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RISK MANAGEMENT IN DOCUMENT PRESERVATION: CHALLENGES AND CONTROLS IN HIGHER EDUCATION INSTITUTIONS

Marcia Cassitas Hino

Departamento de Ciência e Gestão da Informação. Universidade Federal do Paraná.

https://orcid.org/0000-0001-5763-3456

Elder Lopes Barboza

Departamento de Ciência e Gestão da Informação. Universidade Federal do Paraná.

https://orcid.org/0000-0003-0466-9038

Suely Ferreira da Silva

Doutoranda do programa de Ciência e Gestão da Informação. Universidade Federal do Paraná.

Raquel Rutina Korobinski

Consultora em Gestão da Informação

https://orcid.org/0009-0005-5742-0895

Abstract: In an information-centric world, the data explosion underscores the strategic importance of information for institutions and governments. In educational institutions, document management is crucial for preserving heritage and ensuring intellectual development. The study aims to analyze the inherent risks in document management within a Higher Education Institution. The research method adopted in this study was action research, conducted within the document management of two Higher Education Institutions. The study presents a detailed risk matrix, encompassing the identification and classification of risks and controls, offering a detailed view of the various challenges and threats to which the document management process is potentially exposed. This study also highlights the importance of a systemic risk management approach in document management within educational environments with clear guidance for areas requiring immediate attention; and it emphasizes that the implementation of appropriate controls can substantially reduce exposure to these risks.
Keywords: Document management; Risks evaluation; Action-research.

Título: GESTIÓN DE RIESGOS EN LA GESTIÓN DOCUMENTAL DE INSTITUCIONES DE EDUCACIÓN SUPERIOR.
Resumen: En un mundo centrado en la información, la explosión de datos subraya la importancia estratégica de la información para las instituciones y los gobiernos. En las instituciones educativas, la gestión documental es crucial para preservar el patrimonio y asegurar el desarrollo intelectual. El estudio tiene como objetivo analizar los riesgos inherentes a la gestión documental dentro de una Institución de Educación Superior. El método de investigación adoptado en este estudio fue la investigación-acción, realizada en la gestión documental de dos Instituciones de Educación Superior. El estudio presenta una matriz de riesgos detallada, que abarca la identificación y clasificación de riesgos y controles, ofreciendo una visión detallada de los diversos desafíos y amenazas a los que el proceso de gestión documental está potencialmente expuesto. Este estudio también destaca la importancia de un enfoque sistémico de gestión de riesgos en la gestión documental dentro de entornos educativos, con una orientación clara para las áreas que requieren atención inmediata; y enfatiza que la implementación de controles apropiados puede reducir sustancialmente la exposición a estos riesgos.
Palabras clave: Gestión documental; Evaluación de riesgos; Investigación-acción.

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1 INTRODUCTION

The perception of the strategic value of information for individuals, institutions, and governments is known worldwide. With the advancement of technology and the digitalization of processes, the volume of information generated and stored has increased exponentially (Nasrueva & Mutaeva, 2020). This data explosion brings new challenges, such as the need to manage, organize, and secure the information. The ability to effectively access and utilize this vast amount of data has become crucial for the success of individuals, institutions, and governments in an increasingly information-driven world (Paramasivam & Anthonyraj, 2022).

In the field of education, educational institutions accumulate a significant amount of documents over time, such as academic records, research, projects, and reports, among others. It is the responsibility of these institutions to ensure the proper preservation and organization of these documents so that they can be retained and available for future reference. Activities aimed at this purpose play a crucial role as they contribute to the preservation of the institution's documentary heritage, facilitate informed decision-making in the face of challenges and opportunities, preserve institutional memory over time, and ensure compliance with legal aspects related to the institution's activities. As noted by Funston-Mills and McKinnie (1988), these archival records are essential for documenting the origin, structure, purpose, and historical evolution of the school.

In the corridors of educational institutions, where knowledge flourishes and minds expand, there is a rich and diverse environment of information contained in documents. From academic records to research projects, reports, and student papers, these documents form the backbone of the educational journey. Effective management of this vast amount of documents becomes increasingly challenging, requiring structured and systemic approaches to manage and preserve the documents.

Risk management, however, can only be effective if the risks themselves are identified and understood (Hubbard, 2020). The importance of effective risk management in document management becomes evident when recognizing that documents are valuable assets not only for educational institutions but also for students (Fadun, 2013). Academic records, research projects, and class notes encapsulate the intellectual development of both students and teachers, making their preservation essential. Loss, damage, or unauthorized access to these documents can lead to severe consequences, undermining institutional credibility and student rights (Hamzat et al., 2024; Hubbard, 2020). In higher education institutions, this aspect of risk management also intersects with social justice, ensuring that diplomas are issued solely to those who have genuinely completed all phases of the academic process, thereby safeguarding fairness and institutional integrity.

Some institutions responsible for managing documentary heritage, such as the National Library and the National Archives, already have structured risk management plans. However, there is a significant gap in risk management applied to academic documents in higher education institutions, especially from the perspective of students. Documents such as proof of course completion, grade lists and attendance records are essential to ensuring the continuity and validity of academic trajectories. This deficiency becomes even more critical when institutions close their activities without adequately fulfilling their obligations to students, compromising rights and generating lasting impacts. As stated by Hamzat et al. (2024, p.2) “academic board records comprise the information and documents about students’ academic careers including transcripts, verifications, grade reports, degree audits and diplomas”.

In this context, the document management processes of two institutions that ceased operations were analyzed by UFPR. The analysis sought to identify risks that could compromise the quality of document management processes. The guiding question of the study was: What are the inherent risks in document management in a higher education institution, and how can these risks be identified and measured? Thus, this study aims to analyze the inherent risks in document management in two higher education institutions, with a specific focus on identifying and measuring these risks in the phases of reception, processing, archiving, and storage of documents. It does not cover the future phases of digitization and information retrieval.

The contributions of the study are diverse: It exposes existing risks in document management, bringing to light the challenges present in this process. Additionally, based on evidence and careful analysis, it provides informed insights to support decision-making in this area. The study also contributes to improving the prioritization of mitigation actions by identifying exposure levels and susceptibility to each risk. It generates information that inspires the creation of new

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policies and actions related to document management activities. Finally, it broadens the understanding of document management processes, enriching theoretical and practical knowledge in this field.

This article is organized as follows. The first section, the introduction, presents the context, the study's objective, and the justification for its conduct. The second section provides a literature review, discussing document management and risk management. Section three presents the methodological aspects that outlined the study. The fourth section shows and discusses the results, organizing its content in a risk matrix. Finally, the fifth section presents the study's conclusions.

