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Article

Assessing the Impact of Digital Tools on the Recruitment Process Using the Design Thinking Methodology

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Abstract: This study explores the information–communication discourse in modern recruitment by applying the Design Thinking (DT) methodology to enhance employee selection and integration strategies. By incorporating digital tools and empathetic approaches, this study examines innovative practices that improve candidate experience and ensure alignment with organizational culture. This study follows the DT framework, encompassing empathy, problem definition, and ideation, with a research sample including candidates, employees, and HR professionals. Methods such as desk research, interviews, diary methods, and P/C matrix diagonalization, supported by original metrics, assess the effectiveness of these approaches. The findings highlight that digital tools, particularly gamification and online assessments, significantly enhance recruitment quality, increase efficiency, reduce hiring time, and improve cultural alignment. Additionally, this study develops informational constructs of knowledge, skills, and attitudes, offering deeper insights into key factors for successful hiring. By integrating new media and technological solutions, this research contributes to transforming traditional recruitment practices into more candidate-centred processes. Further evaluation through complementary studies is recommended to determine the long-term impact of digital tools on recruitment outcomes and employee selection success.

Keywords: design thinking; recruitment; information–communication discourse; digital tools; informational constructs



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1. Introduction

The recruitment and selection process is crucial for the successful functioning of organizations, yet traditional selection methods are often time-consuming, inefficient, and fail to meet the needs of both candidates and organizations. In today's corporate environment, characterized by rapid changes and intense competition for talent, innovative approaches to human resource management have become a necessity. Digitalization has proven to be a key factor in shaping how companies manage resources, engage with clients, and incorporate sustainability into their business models (Manuti & Pasquale, 2017). Technologies such as the Internet of Things (IoT), artificial intelligence (AI), and blockchain are revolutionizing resource management by enhancing transparency and simplifying administrative processes (Rončević et al., 2024). Within this context, digital technologies—including the IoT, big data, AI, virtual and augmented reality, and digital platforms—exert a powerful transformative influence, fundamentally redefining value creation (Dragičević et al., 2023).

Advancements in information and communication technologies have transformed recruitment, selection, and hiring processes, prompting organizations to adopt contemporary methods that reduce costs, enhance efficiency, and strengthen competitive advantages

(Bašić & Ćulibrk, 2021; Abuladze & Hasimi, 2023; El Ouakili, 2025). Gamification has also emerged as an innovative technique to engage candidates and improve the effectiveness of recruitment strategies, making the process more dynamic and aligned with modern candidate expectations (Vorecol, 2024). Holm's (2009) research suggests that e-recruitment increases the number of applications, shortens the time from job advertisement to offer acceptance by two-thirds, and reduces costs. The integration of new technologies into the selection and hiring process enables organizations to make faster, more accurate, and more objective decisions, improving the candidate experience and increasing the efficiency of HR processes (Albassam, 2023). The DT methodology, which fosters creative problem-solving, innovation development, and user-centricity, represents a potential solution for optimizing these processes (T. A. Kelley, 2001; Martin, 2009; Rauth et al., 2010; Liedtka, 2014b; Glen et al., 2015; Kolko, 2015; Beckman, 2020; Björklund et al., 2020; Johann et al., 2020).

This paper distinguishes between two key terms: the DT method and the DT methodology. DT as a method refers to a way of thinking that combines analytical and intuitive approaches, emphasizing empathy, creativity, and the iterative adaptation of solutions based on user needs (Brown, 2009; Dunne, 2018). It does not rely on traditional scientific research instruments such as surveys but rather employs observation and interaction to gain a better understanding of the user experience (Ní Shé et al., 2021; Li et al., 2018). This aligns with the idea that Design Thinking fosters user-centred problem-solving by engaging directly with stakeholders in real-world contexts (Brown, 2009; Baran, 2017). On the other hand, DT as a methodology entails a structured process consisting of five clearly defined stages: empathy, definition, ideation, prototyping, and testing (Mariani et al., 2025). This approach is widely recognized for developing innovative solutions through iterative testing and refinement (Alqahtani, 2022). The methodological framework of Design Thinking enables organizations to integrate creativity into their strategic decision-making while maintaining flexibility to adapt based on feedback (Baran, 2017).

Design Thinking (DT) methodology, originating from product and service design practices, has gained increasing attention in broader business contexts. Brown (2009) emphasizes DT's focus on user empathy, making it particularly suitable for addressing complex problems such as recruitment processes. Cross (2011) highlights how DT enables the creation of innovative solutions through collaboration and iterative approaches, crucial for adapting recruitment processes to dynamic labour markets.

In the context of human resource management, Liedtka and Ogilvie (2011) argue that applying the DT methodology can enhance processes through a better understanding of candidate and organizational needs. The authors suggest that empathy towards candidates can be used to shape experiences that improve their satisfaction during the selection process. Thus, the use of the DT methodology encourages the development of more empathetic thinking and effective strategies for facing challenges, particularly those inadequately addressed by traditional rational-analytical approaches (Micheli et al., 2019).

