	VA
3.9	Check if update is needed	Publication Verification Department (Portal)	BVA
3.10	Update publications	Scientometric center's Operator	BVA

3.11	Send publications for re-checking	Scientometric center's Operator	NVA
3.12	Form analytical report	Scientometric center's Operator	BVA
4	Add information about publications	Employee/postgraduate	VA
5. Verify information and evaluate publications sub-process			
5.1	Publication verification needed	-	VA
5.2	Check the submitted information for validity and accuracy	Portal (Publication Verification Department)	VA
5.3	Check if information is valid and accurate	Portal (Publication Verification Department)	BVA
5.4	Check if revision is needed	Portal (Publication Verification Department)	BVA
5.5	Send publications for revision	Portal (Publication Verification Department)	NVA
5.6	Make corrections on publications	Employee/postgraduate	NVA
5.7	Send for re-evaluation	Employee/postgraduate	NVA
6.	Data processing and grading	Portal (Publication Verification Department)	VA
7.	Retrieve data on the evaluated publications	Office of Academic Research	NVA

8.	Calculate bonuses	Office of Academic Research	VA
9.	Upload results to Portal	Portal (Publication Verification Department)	NVA
10.	Retrieve evaluated publications	Employee/postgraduate	NVA
11.	Check if agree with bonuses	Employee/postgraduate	BVA
12.	Submitting the results to the commission	Office of Academic Research	NVA
13. Appeal			
13.1	Does not agree with evaluation	-	VA
13.2	Submit an appeal	Employee/postgraduate	NVA
13.3	Consider an appeal	Portal (Publication Verification Department)	VA
13.4	Send email with the decision	Portal (Publication Verification Department)	NVA
13.5	Check if agree with the decision	Employee/postgraduate	BVA
13.6	Re-appeal	Employee/postgraduate	NVA
13.7	Send materials to Coordinator	Portal (Publication Verification Department)	NVA
13.8	Send materials to University's Committee	Coordinator	NVA
13.9	Consider the appeal	University's Committee	VA
13.10	Inform about decision	University's Committee	BVA

14.	Check if decision of appellation is positive	Portal (Publication Verification Department)	BVA
15.	Hold a meeting of the commission	Commission on bonuses	VA
16.	Academic bonuses accrued	-	VA

APPENDIX II

Academic bonuses Campaign Waste analysis

Waste category	Type of waste	Activity	Justification
Move	Motion	5.6 Make corrections on publications (NVA)	Making corrections on publications involves unnecessary motion waste, indicating that the initial validation or quality control might not have been effective.
	Transportation	3.7 Send publications for checking (NVA) 5.5 Send publications for revision (NVA) 5.7 Send for re-evaluation (NVA) 13.7 Send materials to Coordinator (NVA) 13.8 Send materials to University's Committee (NVA)	These steps involve transporting publications or materials for checking, re-checking or revision, which adds unnecessary movement or transportation waste to the process.
Hold	Waiting	3.7 Send publications for checking (NVA)	Waiting for the checking process to be completed before proceeding introduces waiting waste into the workflow.
	Waiting	5.5 Send publications for revision (NVA)	Waiting for publications to undergo revision before proceeding causes waiting waste and delays in the overall process.
	Waiting	5.7 Send for re-evaluation (NVA)	Waiting for re-evaluation introduces waiting waste, as it delays the workflow.

	Waiting	7. Retrieve data on the evaluated publications (NVA)	Waiting for the retrieval of data on evaluated publications creates waiting waste and delays subsequent steps.
	Waiting	9. Upload results to Portal (NVA)	Waiting for the upload of results to the portal before proceeding introduces waiting waste into the process.
	Waiting	10. Retrieve evaluated publications (NVA)	Waiting for the retrieval of evaluated publications leads to waiting waste, especially if it delays subsequent activities.
	Waiting	13.7 Send materials to Coordinator (NVA)	Waiting for the materials to reach the Coordinator causes unnecessary delays and waiting waste.
	Waiting	13.8 Send materials to University's Committee (NVA)	Waiting for the materials to reach the University's Committee introduces waiting waste into the process.
Overdo	Overproduction	5.4 Check if revision is needed (BVA)	Checking if revision is needed indicates a potential overproduction of work, as additional checking steps might be required.
	Overprocessing	5.5 Make corrections on publications (NVA)	Making corrections on publications, particularly if they were not adequately validated initially, can result in overprocessing waste.
	Overprocessing	Step 3.10: Update publications	Identifying any redundant or unnecessary updates that do not add value to the final outcome can reduce over-processing.
	Defect	Step 13.6: Re-appeal	Analyzing the reasons for re-appeals and implementing measures to address them can minimize defects and improve the efficiency of the appeal process.