2 LITERATURE REVIEW

The theoretical framework section of this article focuses on establishing the conceptual foundations for analyzing the risks associated with document management in higher education institutions. To achieve this goal, this section is divided into two interrelated topics: document management and risk management.

2.1 Document management

Article 3 of Law No. 8.159, dated January 8, 1991, stipulates that document management involves a set of processes and techniques related to the creation, movement, use, evaluation, and archiving of documents during their active and intermediate phases, with the ultimate goal of either eliminating them or preserving them permanently. Document management is viewed as a tool that enables the organization of information and documents in relation to the processes and practices that support knowledge management (Vianna & Valls, 2016; Dos Santos, 2009). In this context, ISO 15489:2016 provides international standards for records management, offering guidelines on best practices for creating, managing, and maintaining records throughout their lifecycle (International Organization for Standardization, 2016). This standard emphasizes the importance of establishing robust processes for document management to ensure the integrity, accessibility, and usability of records in various organizational settings, including higher education institutions.

The implementation of document management offers a range of direct benefits, such as optimizing space and producing documents consciously, as well as promoting the expansion of the business environment by supporting information management and, consequently, knowledge management (Silva, 2019). As outlined by Bellotto (1998), documentation involves various activities between the creation of the document and its use, supporting the principle of Respect for Provenance, which preserves administrative and historical values and thus enables organization based on purpose and origin. In line with ISO 15489:2016, effective record management ensures authoritative business evidence is created, captured, and managed, which supports transparency, accountability, informed decision-making, risk management, compliance, and operational efficiency, among other benefits (International Organization for Standardization, 2016). Only after this organization is it possible to explore the advantages of applying document management to information management at different hierarchical levels (Roncaglio, Svarça & Bojanoski, 2004).

From this perspective, Higher Education Institutions can benefit from document management, as they regularly produce vital documents that describe various aspects of the organization, its staff, and its students. However, Jardim (2018) highlights that there is no evidence of effective implementation of document management in typical application scenarios, not only in Brazil.

Document management in educational institutions is a crucial aspect for their efficient and organized functioning. By applying concepts, theories, and practices related to document management, it is possible to ensure quick and accurate access to necessary information, promote administrative transparency, and preserve institutional memory.

Effective document management in educational institutions brings a range of benefits (Moreira & Nunes, 2009). Firstly, it facilitates the flow of information, allowing documents to be found and shared quickly and efficiently (Bottino, 2014). This is especially important in an educational environment, where decision-making and access to accurate records are fundamental for academic and administrative planning (Moreira & Nunes, 2009). Additionally, proper document management contributes to preserving the institution's history and culture (Santos Neto & dos Santos, 2015). Documents such as meeting minutes, reports, pedagogical projects, academic papers, and records of extracurricular activities are valuable sources of information that document the institution's history and can serve as references for future research (Moreira & Nunes, 2009; Santos Neto & dos Santos, 2015).

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However, document management in educational institutions also faces specific challenges (Moreira & Nunes, 2009). The volume of documents generated in an academic environment is significant and constantly growing, which can hinder proper organization and storage (dos Santos & Aganette, 2021; Toebe et al., 2020). Additionally, the transition to digital formats and the use of electronic document management systems (EDMS) may present technological challenges and require staff training.

In this context of challenges and complexities in document management in educational institutions, addressing the topic of risk management becomes crucial, as it plays a fundamental role in building effective strategies, allowing exploration of how these concepts relate to the specific challenges faced in document management.

2.2 Risk management

Risk is defined by the ISO 18128:2014 standard as the result of uncertainty, which is the state of deficiency in information, understanding, or knowledge about an event, its consequences, or its likelihood (International Organization for Standardization, 2014). Risk is described in ABNT NBR ISO 31073:2022 by referencing potential events and their consequences, or a combination of both, and is expressed in terms of the combination of the consequences of an event (including changes in circumstances) and the associated likelihood of its occurrence (Associação Brasileira de Normas Técnicas, 2022). Risk management aims to support the management process by ensuring that risks are reduced to an acceptable level by those responsible, without necessarily eliminating them (Ramos, 2018).

Risk management is related to the protection of individuals and organizations (Dionne, 2013) in an environment of uncertainty. According to Ramos (2018), risk management should include activities such as identification, measurement, classification, and monitoring of risks to safeguard the interests of the organization and/or individual.

The ISO 18128:2014 standard is an international standard that establishes principles and guidelines on risk assessment for records processes and systems (International Organization for Standardization, 2014). It does not define specific steps but provides a general framework for the risk management process, guiding aspects for effective risk management, whether in terms of concepts, fundamentals, techniques, or implementation. General risk management process is established in ABNT NBR ISO 31000:2018 (Associação Brasileira de Normas Técnicas, 2018) and it is presented in Figure 1.

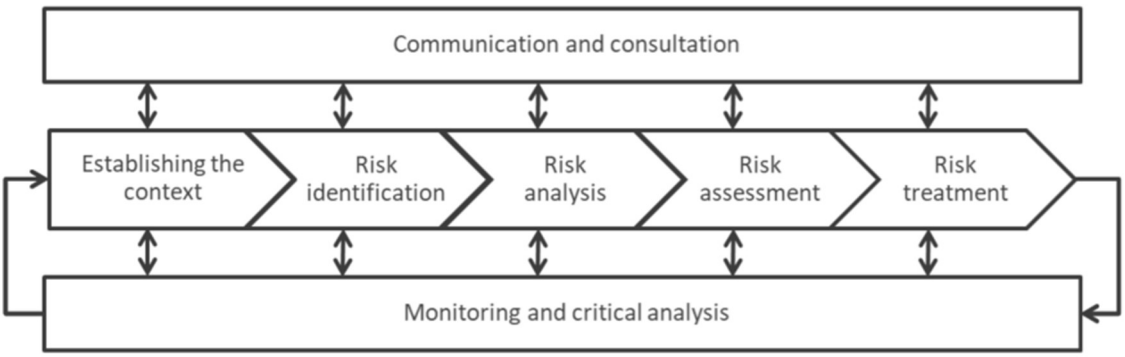

Figure 1. Risk Management Process. Source: adapted from Associação Brasileira de Normas Técnicas, 2018.

According to ABNT NBR ISO 31000:2018, establishing the context allows for the definition of basic parameters for risk management, enabling the definition of scope and evaluation criteria (Associação Brasileira de Normas Técnicas, 2018). The context considers relevant internal and external parameters, as well as an understanding of the specific risks associated with the phenomenon to be assessed.

