Application of Design Thinking in Digital Transformation in Human Resources in the Public Sector

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Abstract. The digital transformation of public sector organizations is often hindered by bureaucratic rigidity, inefficient processes, and resistance to change. This study explores how Design Thinking can drive innovation in the Department of People Management at the Court of Auditors, addressing these challenges through a user-centered approach. Using a mixed-methods methodology, the research combines qualitative interviews with people management leaders and quantitative surveys with employees to identify inefficiencies and co-develop solutions. Key pain points include complex leave request workflows, lack of integration with digital tools, and communication gaps. To tackle these issues, Design Thinking was applied iteratively, facilitating collaborative workshops, prototyping, and continuous stakeholder engagement to develop a more efficient, automated leave management system. This solution improved transparency, accessibility, and decision-making, reducing administrative burden and enhancing regulatory clarity. The findings indicate that Design Thinking fosters problem-solving, streamlines people management processes, and promotes adaptability within bureaucratic institutions. By embedding empathy, co-creation, and iterative problem-solving into digital transformation efforts, this approach enables sustainable innovation in public sector organizations. The study contributes to the broader field of digital government by presenting a replicable framework for modernizing people management practices. Future research could assess the long-term impact of these interventions and explore their applicability to other domains of public administration, ensuring continuous improvements in efficiency, service delivery, and user experience.

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1. Introduction

A public sector consists of government entities and state-controlled institutions responsible for governmental functions, regulation, and provision of public services Lane, 1993. Identifying the needs of this sector is crucial to formulating and improving effective public policies, allowing for the appropriate allocation of resources and efforts to efficiently and targetedly meet society's demands Nigro, 1984. However, the bureaucracy inherent to these sectors can make internal processes slow, compromising their effectiveness Cardoso Jr, 2011. To overcome this challenge, the introduction of technology has proven to be relevant, providing greater agility to processes de Oliveira et al., 2012; Haug et al., 2024.

When we understand that the concept of ”public sector innovation” goes beyond the Schumpeterian vision, centered on a manufacturing logic Schumpeter, 1982, and begins to incorporate a perspective focused on services Jæger, 2013, we realize that the value to be delivered must be co-created with users Trischler and Scott, 2016. The capacity for co-creation becomes an indispensable factor for the development of innovations in public services that truly meet the demands of citizens Voorberg et al., 2015. Voorberg, Bekkers and Tummers Voorberg et al., 2015 highlight that co-creation involves everything from the engagement of citizens in the formulation of the service (as co-initiators) to their participation in the design and delivery of content (as co-developers).

The growing need to consider users as co-creators of value in public services poses a series of challenges to public management, which needs to transform itself into a more open and collaborative system. As a result, new methodologies become essential to allow users to co-create the experience they want to have Hanelt et al., 2021; Trischler and Scott, 2016.

To address these issues more effectively, the application of design thinking emerges as an innovative approach. By incorporating empathy, collaboration and creativity into the process of identifying requirements, design thinking provides a more holistic and user-centered way to solve these challenges Melo and Abelheira, 2015. At the heart of this approach is the concept of design thinking, a mindset that transcends the mere literal interpretation of a designer, implying the use of methods adapted to individual needs and making use of available technologies to create value for the user Silva et al., 2012. Furthermore, the application of design thinking results in effective problem-solving, differentiating itself from other approaches that often limit themselves to formulating the problem without achieving a concrete solution Martin, 2009.

In this context, the Court of Auditors of the State of Pernambuco (TCE-PE), the institution responsible for monitoring and auditing public resources in the state, has chosen to make significant investments in technological innovation. The goal is to speed up and improve its internal processes, aiming at a more efficient and transparent management of public resources. However, the court’s employees often face challenges in explaining and articulating complex everyday issues, which can result in inadequate and ineffective solutions. The study focuses on using the Design Thinking approach to guide innovation in the Human Resources Department of the Court of Auditors of Pernambuco, aiming to reduce the rigidity intrinsic to institutional bureaucracy. Through this approach, we seek to develop an efficient, intuitive solution adapted to the needs of employees and, as a consequence, disseminate the technique and promote improved deliveries to society, in addition to improving people management processes, automating tasks, integrating information, facilitating data analysis and promoting greater agility and effectiveness in related activities.