Recent academic research underscores the transformative potential of Design Thinking in HR practices. Sivathanu (2019) demonstrates how organizations like Airbnb have leveraged Design Thinking principles to improve employee experience while achieving competitive advantage through innovative HR practices such as cultural transformation programmes. Zafar et al. (2023) explore how predictive workforce analytics combined with Design Thinking can enhance training evaluation practices by enabling evidence-based decision-making in workforce management. Piwowar-Sulej and Austen (2021) highlight how Design Thinking can be applied strategically to improve the image of HR departments by fostering collaboration across organizational units. These studies collectively illustrate how Design Thinking contributes not only to operational efficiency but also to strategic alignment between employee satisfaction and organizational goals.

Design Thinking is a creative, non-linear process used for innovation. While non-linear, it is important to note that this does not mean there are no specific steps to follow for the process to be effective (Baričević Debeleć & Luić, 2023). This human-centred approach allows designers and teams to better understand user needs and develop relevant and useful solutions. Essentially, DT combines creativity with a structured approach, resulting in innovative ideas and products.

The application of the DT methodology has recently expanded beyond its traditional use in product and service design (Antoljak & Kosović, 2018). After being extracted from the design context, DT has become a significant concept in management and innovation research (Johansson-Sköldberg et al., 2013). Through a sequence of steps such as empathy, problem definition, ideation, prototyping, and testing, DT enables teams to explore different perspectives and develop solutions that meet real user needs.

Existing studies (Brown, 2009; Kimbell, 2011; Brown & Martin, 2015; Liedtka, 2014a; Carlgren et al., 2016) indicate the benefits of this methodology, including increased participant engagement and a better understanding of end-user needs. The user-centric focus allows for a better understanding of their needs, thoughts, emotions, and motivations, which forms the basis for shaping and redefining problems and generating ideas. The process of shaping and redefining problems is crucial for seeing new perspectives, while idea generation develops creative solutions (Au, 2024).

However, the application of DT in the recruitment process and its implementation in human resources is insufficiently researched, particularly in the context of aligning candidates with organizational culture and optimizing selection procedures using digital tools.

Van Aken and Chandrasekaran (2015) highlighted that DT is particularly useful in solving problems that require balancing human and technical aspects. Their research suggests that the iterative prototyping process can help identify the most effective recruitment approaches, especially when the goal is to reduce employee turnover. Schrage (2014) adds that experimenting with inexpensive prototypes allows organizations to test new recruitment methods without significant investments. This is particularly relevant in the context of developing digital tools that can support the selection process, such as online interview platforms or applicant tracking systems (ATSs).

2. Materials and Methods

2.1. Research Problem

The research problem in this study focuses on understanding how the application of Design Thinking (DT) methodology can enhance the employee recruitment and selection process. Specifically, it investigates the extent to which innovative tools, such as gamification and digital platforms, can improve candidate experience, increase selection efficiency, and reduce the mismatch between candidates and organizational culture. While there are indications of the usefulness of such approaches, comprehensive research exploring their impact and providing guidelines for their practical implementation is lacking.

Traditional recruitment processes face numerous challenges, including lengthy selection procedures, candidate misalignment with organizational culture, and the frequent inability to select the best candidate for a given position. These issues can result in high employee turnover rates, reduced team productivity, and increased recruitment costs. With the increasing presence of technology and digital tools in recruitment processes, an opportunity arises to implement innovative methodologies that can improve the selection process, increase efficiency, and ensure better employee alignment with organizational values. However, despite DT's potential, existing research rarely explores its application in this specific context.

The lack of integration of empathetic and creative approaches in recruitment processes creates an opportunity to investigate how DT can address these challenges. It is crucial to understand how this methodology can expedite the selection process, increase precision, and ensure the selection of the best candidate for a specific position. To address these challenges, this study establishes a general research objective and three specific objectives derived from it, aimed at analysing key aspects of applying the DT methodology in the recruitment process.

The general objective of this research is to determine the “impact of digital tools and Design Thinking methodology” on the selection process, employee alignment with organizational culture, and the accuracy of candidate selection, while the specific objectives are defined below:

C1. Analyse the impact of digital tools on the selection process and time to hire.

C2. Examine the influence of Design Thinking’s iterative approach on employee alignment with organizational culture.

C3. Evaluate how the application of the Design Thinking method improves the precision of selecting the best candidates.

Each specific objective is directed at investigating different aspects of DT application in HR processes and is therefore associated with a corresponding hypothesis to be tested during the study:

H1: *Digital tools improve the quality of the selection process and reduce time to hire.*

(Explanation: Digital tools, such as automated selection platforms, data analytics–big data, and artificial intelligence, enable the faster and more efficient processing of candidate applications. The use of these tools can shorten the time required for resume analysis, pre-selection, and interviews, thus reducing the duration of the selection process. Additionally, digital tools allow for a faster connection with candidates, improving the speed of the entire recruitment process. This hypothesis is based on the belief that digitalization makes the selection process more efficient and precise, shortening time to hire and enabling organizations to find suitable candidates more quickly).