The next three phases refer to the risk assessment process. The first phase, risk identification, focuses on finding, recognizing, and recording risks, enabling the identification of causes and sources of risk. It aims to determine what events or situations could occur that might impact the ability of records to meet the organization's needs (International Organization for Standardization, 2014). The second phase, known as risk analysis, involves evaluating the risks, requiring a comprehensive and in-depth understanding of the risk and its context. This phase is responsible for measuring the risk based on its likelihood of occurrence and the consequences in the event of risk materialization. It is at this phase that the inherent risks of the business are measured. Inherent risk is the risk an organization faces before implementing

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any treatment or mitigation measures (International Organization for Standardization, 2014). This analysis helps prioritize risks based on their significance and understand how they might affect the organization. Finally, the third phase is risk evaluation, which involves analyzing the existing controls for mitigating the inherent risks identified in the previous phase and calculating the actual exposure to risks, now referred to as residual risks. Thus, residual risk is the risk that remains after applying existing controls (International Organization for Standardization, 2014). This phase is also responsible for comparing the estimated risk levels with the organization's risk appetite, thereby defining which risks should be treated or accepted. Risk appetite, or risk criteria, is a fundamental concept in risk management and refers to the institution's willingness or tolerance to deal with risks (International Organization for Standardization, 2014). It reflects the amount of risk an organization is willing to accept or tolerate in pursuit of its objectives. In other words, it is the level of uncertainty an organization is comfortable assuming. Risk appetite helps define which risks should be accepted and which should be mitigated. Some institutions may have a more conservative risk appetite, preferring to avoid substantial risks, while others may be more aggressive in their pursuit of opportunities, accepting a higher level of risk.

The next phase is risk treatment. It involves implementing specific strategies and actions to address the identified and assessed risks. These strategies can range from risk mitigation through the implementation of controls or preventive actions to risk transfer through insurance or contractual agreements.

Monitoring and critical analysis track and evaluate the progress and effectiveness of risk treatment strategies. The main goal of this phase is to ensure that risk management measures are working as planned and that risks are kept within acceptable limits. It is also responsible for indicating when adjustments to plans are needed.

The communication and consultation phase involves sharing relevant information about risks, treatment strategies, and decisions with all relevant stakeholders. This phase aims to ensure that all involved parties are aware of and understand the risks and the actions taken to manage them.

In addition to the essential risk management phase outlined by ABNT NBR ISO 31000:2018, it is crucial to understand some key concepts that broaden the understanding and deepen the effectiveness of the risk management process (Associação Brasileira de Normas Técnicas, 2018). These interrelated concepts provide a comprehensive view of risk dynamics. The first concept is 'inherent risks'. These risks represent the level of uncertainty an organization faces before adopting any treatment or control measures (Associação Brasileira de Normas Técnicas, 2018). They are the pure expression of exposure to threats and opportunities without direct interventions. Understanding inherent risks is crucial for establishing a solid baseline for subsequent assessment. In this context, another important concept arises: 'control efficiency'. This refers to the ability of implemented controls to reduce the likelihood or impact of identified risks (Associação Brasileira de Normas Técnicas, 2018). Assessing control efficiency allows for a critical analysis of adopted measures, contributing to the selection and improvement of the most appropriate risk management strategies. The third concept is 'residual risk', which can be defined as the risk that remains after implementing treatment actions (Associação Brasileira de Normas Técnicas, 2018). Essentially, residual risk represents the remaining uncertainty after mitigation efforts.

Together, these three concepts provide a holistic view of the risk management cycle. They highlight that risk management is not a static process but rather a continuous commitment to understanding, assessing, and improving. The goal of risk management is to reduce residual risk to an acceptable level, in line with the organization's risk tolerance and strategic objectives.

2.3 Risk management in document management

Risk management in document management is an important process to ensure the security, accessibility and preservation of information in organizations, especially in higher education institutions, where documents have historical, academic, administrative and legal value. This practice seeks to identify, assess and mitigate potential threats that may compromise the integrity, authenticity and availability of institutional records.

Risks related to document management can be observed at various phases of the document life cycle. During transportation, reception and initial storage, there is a risk of physical damage, such as tears, humidity (Beck, 2000; Machado & de Almeida Camargo, 2000) and contamination by biological agents (Ogden, 2000; Furtado et al., 2018), in addition to the lack of preparation of the personnel responsible for dealing with the documents (Toebe et al., 2020; Bard, 2018; Paes, 1998).

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"The area for receiving collected documents must have a special entrance for cargo trucks, which must be covered, in order to protect the documents against strong winds and rain" (Beck, 2000, p. 10).

In the document treatment and cleaning phase, it is important to mitigate risks associated with improper handling and the use of materials or techniques that may compromise the physical integrity of the documents (Nascimento & Padro, 2018; Pereira & da Silva, 2016; Costa Silva, 2015; Pinto, 2010; Roncaglio et al., 2004; Beck, 2000; Ogden, 2000; Spinelli Jr, 1997). Cleaning techniques must be performed by trained professionals (Rodrigues, 2010; Machado & de Almeida Camargo, 2000), using appropriate equipment (Ferreira, 2019; Borges, 2015) and products (Pinto, 2010; Carrasco, 2007; Roncaglio et al., 2004; Beck, 2000) to avoid irreversible damage, such as abrasions or loss of information.

The archiving and storage phases of documents also present specific risks. Inadequate classification of documents (de Almeida Camargo, 1026; Moreno, 2008; Lunardelli & Calderon, 2008; Schellenberg, 2002; Ogden et al., 2001; Bellotto, 1998; Castro et al., 1985) and filing out of order (Paes, 2004; Machado & de Almeida Camargo, 2000) are the main risks of the filing phase. The storage phase is also subject to risks such as contamination of already cleaned documents (Ogden, 2000; Machado & de Almeida Camargo, 2000), the use of furniture that is inappropriate for this purpose (Pinto, 2010; Pereira & da Silva, 2016; Roncaglio et al., 2004; Beck, 2000; Ogden, 2000), and failures in document access security processes (Pereira & da Silva, 2016; Cruz Mundet, 2008).

To address these challenges, international standards and specific legislation offer fundamental guidelines for the safe and effective management of documents. These guidelines help institutions develop policies that reconcile long-term preservation with the accessibility and confidentiality of information, ensuring the integrity and reliability of records.