2. Related Works

The rapid changes taking place in the contemporary world and the recognition of the limitations of the dominant model of public policy implementation (policymaking) point to the need to discuss the possibilities that open up for public administration, based on the incorporation of design thinking principles and their contributions both to a better understanding of public problems and to the construction of more effective government solutions. However, we still lack structured knowledge about this co-creation approach, especially how it fits into current policymaking practices and public organizations Cavalcante et al., 2019.

Based on this, governments around the world have sought support from this framework to implement co-creation processes (Ansell and Torfing, 2014). In Brazil, Santos and Hoffmann Santos and Hoffmann, 2016 conducted research with the aim of proposing a methodology for the design and implementation of more effective public services, applied in the context of a project in the city of Florianópolis, based on the concepts of Service Design and Project Management. In addition, Cavalcante Cavalcante et al., 2019 organized a collection that enriched the debate on the culture of innovation in Brazil, by presenting and discussing cases that implement innovative methods and approaches to management and public policies in different sectors and levels of government.

On the other hand, Voorberg et al. Voorberg et al., 2015 highlight the lack of empirical knowledge on co-creation, in addition to the scarcity of evidence that positions it as a significant strategy. These authors also raise important questions, such as the objectives of co-creation with citizens, the factors that influence the process and the expected results.

Trischler and Scott Trischler and Scott, 2016 add to these questions the lack of studies on user engagement methods in service design in different contexts of the public sector. Similarly, Cavalcante Cavalcante et al., 2019 highlights that, despite the progress in Brazil in the development of materials and in the training of civil servants to disseminate design thinking in government, it is necessary to understand its principles in greater depth in order to promote and incorporate this approach effectively. For Cavalcante Cavalcante et al., 2019, there is still a lack of structured knowledge on how this approach fits into the current practices of public organizations.

3. Methodology

Improving people management processes is a fundamental objective for organizations seeking efficiency, productivity and innovation. In the context of the Court of Auditors of Pernambuco, this improvement becomes even more crucial, given the strategic role played by this body. To achieve this objective, this study adopts a rigorous and comprehensive approach, centered on the application of a mixed research methodology. The core of this approach lies in the combination of quantitative and qualitative methods, allowing for a complete and multifaceted understanding of the challenges and opportunities faced in the area of people management. This article outlines the steps and procedures adopted to conduct this research, highlighting the importance of each phase and the synergy between them to achieve the proposed objectives.

Through in-depth interviews and questionnaires, we sought not only to identify gaps and areas for improvement in existing processes, but also to understand the perceptions and experiences of the managers and professionals involved. This in-depth understanding serves as a basis for proposing effective and sustainable solutions, aligned with the specific needs and realities of the Court of Auditors of Pernambuco.

By adopting an exploratory-sequential approach, starting with a qualitative investigation and expanding to a quantitative analysis, we hope to obtain valuable and informed insights into the challenges and opportunities in people management in this context.

3.1. Objective of the Study

By exploring the steps, this article aims to understand the application of design thinking in the redesign of public products and services, and as a consequence, disseminate the technique and promote the improvement of deliveries to society.

The ultimate goal of this study is to show how innovative co-creation solutions can be adopted in public environments to automate tasks, integrate information, facilitate data analysis and promote greater agility and effectiveness in the services provided to society.

3.2. Study Type

This is a mixed-methods study, combining quantitative and qualitative methods to obtain a comprehensive understanding of people management processes. The study adopted an exploratory-sequential design, where the qualitative phase precedes the quantitative phase. First, interviews were conducted to explore in depth the perceptions of people managers, since the researchers were unaware of the current problems in the court of auditors. The main objective was to identify what the main problems were and their order of priority given the needs of the managers. The interviews with the managers took place every two weeks and a questionnaire was carried out with the employees in order to obtain a diversity of perspectives in the sector.

3.3. Sample

The sample was composed of two distinct groups:

- **Interviews:** 7 people managers were intentionally selected to participate in the interviews. The selection was based on their experience and knowledge about the people management processes in their respective organizations. It was also considered that it would carry out the management process of authorizing vacation requests.
- **Questionnaires:** 48 professionals in the area of human resources management responded to the questionnaire. In order to map the main problems that vacation requesters had.