H2: *The iterative approach of Design Thinking improves employee alignment with organizational culture.*

(Explanation: DT uses an iterative approach that focuses on understanding user needs, testing solutions, and adapting them based on feedback. When applied to the selection process, this approach allows for a better understanding of candidates through multiple iterations, interviews, and testing. Through this process, the organization can better assess how a candidate fits into its culture and values. By using empathy and testing through DT, organizations can better understand candidates’ personal characteristics and their ability to align with the specifics of organizational culture, thereby improving alignment and reducing the risk of future mismatches).

H3: *The application of the Design Thinking method increases the precision of selecting the best candidates.*

(Explanation: The DT method focuses on creative problem-solving and a deep understanding of the needs of all stakeholders, including candidates. By using empathy in the research phase, DT allows organizations to better understand candidates’ motivation, values, and behaviour. The iterative process of testing and prototyping ensures that selection criteria and decisions are based on feedback. Using DT enables the selection of candidates based on their ability to respond to real challenges within the organization, thereby increasing the precision of selecting the best candidates who meet the organization’s needs).

2.2. Research Design

The pilot study of this research, which uses the DT methodology to optimize the recruitment process, employed a qualitative approach to collect relevant data, test new ideas, and evaluate results. This approach integrates multiple qualitative research methods to ensure a holistic analysis and optimization of the recruitment process. Secondary sources were searched using a systematic literature review (SLR) of the existing academic and professional literature, which is particularly effective for researching complex phenomena as it synthesizes existing knowledge and identifies research gaps (Kitchenham & Charters, 2007; Tranfield et al., 2003). In addition to the SLR, qualitative primary data collection was conducted through semi-structured interviews and diary studies, ensuring methodological triangulation. The snowball sampling method was employed to select the primary research sample, ensuring a diverse range of insights from companies in the construction sector in north-western Croatia. The study began by targeting four key participant groups: inexperienced workers, experienced workers, supervisors, and HR professionals. These groups were chosen to provide a comprehensive perspective on the recruitment and selection processes within the sector. As the study progressed, additional participants were identified through referrals, allowing for a broader and more representative sample. To evaluate cultural alignment, specialized questionnaires were used: the Organizational Culture Assessment Instrument (OCAI) (Cameron & Quinn, 2011) and Cultural Intelligence (CQ) Self-Assessment (Ang & Van Dyne, 2008). These tools enable a better understanding of how candidates fit into the organizational culture, values, and mission of the company.

After initial interviews, participants recommended other relevant individuals from their network, allowing for rapid recruitment and access to hard-to-reach groups. To ensure diversity and avoid bias, demographic and professional characteristics of participants were analysed, and targeted selection was additionally applied. Although the study does not employ traditional statistical validation, the robustness of the findings is ensured through method triangulation, the cross-validation of responses across participant groups, and iterative feedback loops. This approach aligns with qualitative research rigour, ensuring the internal validity and transferability of findings. This approach provided qualitative insights from key stakeholders, laying the foundation for further research phases and the development of innovative solutions in recruitment in the construction sector. Following the pilot study, the primary research study is planned, based on insights from the pilot study, and encompasses all 5 phases of DT. The validity of methods are assessed through continuous validation cycles, where each iterative phase of the DT process informs and refines the next, ensuring the cumulative confirmation of research insights. The goal is to confirm the validity of methods, collect representative data, and draw final conclusions. Table 1 presents the conceptual framework for the Design Thinking methodology in improving worker experience in the construction sector.

Table 1. A description of the concept and methodology of the DT process in 3 steps.

Steps	Concept Description	Methodology
1. Empathy	Understand the challenges and needs of all participants in the selection process in the construction sector.	-Desk method, interviews, diary method with HR professionals, shift managers, and workers -Snowball method for gathering diverse perspectives
2. Define	Clearly define key problems in the selection process and create meaningful guidelines for improvements.	-Diagonalization of Process/Class (P/C) Matrix for problem analysis and solution prioritization -Grouping key needs and defining selection problems

Table 1. *Cont.*

Steps	Concept Description	Methodology
3. Ideate	Generate innovative solutions to optimize selection, reduce hiring duration, and improve candidate–organization alignment.	-Virtual brainstorming and post-it notes in MIRO tool -Generating ideas on the question: “How can digital tools accelerate and improve the selection process?” -Sketching digital solutions for selection optimization

The Design Thinking (DT) approach comprises five key phases of the design process: empathy, define, ideate, prototype, and test (Brown, 2009; Stanford d.school, 2010; D. Kelley & Kelley, 2013). In this study, the preliminary research focuses on implementing the first three phases. The empathy phase forms the foundation of the user-centred approach, enabling a deeper understanding of user needs and challenges. Three methods were applied in this study: an analysis of the available relevant literature (desk research), one-on-one interviews, and the diary method. Utilizing these techniques provided insight into users’ thought processes, their requirements, and existing challenges in the recruitment process, providing a basis for developing innovative and practical solutions that can enhance the efficiency and quality of candidate selection.