APPENDIX III

Academic bonuses campaign issue register

Name	Description	Impact	Priority	Assigned to
Insufficient data verification from Scopus and WoS	Data downloaded from Scopus and WoS for publication verification lacks accuracy and completeness	Incomplete and inaccurate data may lead to errors in the evaluation of academic bonuses	High	Scientometric center's Operator
Lack of centralized storage and integration with the portal	There is no centralized storage for publication data, and the data entered by users on the portal is not integrated with the system	Difficulty in maintaining data consistency and accessibility, leading to manual verification and potential errors	Medium	Portal development team
Errors in reference books on journals	Reference books on journals are maintained with errors due to inaccuracies in Scopus and WoS	Incorrect information may result in incorrect evaluation and allocation of academic bonuses	Medium	Scientometric center's Operator
Outdated and contradictory internal documentation	Existing documents detailing the processes are outdated and contradictory, causing confusion and inefficiency	Inconsistent understanding of processes and potential misinterpretation of activities	Medium	Business Analyst

Limited domain experts' knowledge in process modeling	Domain experts have low knowledge in business process modeling languages, hindering the feedback process	Difficulty in effectively communicating and validating the process models	Low	Business Analyst
Manual handoffs and data processing	Several manual handoffs and data processing steps exist, leading to potential delays and errors	Increased processing time and higher chances of mistakes in data handling	Medium	Publication Verification Department (Portal)
Lack of automation in data retrieval and submission	Manual retrieval of data and submission to committees result in inefficiencies and delays	Slower decision-making process and potential bottlenecks in the campaign	Medium	Portal development team
Lack of integration between data sources	Data sources such as MDM, SmartReg, Scopus, and Crossref.org are not effectively integrated	Data inconsistency and potential discrepancies in the evaluation process	Medium	Portal development team
Inefficient appeal process	The current appeal process lacks efficiency and clarity, causing delays and confusion	Frustration among employees/postgraduates and potential disputes	High	Publication Verification Department (Portal)
Outdated and Contradictory	Internal documentation related to the academic bonuses	Confusion and inefficiencies in process execution, leading to potential	Medium	Documentation Team

Internal Documentation	campaign is outdated and contradictory, containing obsolete activity descriptions and referring to non-existent documents and files.	misinterpretation and incorrect implementation of the campaign.		

APPENDIX IV

Simulation Assumptions

Type	Description
Instances	The simulation considers 900 instances of the process, all of which are completed. All 900 instances are started during the simulation.
Time	Sequential Execution: Unless explicitly mentioned or indicated by gateways, we assume that the tasks within the process are executed sequentially, one after the other. Task Durations: For each task, we can estimate the average time required based on historical data or expert estimation. This duration can be represented in hours, days, or any other suitable time unit. Variability: It is assumed that the task durations have inherent variability due to factors such as workload, complexity, and resource availability. This variability can be represented using statistical distributions such as normal distribution or exponential distribution. Task Dependencies: Some tasks may have dependencies on others, meaning they can only start or finish after certain preceding tasks are completed. These dependencies should be identified and incorporated into the simulation model.
Gateways	Exclusive Gateways are used to model branching paths in the process flow based on certain conditions. We assume that the conditions for each exclusive gateway are well-defined and can be evaluated accurately. Parallel Gateways are used to model parallel or concurrent execution of tasks. We assume that tasks executed in parallel do not have dependencies on each other and can be executed independently. The evaluation of gateways is assumed to be instantaneous, meaning that once the conditions for a gateway are met, the process flow immediately follows the corresponding outgoing path.

Resource Availability	The simulation analysis assumes that the necessary resources, including the Scientometric center's Operator, Employee/Postgraduate, Publication Verification Department, Office of Academic Research, Commission on Bonuses, and University committee, are available and allocated appropriately throughout the process. It assumes that the resources have the required skills and knowledge to perform their assigned tasks.
Data Accuracy	The data obtained from Scopus, WoS, and other sources are assumed to have a certain level of accuracy. Although it is mentioned that these sources may contain errors, it is assumed that the data used for the simulation analysis is reasonably accurate
Data Integration	The simulation analysis assumes that the data from different sources, such as Scopus, Crossref.org, and openalex.org, can be integrated and synchronized effectively. It assumes that the necessary mechanisms are in place to retrieve and process the data from these sources
Data Verification	The simulation analysis assumes that the data verification process, carried out by the Publication Verification Department and the Portal, is effective in ensuring the validity and accuracy of the publication information provided by employees and postgraduate students. It assumes that the verification process can identify and correct any discrepancies or errors in the submitted data
Process modeling	It was created a simplified variation of the Academic bonuses high level model but made sure that all essential processes were taken into account. Some roles and activities were eliminated from the model since they do not make a significant contribution to the academic bonuses accrual process