3.4. Data Collection

The data was collected in two distinct phases:

- **Qualitative Phase:** Semi-structured interviews were conducted with the 7 human resources managers between March and October 2023. Each interview lasted an average of one hour and was recorded and transcribed for later analysis.
- **Quantitative Phase:** A structured questionnaire was distributed to 48 human resources management professionals during June 2023. The questionnaire included closed-ended questions and Likert scales to measure perceptions about the effectiveness of human resources management processes and the use of automated technologies.

3.5. Research Instruments

- **Recording and Transcription of Interviews:** The interviews were recorded via Google Meet with the consent of the participants and later transcribed for analysis.
- **Analysis and Synthesis of the Questionnaires:** The questionnaires were analyzed quantitatively to create empathy and persona maps.

3.6. Procedures

- **Interview Preparation:** The interviews were conducted in person or via videoconference, depending on the availability of the participants.
- **Questionnaire Development:** The questionnaire questions were developed based on the results of the interviews with the managers, since they also requested vacations from the court.
- **Qualitative Data Analysis:** The interview transcripts were analyzed to map problems in the processes, identify solutions, and define new rules for requesting vacations.
- **Quantitative Data Analysis:** The questionnaire data were analyzed and inferential analyses were performed to identify significant correlations and differences in the participants' perceptions.

4. Application of Design Thinking to Promote Digital Transformation

To achieve the objectives proposed in this study, an approach based on design thinking will be adopted, a human-centered methodology that promotes innovation through multidisciplinary collaboration, empathy and iterative experimentation Brown, 2009. Design thinking is composed of a series of interconnected steps, which will be followed in this project to guide innovation in the Human Resources Department of the Court of Auditors of Pernambuco. Figure 2 illustrates the application of Design Thinking to promote digital transformation.

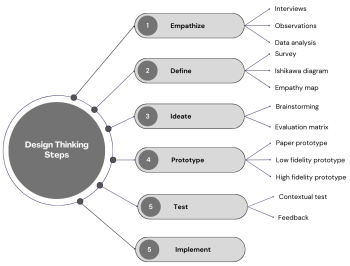

Fig. 1 – Stages in the Development of Design Thinking.

4.1. Empathic Understanding.

4.1.1. Preparatory phase:

Relevant information about the organization was gathered to understand the activities provided, the organizational structure, the organization of workflows, and the management maturity of the agency. The research

team conducted an initial survey with the main stakeholders in order to understand the organizational problems and the context of the work of the employees, as well as the suggested units. From this meeting, it was possible to identify a scope of the main problems faced by the DGP management, as well as to prioritize them.

4.1.2. Kick off:

After defining the scope, together with the confirmation of the research schedule, the data collection activities were formally initiated through meetings that would occur biweekly a priori, and could be scheduled weekly when necessary. This meeting will be attended by the project coordinators from UFRPE, the agency to be dimensioned TCE-PE and the units involved and will be held from March to August 2024. During these meetings, in addition to presenting the objectives and the expected schedule for data collection, the teams from the agency and UFRPE will ask the managers of the selected organizational units to appoint a supporter to their teams. This supporter will streamline contacts during the data collection process and will serve as a collaborator formally appointed by the manager to assist in subsequent tasks.

In order to ensure the efficiency of the meetings, the team from the organizational unit that will be present at the interviews may be composed only of the manager and the designated supporter. Alternatively, other people from the unit may participate, as long as they are appointed by the manager and there is an explicit justification for the need for their support. The presence of these individuals will be conditioned on the justification presented by the manager.

During the closing of the inaugural meeting, the manager of the organizational unit will be asked to fill out a document, with or without the support of members of his/her team, within the deadline agreed upon during the meeting, not exceeding seven days. This document aims to collect preliminary information about the processes and deliverables carried out by the organizational unit. This information will be analyzed by the researchers to optimize the next meetings and guide the next steps of the research process.

This stage consisted of 4 meetings and the table 1 illustrates the main issues faced in the process were identified.

Issue	Description
Process Complexity	The existence of many steps and signatures in the leave request and authorization process can make the workflow bureaucratic and time-consuming, leading to dissatisfaction and delays for employees.
Lack of Integration with Work Calendar	The absence of a functionality that allows the leave system to integrate with the employees' work calendar can result in incorrect calculations of the leave period to be paid, causing rework and manual adjustments.
Difficulties in Leave Accounting	The system's difficulty in correctly accounting for employees' return dates from leave can lead to incorrect payments and inconsistencies in records, causing financial and administrative impacts.
Accumulation of Employee Leave	The occurrence of leave accumulation by employees, even though it is prohibited, can generate future issues related to labor liabilities and negatively impact the organization's leave management.
Inadequate Communication	The lack of clear and transparent communication about the rules and procedures of the Leave Schedule System can create doubts and misunderstandings among employees, making it difficult to comply with established policies.