3 METHODOLOGY

In the realm of research, there is an approach that transcends passive observation and actively engages in transforming the realities it seeks to understand: action research. Action research is a dynamic and engaged methodology that combines the rigor of research with practical action and problem-solving in the real world. In this method, researchers are change agents who interact with the settings they study, collaborating closely and cooperatively with the participants involved. It thrives on constant interaction between research and practice, not only analyzing challenges but also directly confronting them. Its purpose is not just to generate knowledge, but to also catalyze significant and positive changes (Coughlan & Coghlan, 2002; Thiollent, 2022). This methodological approach was chosen for its active role in transforming the reality of observed phenomena, aiming to co-create solutions, develop strategies, and achieve tangible improvements in real-time. The implementation of action research involves a series of carefully planned and executed steps to achieve the goals of transformation and problem resolution. Its implementation in this study followed the guidelines of Susman and Evered (1978) and Coughlan and Coghlan (2002). The Figure 2 illustrates the action research process adopted for this study.

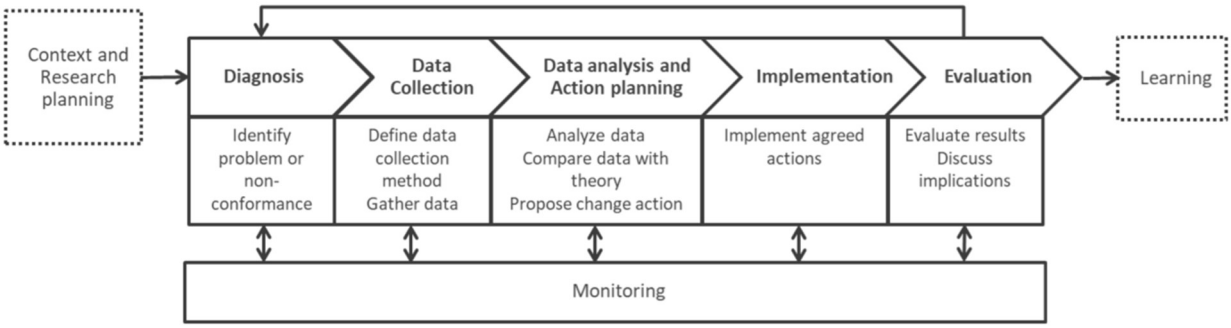

Figure 2. Action research phases. Source: The authors (2023).

According to the model, the journey begins with the contextualization and planning of the research, where the foundations are established to guide the entire project. In this phase, researchers define the setting, objectives, and general guidelines of the action research to be conducted (Coughlan & Coghlan, 2002). The initial phase of this cycle, known as diagnosis, involves identifying problems or compliance gaps. During this phase, researchers work closely with participants to identify and thoroughly understand the issue that needs to be addressed. Diagnosis includes gathering information about the current situation, analyzing underlying causes, and understanding the impact of the problem on

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stakeholders (Susman & Evered, 1978). The subsequent phase, called data collection, focuses on selecting methods for information capture and actively seeking relevant data (Coughlan & Coghlan, 2002). The next phase involves analyzing the data, followed by the development of actions. During this phase, participants collaboratively confirm the discrepancy between expected and actual results, explore alternatives, and propose actions (Coughlan & Coghlan, 2002). The fourth phase is implementation, where the planned actions are put into practice. This includes executing the strategies developed to address the problem, monitoring progress, and resolving challenges that arise during implementation (Susman & Evered, 1978). The fifth phase, titled evaluation, involves assessing the effectiveness of the actions implemented in relation to the original diagnosis. Researchers and participants evaluate the impact of the actions compared to the initially identified problem. This phase is particularly rich as it includes the analysis of results, reflection on what worked and what didn't, and comparison with the defined objectives (Susman & Evered, 1978; Coughlan & Coghlan, 2002). Finally, the last phase, called learning, reveals the lessons learned throughout the action research project. This continuous cycle not only guides the process but also fosters deep interaction between research and action, leading to significant transformations and lasting learning (Susman & Evered, 1978).

4 ACTION RESEARCH DEVELOPMENT

This section presents the practical implementation of the methodological steps adopted to explore the inherent risks in document management within educational institutions, detailing the actions undertaken at each phase, as well as the strategies used to achieve the research objectives.

4.1 Research context and planning

Document management activities are varied, as they are aligned with the specific needs of each organization (de Almeida & Vitoriano, 2018). The research was conducted at the Federal University of Paraná (UFPR), which received a closed collection of documents from two other higher education institutions that had ceased their operations. The transferred collections did not show visible signs of significant damage to their integrity, although the storage conditions, checked at the time of removal, were inadequate. Although the documents had a previous organization, it was observed that they seemed to be mixed and disorganized in terms of content. The collections underwent a series of procedures at UFPR up to the time of this research, including storage, pest control, sorting, cleaning, and archival identification, thereby defining the scope of the study. The detailed workflow covered by the study is in Figure 3.

The objective of the activity carried out by UFPR is to provide the responsible parties with the necessary information for making decisions regarding the students' right to obtain their course completion diplomas. The team working on this phase of the project consists of professionals from the fields of education, information management, and library science, including faculty members, technical staff, and undergraduate and graduate students, covering an interdisciplinary perspective. The team structure for document management includes a project coordinator, a technical documentation coordinator, seven supervisors specialized in archival treatment, twenty undergraduate and graduate scholarship students responsible for document processing, and two external consultants for issues related to archival treatment and document conservation.

The study planning was conducted through a comprehensive literature review covering central themes, namely document management and risk management. This review aimed to deepen the understanding of the topic and provide a foundation for decision-making. Additionally, knowledge was enhanced through participation in two seminars on archival techniques, which aimed to disseminate knowledge both theoretically and practically. These seminars prepared the technical support team in document treatment for their activities. The data collection techniques employed included interviews with those involved in the process, direct observation, and the analysis of documents produced during the course of the activities.