A. The empathy phase represents a crucial component of this research. The aim of this phase is to understand the actual needs of organizations and candidates. The research study concerned was conducted with the informed consent of all the participants regarding ethical permissibility. At the beginning of the study, participants were informed that their participation was voluntary and that they had the right to withdraw from the study at any time during the experiment without any sanctions. Procedures, principles, and ethical issues related to the collection, analysis, and interpretation of data from the experiment were carefully monitored to ensure the credibility of the research outcomes in all phases of the study. In the empathy phase, three data collection techniques were employed to ensure a deeper insight into employee needs, the recruitment process, and the application of digital tools and the DT methodology. Each technique was focused on different aspects of investigating employee needs to identify key factors influencing the selection process, employee alignment with organizational culture, and precision in candidate selection. These techniques include the following:

1. Desk method (SLR)—Data were collected by analysing relevant sources from existing works on the application of digital tools in HR processes. The search was conducted in Web of Science and Scopus databases, using key terms such as “design thinking”, “employment”, “recruitment”, “digitalization”, and “HR”. This method enabled an understanding of trends in candidate selection and the effectiveness of digital tools in optimizing the selection process and reducing time to hire.
2. One-on-one interviews—Interviews with HR professionals were conducted from 14 February to 26 February 2025 to gather insights on whether the application of the DT methodology can assist in candidate selection. Questions were adapted from questionnaires specialized in assessing cultural alignment (the Organizational Culture Assessment Instrument—OCAI—and Cultural Intelligence Self-Assessment) as they allow for a better understanding of how candidates fit into the company’s organizational culture, values, and mission. The aim was to examine whether the application of digital tools improves the selection process and reduces the time needed to select the best candidate. The interviews enabled a deeper understanding of the impact of the iterative approach on employee alignment with organizational culture and precision in candidate selection. Participants shared their experiences in using

digital tools for candidate selection and evaluation, and the data collected through interviews were used in the next step to define key needs and selection problems.

3. Diary method—Using this method, candidates and employees were tracked throughout the entire recruitment process. Candidates shared their experiences, which were then documented through diary entries. Their thoughts and reactions to various stages of recruitment were recorded, including their communication with HR professionals, testing, interviews, and reactions to the tools used. This method allowed for a deep understanding of the emotional and practical challenges candidates face in the selection process, while the data were used to evaluate how the DT approach affects the candidate experience.

B. The define phase is the next step following the completed empathy phase, in which key needs and challenges in the recruitment process are identified through desk research, interviews, and the diary method. This phase represents a synthesis of collected data and enables the structured shaping of insights gained through analysis. The define phase was conducted in February 2025 and was based on findings from the empathy phase. The next step was to structure and analyse key recruitment challenges in the construction sector and create meaningful guidelines for improvements. To define the most important problems and needs, the diagonalization of the P/C matrix (problems/correlations) was used. For designing solutions in the construction sector, where problems are often operational, strategic, and related to efficiency, the P/C matrix can be useful as it allows for structured problem analysis and the definition of strategic priorities. The definition process included the following steps:

1. Problem identification—Participants listed key problems faced by various actors in construction sector recruitment (e.g., inexperienced workers, experienced workers, supervisors, HR professionals).
2. The categorization of problems and needs—Problems were grouped into broader categories (e.g., a lack of qualified workers, high turnover, lack of sector attractiveness for young people).
3. The diagonalization of the P/C matrix—In this phase, the diagonalization method was used to analyse mutual correlations between problems and needs and determine those with the greatest strategic impact.
4. Problem prioritization—Based on the obtained results, key challenges requiring urgent and innovative solutions were defined for the subsequent ideation phase.

This approach enabled a clear and structured understanding of the problems and laid the foundation for developing effective solutions in the subsequent phases of the DT process.

C. The ideation phase was conducted through a collaborative workshop adapted to recruitment in the construction sector. Thirty participants who had recently undergone the selection process in the observed company were chosen for the workshop using the snowball method. All participants were male, living in Croatia, with an average age of 32 years. All participants provided informed consent, and their responses were anonymized to protect their privacy. This study adhered to ethical guidelines to ensure the integrity and confidentiality of collected data. A pilot study was conducted to test the workshop methodology aimed at generating ideas for developing digital tools that could accelerate and improve the selection process in the construction sector. The workshop was held in February 2025 and was conducted virtually using videoconferencing and collaborative tools. Google Meet was used for communication and the MIRO platform for conducting activities.

The workshop was structured in five phases:

1. Introduction—Workshop facilitators introduced themselves and explained the purpose of conducting the workshop, after which each participant had one minute for a brief introduction.
2. Problem definition—Workshop facilitators presented the scenario and defined the problem, using the P/C matrix diagonalization to structurally analyse problems and their interconnections. Participants ranked key challenges in construction sector recruitment according to their impact and solvability, thus defining priority interventions.
3. Ideation—The goal was to encourage participants to generate innovative solutions. Through brainstorming, participants developed innovative solutions, recorded them via MIRO post-it notes, and sketched conceptual models using virtual post-it notes in MIRO, discussing the question: “How can digital tools accelerate and improve the selection process?” This segment lasted 15 min, during which participants freely wrote down and shared their ideas.
4. Prototyping—After selecting key ideas, participants sketched them on paper and then shared them with the workshop facilitators, who moderated further discussion. Finally, a virtual prototype model was created in MIRO, aiming to demonstrate a possible solution for improving recruitment in the construction sector.
5. Conclusion—Workshop facilitators conducted an evaluation activity to gather feedback from participants on the process itself and workshop results. The workshop evaluation collected insights for improving the methodology and further development of solutions aimed at optimizing recruitment in the construction sector.