Tab. 1 – Issues in the Leave Management System

4.2. Problem Definition.

From the empathy phase, we moved on to problem definition, where the main objective of this stage was to clearly and objectively establish the scope of the problem to be solved, ensuring alignment among all those

involved in the process. An in-depth understanding of the problem is essential for us to be able to develop effective solutions that are in line with the reality of the users.

To structure the analysis of the problem, we used the Ishikawa Diagram, also known as the cause and effect or fishbone diagram. This tool allowed us to map the possible causes of the problem in a visual and organized way, identifying factors such as processes, people, tools, methods and environment that directly impacted the situation under study. This artifact made it possible to prioritize the most relevant causes and helped in formulating initial hypotheses for the next stage.

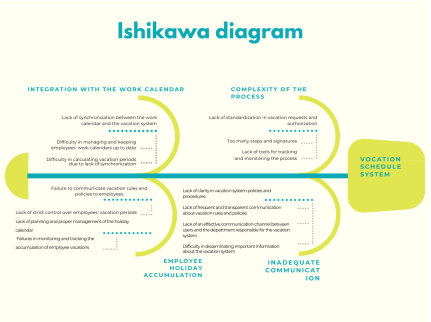

Fig. 2 – Ishikawa Diagram

In addition, we turned our attention to a more in-depth understanding of the users impacted by the process under study. The focus was to consolidate the information collected and validate whether the initial perception of the problem corresponded to the reality of all those involved.

We began this process with users from the DGP (Human Resources Management Department), where we created an Empathy Map and a Persona to represent this group. These two artifacts were essential to understanding their pain points, needs, expectations and behaviors in relation to the problem.

To validate this understanding, we created a form with pertinent questions, seeking to understand whether the DGP's perceptions were shared by others involved in the vacation request and management process. The form was widely distributed among employees and managers, and its analysis generated two new Empathy Maps and two new Personas, expanding our view of the problem and ensuring that the proposed solutions were based on different perspectives.

User Type	Stakeholders Summary
HR Personnel (DGP)	Maya hears that due to the low effectiveness of the current system, vacation days are accumulating. She feels frustrated with the rigid process and wants improvements. She constantly reviews requests and deals with heavy rework. She sees that technology in other areas is effective. Maya, 27, works in HR. She manages vacation requests and needs to integrate them with payroll. She ensures compliance with regulations and avoids excessive vacation accumulation. She is tech-savvy and aims to make the tool more user-friendly.
Employee	Lisa desires system integration and a mobile app for vacation tracking. She values flexibility and clear rules but struggles with the current complex system. She seeks an intuitive interface and shared calendars. Lisa, 27. She wants a simpler vacation request process, mobile access, and notifications. She struggles with process complexity and unclear information but sees opportunities in system improvements.
Manager	Carla hears employee concerns about work-life balance. She wants better internal communication about vacation policies. She feels pressure to manage requests fairly and is frustrated by the lack of clear visibility on vacation balances. Carla, 42, is a team manager. She needs detailed reports on vacation balances, efficient request coordination, and compliance with labor laws. She values technology solutions to automate notifications and decision-making.

Tab. 2 – Stakeholders Summary

These artifacts were essential to deepen our understanding of the problem and ensure that the proposed digital transformation was truly user-centric, meeting their needs and resolving the identified pain points.

4.3. Ideation.

In this step, a collaborative brainstorming session was conducted to generate a wide variety of creative ideas to solve the identified problem. All ideas were welcome and will be explored without initial criticism, encouraging innovation and creativity. This phase focused on generating ideas and solutions to the identified problems. Initially, we conducted a group brainstorming session, where we discussed various measures that could be implemented to solve the challenges faced. During this session, we explored different approaches and considered different perspectives to ensure a wide variety of ideas.