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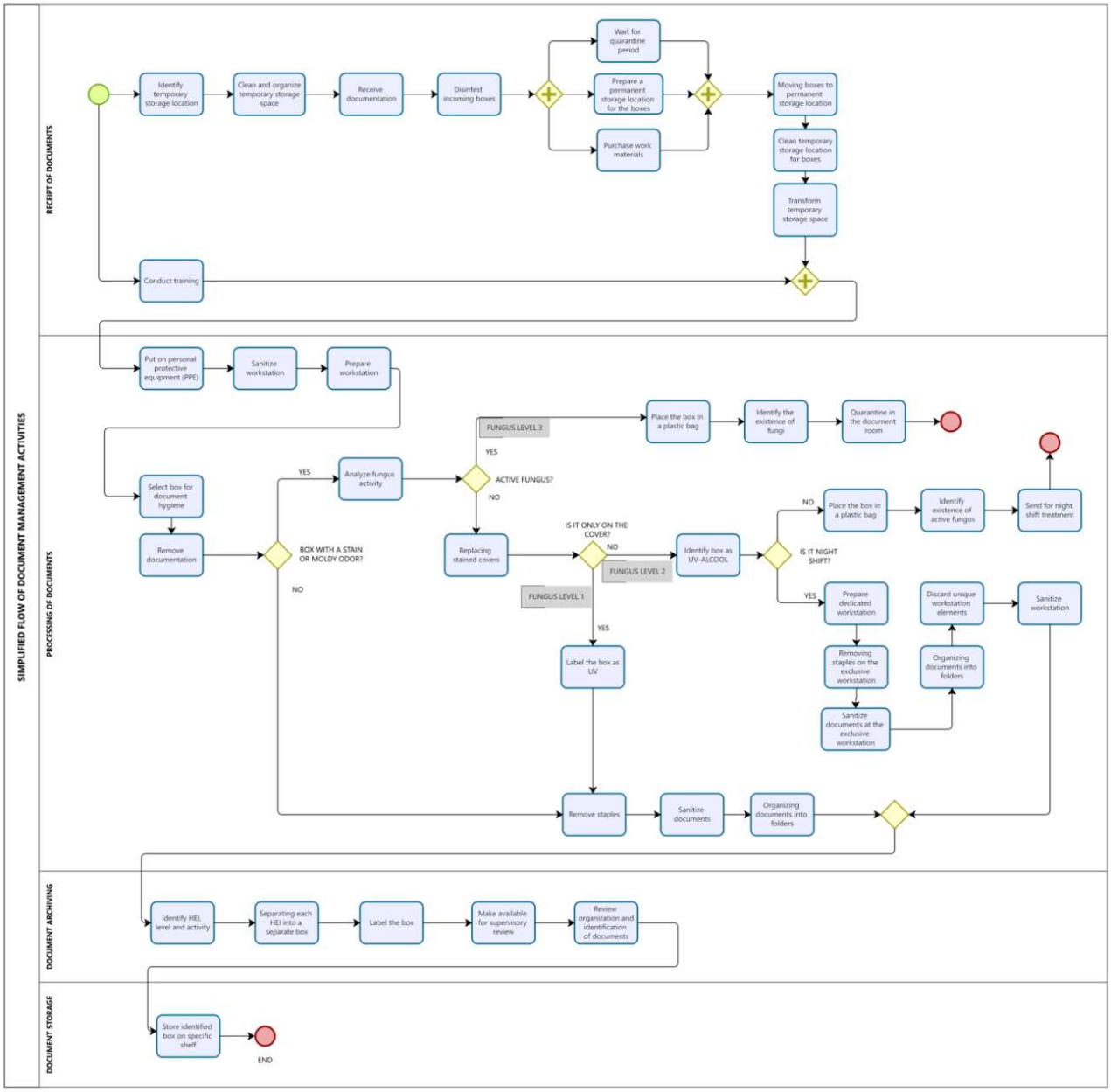

Figure 3. Data management conducted by UFPR. Source: The authors (2023).

4.2 Diagnosis

This phase corresponds to identifying discrepancies between the established expectations, revealing existing problems that need to be addressed and thus initiating the knowledge generation process (Susman & Evered, 1978). Most problems were diagnosed by the supervisors and the technical team responsible for archival treatment in their routine activities. As the activities progressed, unexpected situations emerged, requiring the implementation of actions to quickly define solutions and their implementation. The actions taken directly impacted the processes carried out.

4.3 Data collection

The data collection was conducted within the context of the daily activities of the teams responsible for applying archival methods to the received documents, as well as through the use of a logbook filled out by the supervisors in charge of archival treatment. The logbook was developed with the specific goal of collecting and organizing relevant information about the daily activities. Its primary purpose was to record any significant occurrences related to the

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ongoing activities. The logbook included the following data: date, day of the week, shift (morning, afternoon, evening), occurrence status (open, closed), responsible supervisor, description of the occurrence, description of the solution, and person responsible for implementation. To enrich the study data, interviews were conducted to provide detailed information about some specific activities. Information was also obtained through non-participant observations of work routines on various days and shifts, as well as during follow-up meetings held between the supervisors and the technical coordinator of the activity.

4.4 Data analysis and action planning

This phase of the study was marked by significant intellectual productivity. To facilitate rapid data analysis, identify alternatives, and select the best option, a group was established on the WhatsApp application to streamline discussions and expedite the process. By using photographs and descriptions of the issues, most of the problems could be addressed and discussed. In specific situations, video calls were conducted to clarify points and explore possible alternatives. The results of these discussions were recorded in a document called 'logbook,' ensuring the documentation of actions taken and the possibility of applying solutions in future situations. The WhatsApp group consisted of the technical coordinator, supervisors, external consultants, those responsible for document treatment and archiving activities, and a group of researchers. This diversity of profiles fostered rich discussions and information exchange among the participants.

4.5 Implementation

Among the actions undertaken in the data analysis, the establishment of standard workflows was defined. This measure was justified by the need to apply the same treatment to similar situations involving other technicians supervised by someone different from the one responsible for identifying the problem. The implementation of this standardized procedure allowed for more efficient monitoring and the identification of issues not addressed during the planning phase of the activity.

4.6 Evaluation

This phase is responsible for identifying the consequences of the actions taken to address the problems identified in the diagnostic phase (Susman & Evered, 1978). The evaluation of the actions was coordinated by the supervisors and conducted daily using the logbook, the WhatsApp group among the project participants, and weekly meetings with the project's technical coordinator. The exchange of information through these channels allowed for a thorough assessment of the current situation and the outcomes of the actions taken.

4.7 Learning

Initially, there was a considerable volume of issues; however, the procedures adopted allowed for a rapid response to non-compliance occurrences. Over time, the information recorded daily in the logbook became clearer and more specific, resulting in shorter and less frequent weekly meetings and a reduction in the volume of messages exchanged in the WhatsApp group. These results suggest that the standardization of actions, agile communication, and the ability to visualize problems through photos or video conferences contributed to the resolution of the identified issues.

5 RISK MATRIX FOR DOCUMENT MANAGEMENT IN HEIS

The construction of the risk matrix required the identification and assessment of inherent risks in the process, as well as the analysis of the effectiveness of mitigating controls. These analyses were instrumental in calculating the residual risk. The results obtained from this process were integrated into the project's risk appetite perspective, providing a comprehensive understanding of the project's vulnerability at its current phase.