This approach enabled collaborative idea generation and the rapid prototyping of solutions aimed at improving the recruitment process in the construction sector.

3. Results

In the context of this study, utilizing the DT methodology, triangulation method, cross-validation of responses across participant groups, and iterative feedback loops ensure methodological rigour. This approach aligns with qualitative research standards, enhancing the internal validity and transferability of findings while supporting data collection, idea testing, and result evaluation. This qualitative approach provides a comprehensive framework for optimizing the recruitment process by capturing in-depth insights and ensuring a nuanced understanding of the selection dynamics. The research results were collected through the following: (1) a systematic literature review (SLR), (2) interviews with HR professionals and shift managers, and (3) the diary method with candidates and employees.

3.1. Systematic Literature Review (SLR)

This research initially employed the systematic literature review (SLR) method to gain a comprehensive and objective insight into existing research. This approach allows for the identification of research gaps and integration of various findings to guide future research. The search strategy in Web of Science (WoS) and Scopus databases was structured to enable the identification of relevant studies. The search focus was on peer-reviewed journals indexed in the SSCI and ESCI, covering publications from 2020 to 2025. To direct the search towards the most important aspects of the research, key terms related to “Design Thinking”, the “digitalization of employment”, and “selection processes” were used. This ensured that the search encompassed only relevant scientific papers in English pertaining to the application of DT in the context of employment and human resource management. The aim of this strategy was to collect a wide range of studies analysing how digital tools and the iterative approach of DT can enhance selection processes and improve candidate alignment with organizational culture.

Detailed search criteria and strategies used in these databases are shown in Tables 2 and 3. The initial search, conducted in February 2025 used keywords such as “Design Thinking”, “employment”, “recruitment”, “digitalization”, and “HR” to identify relevant scientific papers investigating the application of DT in candidate selection, the digitalization of the recruitment process, and improving employee alignment with organizational culture. This approach enabled the identification of relevant research contributing to a better understanding of how innovative methods can improve the efficiency and precision of recruitment. This initial search in Web of Science (WoS) and Scopus databases resulted in 2539 papers being found (1058 in Web of Science and 1481 in Scopus), indicating a significant number of studies meeting the review criteria.

Table 2. WoS (SSCI, ESCI) search strategy (2020–2025).

Search Strategy	Hits	Time Frame	Index
(“design think *” AND employment) OR (“recruitment” AND “design think *”) OR (“digital *” AND “design think *”) OR (“HR” AND “design think *”)	1058	All years	CPCI-S, ESCI, SSCI, SCI-EXPANDED, CPCI-SSH, BKCI-SSH, A&HCI, BKSI-S
Refined search: DOCUMENT TYPES: (ARTICLE) AND LANGUAGES: (ENGLISH) AND PUBLICATION YEARS (2025 OR 2024 OR 2023 OR 2022 OR 2021 OR 2020) AND RESEARCH AREAS: (BUSINESS ECONOMICS, INFORMATION SCIENCE, LIBRARY SCIENCE, COMPUTER SCIENCE)	52	2020–February 2025	SSCI, ESCI

In the subsequent step, the search strategy was further refined to ensure the relevance of the identified papers. Given that DT and digitalization are applied across various scientific disciplines, the search was focused on specific subject areas in the Scopus database and categories in Web of Science (as shown in Tables 2 and 3).

Table 3. Scopus search strategy (2020–2025).

Search Strategy	Hits	Time Frame	Index
(TITLE-ABS-KEY (“design think” AND employment) OR (“recruitment” AND “design think”) OR (“digital *” AND “design think *”) OR (“HR” AND “design think *”))	1481	All years	Scopus
Refined search: (TITLE-ABS-KEY (“design think” AND employment) OR (“recruitment” AND “design think *”) OR (“digital *” AND “design think *”) OR (“HR” AND “design think *”)) AND PUBYEAR > 2019 AND PUBYEAR < 2026 AND (LIMIT-TO (SUBJAREA, “COMP”) OR LIMIT-TO (SUBJAREA, “BUSI”)) AND (LIMIT-TO (DOCTYPE, “ar”)) AND (LIMIT-TO (LANGUAGE, “English”)) AND (LIMIT-TO (OA, “all”))	110	2020–February 2024	Scopus

Within Web of Science, the following categories were considered: Business Economics, Information Science & Library Science, and Computer Science (SSCI and ESCI). The corresponding categories in the Scopus database included Computer Science and Business, Management and Accounting.