To evaluate the generated ideas, we constructed a solution matrix(see tab. 3). In this matrix, the Y-axis represented the expectations gathered from customers and stakeholders, while the X-axis represented the overall proposals developed by the team. Each idea was evaluated and scored according to its feasibility and alignment with the expectations of those involved. Based on the selected ideas, we moved forward to creating a prototype. The prototype served as a tangible representation of the proposed solution, allowing for a better visualization and understanding of how the solution would work in practice. This artifact was fundamental in directing the subsequent development of the solution, ensuring that it met the needs and expectations of end users.

	Current system	BPMN	Application
Feasibility	x	o	o
Usability	x	x	o
Maintainability	x	o	o
Monitoring	x	x	o

Tab. 3 – Evaluation Matrix

4.4. Testing and Evaluation.

In the testing and validation phase, the developed prototype underwent a series of rigorous evaluations to ensure its effectiveness and usability. These tests were conducted with users representative of the target audience, allowing the identification of possible flaws and areas that needed improvement. In addition, the prototypes were evaluated in a simulated or pilot environment with the collaboration of the Human Resources Department. User feedback was carefully collected and analyzed to measure the effectiveness and usability of the proposed solutions. Based on the results obtained, the prototypes were adjusted and refined as necessary until the final version of the product was reached.

4.5. Implementation and Iteration.

After the successful validation of the prototype, the project was forwarded to the software factory for the development of the final solution. This stage marked the transition from the design and prototyping stage to the practical implementation of the solution, where developers would work to transform the prototype into a functional and robust application. The involvement of the software factory at this stage would ensure that the prototype specifications and requirements are properly translated into code, culminating in the delivery of a final solution aligned with the expectations and needs of the end users and stakeholders involved in the project. Finally, the validated solutions will be implemented in the HR department's work environment. During this phase, special attention will be given to employee training and the integration of new practices into the existing workflow. In addition, a continuous monitoring and evaluation plan has been established to identify opportunities for improvement and iterate on solutions as needed.

5. Discussion

The results of this study demonstrate the effectiveness of applying the design thinking methodology to innovate people management processes at the Court of Auditors of Pernambuco. The approach allowed for a deep understanding of the needs and challenges faced by the department, promoting user-centered solutions that aim to increase the efficiency and effectiveness of the activities carried out.

5.1. Empathetic Understanding

The empathetic understanding phase was crucial to identify the particularities of the Court of Auditors of Pernambuco. The initial research and interviews allowed for a detailed diagnosis of the organization, facilitating the classification of the agency and the definition of the units and services to be dimensioned. This initial diagnosis guided all subsequent steps, ensuring that the solutions developed were appropriate to the specific context of the organization.

5.2. Problem Definition

The problem definition stage was essential to synthesize the information collected and identify the main challenges to be addressed. The collective interviews and the analysis of the documents submitted by the managers of the organizational units provided a clear overview of the internal activities and processes. This detailed understanding allowed the formulation of well-defined problems, which served as a basis for the ideation of innovative solutions.

5.3. Ideation

The collaborative brainstorming session generated a wide variety of creative ideas to solve the identified problems. The use of a solution matrix allowed the evaluation and prioritization of the ideas based on feasibility and alignment with the expectations of the stakeholders. This process ensured that the selected solutions were not only innovative, but also practical and aligned with the needs of the end users.

5.4. Prototyping

The low and high fidelity prototypes developed during the prototyping phase were essential to test and refine the generated ideas. The use of mood boards and the incorporation of elements from existing tools, such as Google Calendar, ensured that the prototypes were intuitive and familiar to the users. This iterative approach allowed the prototypes to evolve based on employee feedback, resulting in solutions that were well-tuned to the real needs of the organization.

5.5. Testing and Evaluation

The testing and evaluation phase validated the effectiveness and usability of the developed prototypes. Testing conducted with representative users and in simulated environments allowed identifying areas for improvement and adjusting the prototypes as needed. This rigorous validation process ensured that the final solution was robust and aligned with the expectations of users and stakeholders.

5.6. Implementation and Iteration

The implementation of the validated solutions in the HR Department's work environment marked the transition to practice. Employee training and integration of the new practices into the existing workflow were essential to ensure successful adoption of the developed solutions. The established continuous monitoring and evaluation plan will allow identifying opportunities for improvement and iterating on the solutions as needed, ensuring the sustainability and effectiveness of the implemented innovations.

5.7. Practical Implications

The results of this study have significant practical implications for HR management in the public sector. The human-centered approach and iterative design thinking methodology have proven to be effective in solving complex problems and fostering significant innovations. The application of this methodology can be extended to other areas and organizations, contributing to the continuous improvement of public processes and services.