Risks were assessed based on their likelihood of occurrence and the impact generated. Likelihood refers to the chance of an undesirable event occurring. To evaluate likelihood, a scale from 1 to 5 was used, where 1 represents low likelihood, 2 moderate likelihood, 3 high likelihood, 4 very high likelihood, and 5 elevated likelihood. Impact, in turn, represents the consequences or negative effects that may result from this event. The measurement scale includes the following levels:

- Very minor or nonexistent: The impact is minimal or nonexistent. This occurs when there is no risk of damage to documents or the project timeline, or any problem that arises has no perceptible impact on the workflow.
- Minor: The impact is low and restricted to a specific activity. A minor problem may arise in one of the phases, such as removing staples, but the situation can be easily corrected with minimal effort. Small delays may occur but do not affect the overall document management process.

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- Moderate: A moderate impact occurs when a problem affects one or more activities, impacting a considerable number of documents and causing a noticeable delay in the document management process. Efficiency is reduced, and activities can be resumed with reasonable correction efforts.
- Severe: Occurs when a problem affects several activities or a large number of documents, resulting in substantial delays and interruptions in the workflow. There is a significant risk of damage, requiring a complex recovery process and substantial allocation of resources.
- Massive: When it affects several or all activities, rendering the process inoperative or nearly inoperative. There is an imminent risk of permanent and irreparable damage. Recovery is extremely difficult or impossible, making the process virtually unviable. The project timeline is significantly disrupted, potentially leading to substantial delays or shutdown.

Mitigating controls were qualitatively assessed for their adequacy, i.e., their ability to alter the likelihood of risk occurrence or the extent of the generated impact. For this assessment, the efficiency of controls varied between nonexistent (N), inadequate (IA), deficient (D), and adequate (A).

Table I presents the risk matrix with exposure analysis and control efficiency.

Risk Code and Description **Control Description**	**Literature**	**IR**		**EC**	**RR**	
		L	**I**		**L**	**I**
PHASE: RECEPTION OF FILES (RF)						
RF1. Damage or loss of documents during transportation or upon reception by the institution Hiring a specialized document transportation company / Monitoring the document transportation and reception process.	Andrade e Sousa (2014); Beck (2000); Machado & de Almeida Camargo (2000)	3	3	D	2	3
RF2. Disinfestation process not suitable for the type of document received Hiring a specialized company for the activity / Guidance from specialists.	Machado & de Almeida Camargo (2000); Paes (2004, 1998)	4	5	A	2	3
RF3. Failure to observe the quarantine period after disinfestation Centralization of access control to the disinfected document area.	Paes (2004); Ogden (2000)	2	4	A	1	2
RF4. Inadequate location for the final storage of documents Adjusting room temperature and humidity / Sun isolation in the environment / Distance between shelves for document ventilation.	Beck (2000); Machado & de Almeida Camargo (2000)	4	3	D	3	3
RF5. Inadequate environmental conditions in the document storage rooms Allocating rooms on the ground floor with ventilation, pleasant temperature, and ambient humidity, with air circulation and sun protection on windows.	Pereira & da Silva (2016); Pinto (2010); Paes (2004); Beck (2000)	5	4	D	4	2
RF6. Inadequate electrical, plumbing, and sanitary installations for document storage Constant monitoring / Rapid response in case of occurrence.	Beck (2000); Machado & de Almeida Camargo (2000)	5	4	D	4	4
RF7. Inadequate work area for cleaning and organizing disinfected documents	Beck (2000); Machado & de	5	4	D	4	2

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Risk Code and Description **Control Description**	**Literature**	**IR**		**EC**	**RR**	
		L	**I**		**L**	**I**
Dividing work into shifts to have more workspace / Repositioning worktables away from each other / Working with doors and windows open.	Almeida Camargo (2000)					
RF8. Failures in cleaning or organizing the environment to be used for document treatment	Costa Silva (2015); Ogden (2000); Machado & de Almeida Camargo (2000)	4	4	D	3	3
Training with specialists / Assigning cleaning responsibilities to those who use the tables / Utilizing building cleaning services.						
RF9. Contamination of documents due to handling in an inadequate environment	Furtado et al. (2018); Ogden (2000)	4	4	D	2	4
Supervision by specialized supervisors / Use of PPE for document handling / Regular cleaning of workstations.						
RF10. Lack of work materials for cleaning documents	Bard (2018)	5	3	D	2	3
Monitoring the amount of material used / Timely acquisition of materials.						
RF11. Error in the choice of work materials	Carrasco (2007); Pinto (2010); Beck (2000); Roncaglio *et al*. (2004)	5	4	A	2	2
Selection of materials based on specialist guidance.						
RF12. Deficiencies in the preparation of personnel responsible for document treatment	Toebe *et al*. (2020); Bard (2018); Machado & de Almeida Camargo (2000)	4	5	D	2	3
Identification of necessary skills for handling and cleaning documents with specialists / Specific training with specialists.						
PHASE: DOCUMENT TREATMENT (DT)						
DT1. Incorrect use of PPEs	Ferreira (2019); Borges (2015)	3	3	D	2	2
Training on the importance and correct use of PPEs.						
DT2. Incorrect use of materials at workstations	Pinto (2010); Roncaglio *et al*. (2004); Beck (2000)	3	3	A	2	2
Daily supervision by supervisors / Regular training / Centralization of some activities in specific shifts.						
DT3. Failures in cleaning the workstation	Rodrigues (2010)	4	5	D	2	3
Daily supervision by specialist supervisors / Individual guidance / Regular training.						
DT4. Damage to documents during removal from boxes	Rodrigues (2010); Beck (2000)	3	3	A	1	2
Training with consultants / Supervision of activities / Individualized guidance.						
DT5. Extraction of staples and clips damaging documents	Pinto (2010); Costa Silva (2015); Salcedo *et al*. (2014); Ogden (2000)	4	4	D	2	2
Use of extraction equipment suitable for the type of paper / Supervision by supervisors.						