This search resulted in 162 relevant papers (52 from WoS and 110 from Scopus), as shown in Tables 1 and 2. The search process itself is described using the PRISMA flow diagram for selection (Figure 1). By reviewing abstracts and keywords, papers that did not provide a comprehensive description of DT application in recruitment and candidate selection processes were filtered out. Papers were considered relevant if they were related to the use of the DT method, human resources, digital tools, and the recruitment process. After applying the exclusion criteria, 23 publications remained for further analysis. Key data (e.g., authors, title, journal, the year of publication, DT application, digital tools in recruitment) were then extracted and coded from these studies to support the analysis (Figure 1).

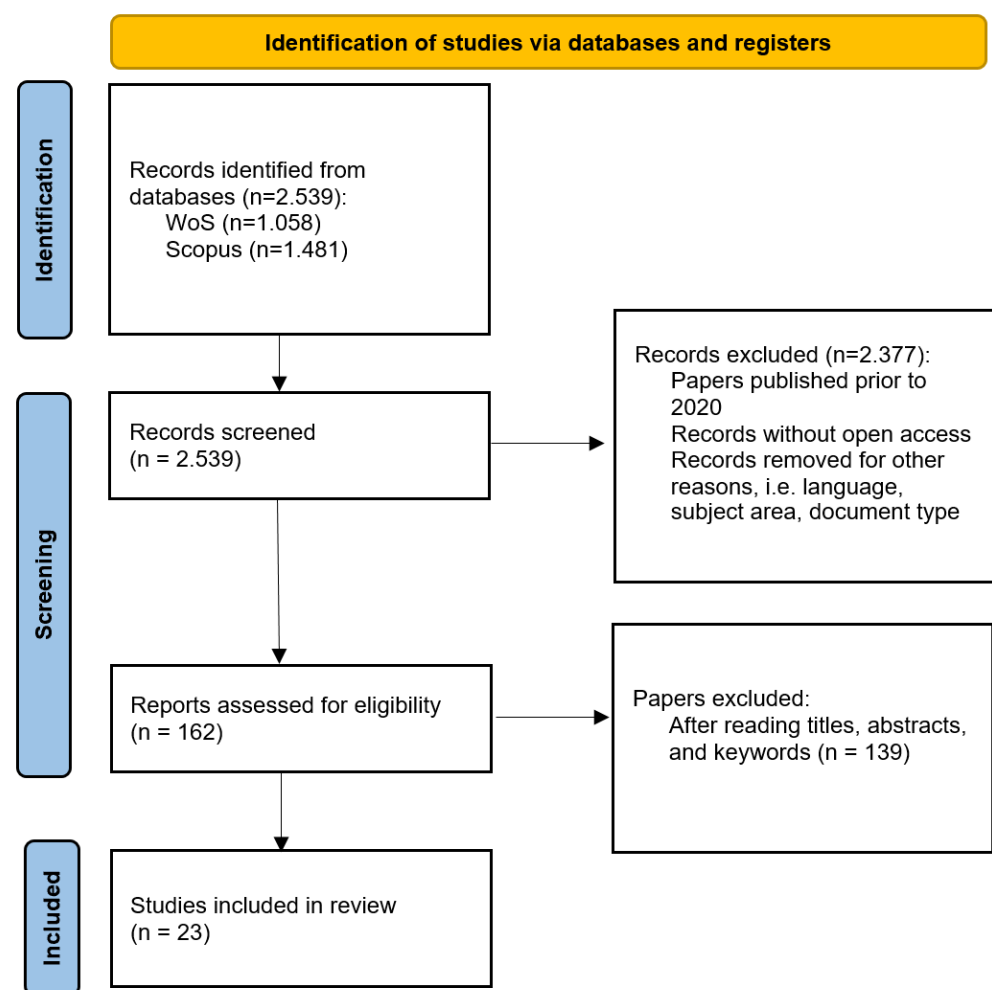


Figure 1. PRISMA flow diagram for selection process of relevant literature.

3.2. Interview with HR Professionals and Supervisors

To process the data collected in interviews with HR professionals and shift managers, in the context of optimizing the recruitment process, a P/C matrix was used as a mathematical representation of the number of processes and data classes or as a matrix of interdependence between processes and data classes. This matrix can display factors from the real system relevant for the strategic planning of the information system (Brumec, 1993; Varga, 2011). In this research framework, the P/C matrix serves as a tool for visualizing and analysing the relationships between different phases of recruitment (processes) and infor-

mation (data classes) generated or used in these phases. This matrix enables the structured tracking of information flow throughout the entire recruitment process, identification of key points where data are created or used, and recognition of potential areas for improvement.

By implementing the P/C matrix in the recruitment process, organizations can better understand how information moves through different phases, allowing for the identification of bottlenecks, unnecessary steps, or opportunities for automation (Table 4). This analytical approach contributes to a more efficient and transparent recruitment process, which can result in better candidate selection and reduced time needed to fill open positions.

The following rules were applied when creating the table:

- (1) Processes are ordered according to recruitment phases.
- (2) Data classes are permuted so that each recruitment phase first generates a specific class and then uses those from previous steps.
- (3) The structure of relationships between data and processes is preserved.

Table 4. Diagonalization of Process/Class (P/C) Matrix for recruitment process in construction sector.