5.8. Lessons Learned

Throughout the collaboration between TCE-PE and UFRPE to improve people management processes, several crucial lessons were learned:

1. **Stakeholder Engagement:** Actively involving leaders and employees from the beginning was essential to align initiatives with strategic objectives. Engaging stakeholders not only ensured their support, but also fostered a sense of ownership and commitment to the success of the project. Their contributions provided valuable insights into the organization's priorities and helped shape solutions to meet specific needs.

2. **Comprehensive Data Collection:** Employing diverse data collection methods, focus groups, surveys, and online forms, enabled a holistic understanding of employee needs. By bringing together data from multiple sources and perspectives, including quantitative and qualitative data, a comprehensive view of the challenges and opportunities within the organization was obtained.
3. **Rigorous Data Analysis:** Applying rigorous qualitative analysis techniques, such as Thematic Synthesis, facilitated the accurate identification of key patterns and issues. By closely examining the collected data, themes and trends emerged, enabling a deeper understanding of the causes of problems and guiding the development of targeted solutions.
4. **Interdisciplinary Collaboration:** Working with a multidisciplinary team enriched problem-solving with diverse perspectives. Bringing together experts from different disciplines, including HR, IT, psychology, and business management, encourages innovative thinking and creative approaches to problem-solving. This interdisciplinary approach ensured that solutions were robust and addressed the multifaceted nature of organizational challenges.
5. **Stakeholder Validation and Feedback:** Incorporating stakeholder feedback increased the relevance and acceptance of proposed solutions. By soliciting input from those directly impacted by the changes, solutions were tailored to meet their specific needs and preferences. Stakeholder validation also fostered a sense of inclusion and transparency throughout the project.
6. **Prioritization:** Setting clear priorities based on the severity of issues allowed for effective resource allocation. By identifying and prioritizing the most pressing issues, resources could be directed to areas with the greatest potential for impact. This strategic approach ensured that efforts were focused on addressing the organization's most critical needs.
7. **User-Centered Solutions:** Prioritizing user experience promoted greater engagement and adoption of implemented solutions. By designing solutions with end-users in mind, usability and accessibility were prioritized, leading to higher levels of acceptance and satisfaction among employees. User-centered design also encourages ongoing feedback and iteration to constantly improve the user experience.
8. **Commitment to Continuous Improvement:** Maintaining a mindset of continuous improvement ensured that solutions remained relevant to evolving needs. Recognizing that organizational needs and priorities change over time, a commitment to continuous evaluation and refinement was essential. This iterative approach allowed solutions to be adapted and optimized to meet emerging circumstances and challenges.

These lessons underscore the importance of a collaborative, data-driven, and user-centered approach to improving people management processes at TCE-PE.

6. Conclusion

This study explored the application of the design thinking methodology to improve people management processes at the Court of Auditors of Pernambuco. Through a human-centered approach that involved empathy, multidisciplinary collaboration, and iterative experimentation, it was possible to develop innovative and effective solutions to the challenges faced by the Human Resources Department.

The empathetic understanding phase allowed a detailed diagnosis of the organization, identifying specific needs and challenges. The clear definition of the problems, based on interviews and document analysis, provided a solid basis for the generation of innovative ideas during the ideation phase. Iterative prototyping, with continuous feedback from users, ensured that the solutions developed were well-adjusted to the real needs of the organization.

Rigorous testing and evaluation of the prototypes validated the effectiveness and usability of the solutions, while practical implementation and employee training ensured successful adoption of the new practices. The established continuous monitoring plan will allow constant adjustments and improvements, ensuring the sustainability of the innovations.

The results of this study indicate that the design thinking methodology is an effective approach to solving complex problems in people management in the public sector. The adoption of this methodology can promote greater agility, efficiency and employee satisfaction, contributing to the continuous improvement of organizational processes.

However, it is important to recognize the limitations of this study, such as the relatively small sample size and the need for long-term follow-up to assess the full impact of the solutions implemented. Future studies can expand the application of design thinking to other areas and sectors, as well as explore different organizational contexts, to validate and expand the findings of this work.

In short, this study demonstrated that human-centered innovation, promoted by design thinking, can significantly transform people management, providing practical solutions that are adaptable to the specific needs of each organization.

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