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Risk Code and Description **Control Description**	**Literature**	**IR**		**EC**	**RR**	
		L	**I**		**L**	**I**
DT6. Failure in document cleaning Use of appropriate cleaning materials / Monitoring and reviewing work by supervisors / Frequent reinforcement of guidelines through video and verbal instructions by supervisors.	Nascimento & Padro (2018); Pereira & da Silva (2016); Costa ilva (2015); Ogden (2000); Spinelli Jr (1997)	3	5	D	2	3
DT7. Disorganization of documents in the box Standardization of guidelines / Doubt resolution channel / Operational support from supervisors / Quick access to specialists.	Lunardelli & Calderon (2008), de Almeida Camargo (2016); Paes (2004)	4	5	D	2	2
DT8. Failure to identify the presence of mold Review of boxes and their documents by supervision before storage.	Spinelli Jr (1997)	5	5	A	2	4
DT9. Failures in isolating boxes with mold Acquisition of appropriate material / Supervision before isolation.	Ogden *et al*. (2001); Spinelli Jr (1997)	3	4	A	2	3
TD10. Inadequate location for quarantine of boxes with mold Storage of quarantined boxes on specific shelves.	Ogden *et al*. (2001); Spinelli Jr (1997)	5	3	IA	4	3
DT11. Workstation for mold treatment not adequately prepared Training / Supervision / Centralization and specialization of activities in a single work shift.	Rodrigues (2010)	4	4	A	2	2
DT12. Incorrect disposal of contaminated elements from the exclusive workstation Training / Supervision / Centralization and specialization of activities in a single work shift.	Rodrigues (2010)	3	4	D	2	4
PHASE: ARCHIVING (ARC)						
ARC1. Incorrect judgment of document value Consultation with specialists / Standardization of definitions / Supervision / Review before storage.	Moreno (2008); Schellenberg (2002); Bellotto (1998); Castro *et al.* (1985)	5	5	A	1	2
ARC2. Incorrect identification of HEI, level, or activity Standardization of procedures / Supervision / Access to specialists.	Pereira & da Silva (2016); Schellenberg (2002)	5	5	A	2	3
ARC3. Storage of various HEI in the same box Review before archiving / Supervision / Training / Standardization of procedures / Development of SOPs.	Paes (2004); Machado & de Almeida Camargo (2000); Ogden (2000)	3	3	A	3	2
ARC4. Error in labeling the identification of documents in the box	Paes (2004); Machado & de Almeida	4	5	D	2	4

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Risk Code and Description **Control Description**	**Literature**	**IR**		**EC**	**RR**	
		L	**I**		**L**	**I**
Supervision / Review of boxes before storage.	Camargo (2000)					
ARC5. Label not properly fixed to the box, allowing detachment and loss of label Review of boxes before storage.		3	4	IA	3	4
ARC6. Failures in document review Review by qualified personnel / Access to specialists for questions.	Schellenberg (2002)	4	5	D	3	3
PHASE: DOCUMENT STORAGE (DS)						
DS1. Storage of boxes on incorrect shelves Daily review by peers.	Ogden (2000); Machado & de Almeida Camargo (2000)	2	3	D	2	2
DS2. Contamination of clean boxes during storage Allocation of boxes in quarantine on separate shelves / Allocation of unexamined boxes on specific shelves.	Beck (2000); Machado & de Almeida Camargo (2000); Ogden (2000)	3	5	D	2	4
DS3. Damage to documents due to shelf overload with box weight None.	Ogden (2000); Machado & de Almeida Camargo (2000)	3	4	N	3	4
DS4. Use of inadequate furniture in document storage rooms Adjustment of existing furniture.	Pinto (2010); Pereira & da Silva (2016); Roncaglio *et al*. (2004); Beck (2000); Ogden (2000)	3	3	IA	3	2
DS5. Security failures at document locations allowing unauthorized access, theft, and vandalism Authorization of access only when accompanied by supervisors.	Pereira & da Silva (2016); Cruz Mundet (2008); Beck (2000); Machado & de Almeida Camargo (2000)	4	4	D	2	3

Legend: (IR) Inherent Risk; (RR) Residual Risk; (EC) Control Efficiency; (L) Likelihood; (I) Impact.

Table I. Risk Matrix. Source: The authors (2023).

The risk appetite is represented through a distinct color system:

- Red: Represents risks considered unacceptable. These are risks with substantial impact, requiring the implementation of mitigation controls.
- Orange: Indicates risks that are considered high but still manageable. They require improvements in controls within a short to medium term and constant monitoring.
- Yellow: Associated with risks that are within acceptable limits but require continuous vigilance. Although manageable, they should not be ignored and should be addressed in the long term.
- Green: Indicates acceptable or managed risks, as their impacts are considered minimal or easily controlled. They also represent risks where efficient controls are in place.

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Figure 4 consolidates the inherent risks contextualized by risk appetite. The risks are represented by their codes and their descriptions are in Table I. A concentration of inherent risks is observed in categories of high likelihood and impact.

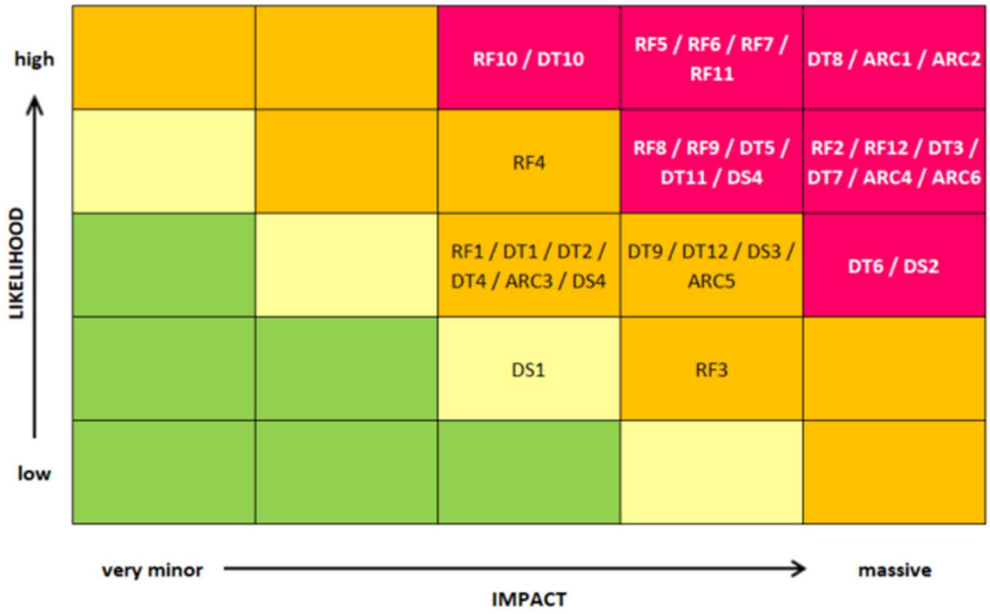

Figure 4. Inherent Risk Matrix. Source: The authors (2023).

The implementation of mitigating actions for these risks and the efficiency of the controls implemented regarding risk exposure stand out. The residual risk view, presented in Figure 5, demonstrates the current mitigation of several risks, whose codes are indicated in the figure and have their detailed descriptions in Table 1. However, it is observed that risk R6 still requires attention and intervention, as it has a high probability of occurrence with significant damage impact.