Process\Class	C1	C2	C3	C4	C5	C6	C7
P1	G						
P2		G					
P3			G				
P4				G			
P5					G		
P6						G	
P7							G

Legend: Processes: P1—candidate attraction, P2—application collection, P3—candidate selection, P4—interviews, P5—final evaluation, P6—decision-making, P7—onboarding. Classes: C1—job advertisement and description, C2—candidate applications, C3—test results, C4—interview evaluation, C5—feedback, C6—final decision, C7—contract and onboarding, G—class generated by the process, K—data class that is key for the phase.

3.3. Collaborative Workshop

The process diagram shown in Figure 2 visualizes solutions for optimizing the selection process, conceived during the collaborative workshop in the ideation phase of the design thinking methodology. This phase involves generating ideas about how digital tools can accelerate and improve the selection process. The process diagram clearly illustrates how digital solutions could transform the selection process, reducing the time needed for candidate selection, increasing the quality of decisions, and ensuring greater transparency and candidate satisfaction. In the information–communication discourse, this model emphasizes the key role of digital technologies in optimizing the recruitment process.

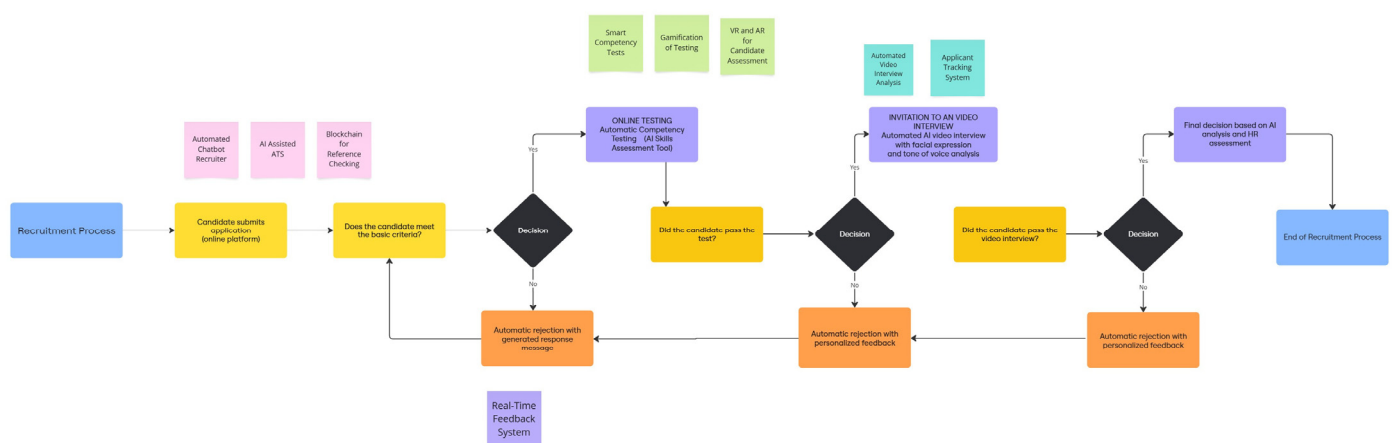


Figure 2. A representation of the generated model for optimizing the selection process.

The selection process begins with collecting candidate applications through digital channels, enabling the simple and rapid gathering of a large number of applications. Subsequently, automated tools are incorporated into the process, such as AI pre-selection systems, which analyse applications and automatically rank candidates according to predefined employer criteria. In the first round of evaluation, a chatbot is implemented to conduct initial interviews and collect basic information about candidates, further accelerating the process. For advanced candidate evaluation, video interviews with an automatic analysis of non-verbal communication, voice tone, and keywords are used. Alternatively, the gamification of testing allows for the assessment of candidate skills through simulations of real work situations. The next step involves verifying the authenticity of candidate data using blockchain technology, which ensures the secure and rapid verification of diplomas, certificates, and work experience. To increase process transparency and improve the employer's image, an automated system is used to generate personalized feedback for all candidates. At the end of the process, the final decision is made using an advanced ATS (applicant tracking system), which uses predictive analytics to filter candidates and recommend the best options. The result of the collaborative workshop is a virtual prototype model whose integrated approach significantly reduces selection time, increases selection quality, and ensures transparency and a positive experience for all process participants.

4. Discussion

The research results explicitly address the crucial role of Design Thinking (DT) in enhancing the recruitment process, particularly in accelerating candidate selection (C1), strengthening alignment with organizational culture (C2), and improving precision in candidate selection (C3). The systematic literature review identified DT as an iterative and collaborative tool that improves HR practices. [Resende et al. \(2023\)](#) demonstrated that DT enhances leadership competencies and fosters collaboration, ultimately optimizing HR processes. While participants acknowledged challenges such as time constraints for certain phases, the immediate implementation of some solutions confirmed DT's potential for real-time problem-solving and collaborative learning.