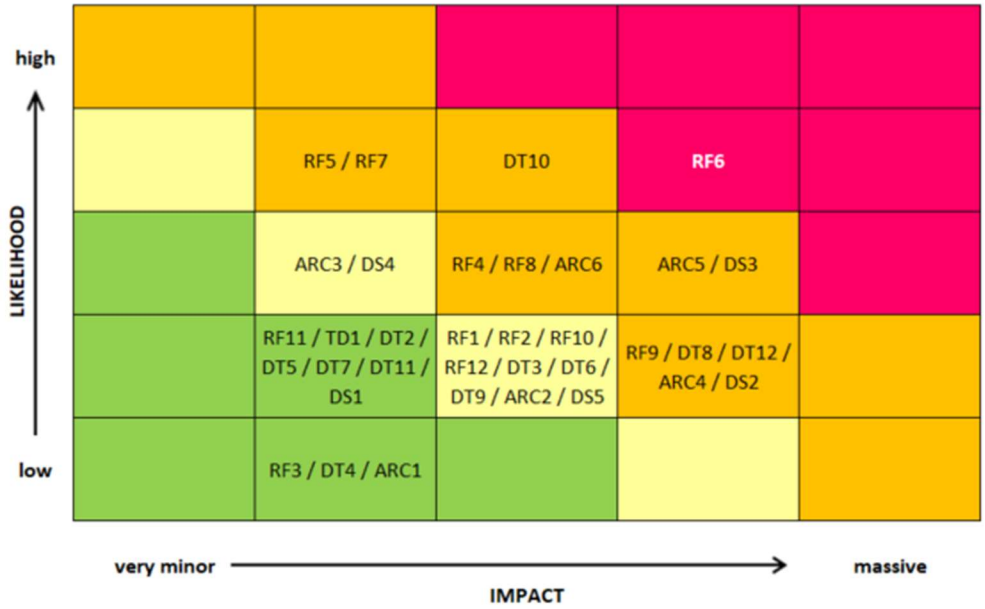

Figure 5. Residual Risk Matrix. Source: The authors (2023).

Twelve risks are in the risk zone with moderate likelihood or impact (orange area), indicating the need for attention and improvements in their controls in the short to medium term.

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6 CONCLUSIONS

Understanding and analyzing risk are increasingly crucial for the preservation of documents that chronicle the trajectory of an educational institution. In the face of unforeseen scenarios affecting its operations, even for routine matters, risk remains latent. The study identified significant patterns in the risk management of document preservation within the higher education institutions analyzed, emphasizing critical vulnerabilities and the effectiveness of mitigation measures across various phases of the document lifecycle.

The reception of documents phase demonstrated to be one of the highest concentrations of identified risks, particularly regarding the inherent probability of risk occurrence. However, it also exhibited the greatest efficiency in the implementation of mitigation controls, significantly reducing both the likelihood and impact of residual risks. This highlights the effectiveness of targeted strategies in addressing vulnerabilities at the point of document intake, where processes often involve human interaction and diverse file types, making it inherently susceptible to errors. The treatment of documents phase - together with the reception of documents phase, was one of the highest quantities of risk identified - achieved the lowest residual risk levels in terms of both probability and impact after the application of mitigation measures. This finding underscores the success of controls implemented during this phase, such as document cleaning, repair, and preparation for archiving, which are inherently procedural and standardized, facilitating effective risk reduction. Archiving was identified as one of the phases with the highest inherent risk impacts. The application of mitigation controls resulted in significant reductions in both probability and residual impact, representing the most substantial improvement across all phases. Nevertheless, this phase remains critical due to the long-term nature of document storage, where even minor lapses can lead to cumulative consequences over time. A notable exception was observed in the storage phase, where one risk remained without any mitigating action. This highlights a critical gap in the risk management process, potentially exposing institutions to long-term vulnerabilities, particularly in cases of environmental degradation and inadequate physical infrastructure, and, in other scenarios, in digital obsolescence.

Despite the successes in reducing residual risks, an important finding is that, with the exception of the reception phase, all other phases exhibited at least one inadequately addressed risk. This indicates inconsistency in the design or application of mitigating measures, which could stem from resource limitations, insufficient training, or gaps in policy enforcement. The results also highlight the differential impacts of mitigation controls across phases. The document storage phase experienced the lowest substantial improvement, demonstrating the difficulty of focusing investments in infrastructure and procedural safeguards. These findings underline the importance of phase-specific strategies in risk management, where the variability in the effectiveness of mitigation measures suggests a need for tailored approaches that address the unique characteristics of each phase.

This study makes significant contributions both theoretically and practically. Theoretically, it expands the understanding of risk management in the context of document management within Higher Education Institutions (HEIs) by examining inherent and residual risks across different phases of the document lifecycle. Furthermore, it integrates classical risk management concepts with document management practices, identifying specific risk patterns and contributing to the development of theories applicable to the educational sector. Practically, the study provides actionable guidelines and insights for educational institutions seeking to improve their document and risk management practices. The proposed risk matrix, combined with the risk appetite calculation, serves as a concrete tool for identifying, assessing, and prioritizing risks, enabling institutions to implement mitigation strategies more effectively. It also highlights critical phases, such as reception, archiving, and storage, allowing managers to allocate resources efficiently. Additionally, it showcases successful mitigation measures, such as those applied during the reception phase, which can serve as models for other phases. The analysis of mitigating controls and the calculation of residual risks further offers a practical framework for continuous improvements in risk management and document preservation.

This study opens opportunities for future research at various levels, with the aim of deepening and expanding knowledge about risk management in document preservation in Higher Education Institutions (HEIs). One possibility is to explore a broad approach to document management, analyzing the risks associated with all phases of the document life cycle, from creation to final destination, to identify vulnerabilities and opportunities for improvement. Another approach would be to investigate emerging risks related to the use of new technologies, such as cloud storage and artificial intelligence, considering their legal, ethical and operational implications. Comparative studies between different HEIs, both national and international, could also provide important insights, highlighting good practices and contextual particularities. Furthermore, future research could also focus on the temporal evolution of document risks, assessing how they change over time and how implemented controls behave in the medium and long term. A comparison

https://doi.org/10.6018/analesdoc.627881

between risk management methodologies, including quantitative, qualitative and hybrid approaches, could provide insights into the effectiveness of different models. Finally, investigations into the impact of document management failures on the student experience, such as delays in issuing diplomas or administrative problems, can demonstrate the practical relevance of risk management for fulfilling the mission of higher education institutions.

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