Furthermore, [Zafar et al. \(2023\)](#) found that DT facilitates predictive workforce analytics, leading to more sophisticated training evaluations. However, the qualitative insights gathered in this study provide an additional validation of how DT and digital tools contribute to recruitment efficiency, cultural alignment, and precision in candidate selection. [Minet et al. \(2024\)](#) analysed how different DT formats impact cognitive experiences, revealing that virtual and hybrid models influence all process phases. Their proposed guide for hybrid DT processes can help organizations adapt recruitment strategies to digital environments. Similarly, [Lee et al. \(2023\)](#) demonstrated that DT mitigates recruitment and retention challenges in nursing homes, emphasizing the need for strategic leadership in diverse work settings. Additionally, [Goher et al. \(2021\)](#) proposed an intelligent labour market management system to balance labour supply and demand, illustrating how disruptive technologies enhance stakeholder collaboration.

The qualitative validation of the P/C matrix analysis provided a structured understanding of recruitment by establishing clear correlations between key phases and generated data, supporting all three research hypotheses. The findings confirm that digital tools significantly accelerate recruitment (H1), while the iterative DT approach enhances employee alignment with organizational culture (H2), and the systematic processing of qualitative data improves the precision of candidate selection (H3). This strategic methodology reduces costs, improves hire quality, and strengthens cultural alignment. Moreover, the sequential approach optimizes information flow, reduces data redundancy, and increases application processing efficiency, aligning with prior studies ([Ginting et al., 2024](#); [Iyer & Khutale, 2024](#);

S & Bhavikatti, 2024; Ebrahim & Rajab, 2025). The iterative refinement of selection criteria, informed by feedback, enhances candidate compatibility with organizational culture, consistent with findings by Chuang and Sackett (2005) and Hoffman and Woehr (2006). By employing methodological triangulation and qualitative pattern analysis, this study substantiates the hypothesized impact of DT and digital tools on recruitment efficiency, cultural fit, and selection precision.

The prototype model developed through a collaborative workshop demonstrated a tangible reduction in selection time (C1), improved hiring quality through iterative feedback loops (C3), and ensured transparency and a positive experience for all stakeholders, reinforcing the role of DT in cultural alignment (C2). These findings support prior research by Ebrahim and Rajab (2025). Gamification and work situation simulations (Figure 2) were instrumental in the candidate skill assessment, as highlighted by Obaid et al. (2020), demonstrating increased engagement and more precise competency evaluation. These insights further validate the research hypotheses by confirming the effectiveness of digital tools (H1), iterative approaches (H2), and DT-driven selection mechanisms (H3). Overall, this study underscores the transformative potential of DT in recruitment, leveraging digital tools, iterative processes, and data-driven decision-making. Further research is recommended to explore DT's impact in the context of digitalization and evolving labour market dynamics.

This study identified resistance to change as a key barrier, with HR professionals sceptical about adopting AI-driven tools due to concerns about dehumanizing recruitment processes (Sivathanu, 2019). To address this, workshops are used to promote openness and provide hands-on training in Design Thinking principles (Bailey et al., 2019). Additionally, cross-departmental collaboration between HR and IT teams enabled the integration of predictive analytics into applicant tracking systems, improving candidate matching and transparency (AIHR Blog, 2023).

5. Conclusions

The research results clearly validate the research objectives (C1, C2, and C3) and support the hypotheses (H1, H2, and H3) that the application of Design Thinking (DT) methodology and digital technologies in the recruitment process significantly enhances selection efficiency, cultural alignment, and selection precision. The process diagram in Figure 2 illustrates how digital solutions—such as artificial intelligence (AI), predictive analytics, gamification, and blockchain technology—transform recruitment by reducing hiring time (C1), improving decision quality (C3), and ensuring transparency and a positive candidate experience (C2). These findings align with the broader academic consensus on digital transformation in human resources, where iterative approaches and data-driven decisions enable more flexible and precise candidate selection.

This research contributes to methodological transparency of DT applications in HR by demonstrating how qualitative validation techniques support hypothesis testing in non-statistical research. The integration of advanced information systems, such as predictive analytics and AI, demonstrates a significant reduction in subjectivity in candidate assessment, while automation enhances data-driven decision-making. Moreover, this study expands the scientific understanding of organizational adaptation to digital environments, emphasizing the synergy between the DT methodology and digital tools in strategic human resource management. Given the increasing influence of digital technologies on the labour market, further research should explore the long-term effects of DT and technological innovations within the context of dynamic organizational changes.

While the findings provide valuable insights into optimizing the selection process through DT and digital technologies, certain methodological limitations impact their gen-

eralizability. This research was conducted as a pilot project using a qualitative study utilizing data triangulation and iterative validation rather than statistical hypothesis testing. Although this method offers a comprehensive analysis of the recruitment process, limitations include its relatively small sample of participants from the construction sector, which may affect the applicability of results to other industries. Additionally, the snowball sampling method, which relies on existing networks, may introduce sample bias. The systematic literature review (SLR) used for secondary data collection effectively examines complex phenomena but may be constrained by time lags in publishing the latest findings. Despite these limitations, this study makes a significant contribution to information and communication sciences by examining the integration of DT and digital technologies in HR processes. It also lays a foundation for future research encompassing broader sectors and larger participant samples.

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Abbreviations

The following abbreviations are used in this manuscript:

DT	Design Thinking
P/C matrix	Process/Class Matrix

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